Flexible Systems Management

P. K. Suri
Rajan Yadav *Editors*

Transforming Organizations Through Flexible Systems Management

Springer

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Preface

Business systems keep facing immense stress due to a variety of developments across the world. As a result, the expected structural changes have far-reaching implications on the traditionally established strategic and operational systems of organizations which may belong to government, corporate, as well as academia. In such a scenario, the organizations which are characterized by flexible systems are expected to be better positioned to absorb the emergent shocks and reshape themselves. On the other hand, it is also being debated that flexible systems may or may not lead to improved performance. To facilitate extensive deliberations on these issues, "GLOGIFT 17", an International Conference with the theme *Transforming Organizations Through Flexible Systems Management*, was organized at Delhi School of Management, Delhi Technological University, Delhi, India, during December 11–13, 2017. The conference aimed at providing a global forum for practitioners, policy makers, faculty members, researchers, and learners to share their practical experiences, knowledge, and insights in the evolution, formulation, and implementation of strategies and models for transforming organizations to keep pace with the changing business ecosystems. The conference attracted academicians and practitioners from several organizations who constructively deliberated on various sub-themes designed on the concept of flexible organizations.

The conference received about 100 research papers. Research papers were subjected to stringent peer review. The selected papers from those that were presented at the conference were again reviewed, updated, and then organized in the form of an edited volume. This edited volume is intended to serve as a valuable reference material in the area of Flexible Systems Management for Transforming Organizations.

This book focuses on key emerging areas concerning flexible systems management as an approach for transforming organizations. This book is organized into three parts corresponding to three themes:

I. Enterprise Flexibility and Performance Management
II. Transformational Strategies and Organizational Competitiveness
III. Supply Chain Flexibility.

Part I on Enterprise Flexibility and Performance Management Comprises Five Chapters. The first chapter presents a generalized flexibility evaluation model by examining interactions between the environment and organizational enablers to measure flexibility. It illustrates that the model can be applied to any organization for which continuity and change assessment is available. The next chapter on strategic flexibility through cross-border acquisitions provides useful insights into the management of firms from emerging economies in the context of their overseas expansion strategies. The next contribution is on the impact of disinvestment on transforming the performance of Indian public enterprises. The chapter aims at determining the financial strength of the central public sector enterprises (CPEs) in India after disinvestment during more than two decades. The findings suggest that disinvestment has not brought much change in the parameters of profitability, assets turnover, and capacity utilization even after 8 years of disinvestment; an increase is observed only in the parameters of productivity and liquidity. The fourth chapter is based on an empirical study involving select companies from the IT and automobile industries. It brings out an integrated model explaining the effect of learning, innovation, and entrepreneurship factors on flexibility. Finally, the fifth chapter analyzes employability gaps and talent supply mismatch in the IT sector with the aim of enhancing manpower flexibility in the concerned organizations. The key insights are in the direction of enabling potential job seekers to clearly understand the employer demands in the IT sector and equip themselves with the required knowledge and skills.

Part II of this book on Transformational Strategies and Organizational Competitiveness consists of seven chapters. The first chapter in this part addresses the research gap related to the identification of Situation-Actor-Process variables that may be expected to influence the performance of e-governance projects using big data. Based on a pilot study of the Central Government Health Scheme, it brings out that big data analytics can play a significant role in transformation of several citizen-centric e-governance initiatives by providing deeper insights to the decision makers in government. The next contribution presents a case study of E-Assessment project of the Department of Commercial Taxes as one of the key initiatives for promoting e-governance in the state of Uttar Pradesh in India. The process re-engineering-based digital transformation of the department showcases how trade-related government services can be provided to citizens in a convenient, efficient, and transparent manner. The next chapter analyzes the association between self-efficacy optimism, personal optimism, and career planning based on a survey of managers working in the public and private manufacturing sectors. A framework depicting interrelationship between human resource flexibility and organizational effectiveness is presented in the next contribution. The possible role of organizational citizenship behavior and employee interest to stay with the organization is also illustrated. The next chapter examines the relationship between

supportive culture and job satisfaction mediated by stress and career advancement based on a survey of women employees of call centers. The findings can be useful in bringing about transformation in an organization in terms of increasing the motivation levels and lowering the attrition rate of employees. The next contribution in this part brings out a multi-criteria-based decision support framework for addressing healthcare waste management issues in developing countries. The proposed conceptual framework provides a line of action for hospitals and waste disposal firms for effective management of healthcare waste in developing countries in a sustainable manner. Finally, the last chapter in this part aims at understanding the customer's emotional engagement and their inclinations toward the promotion/brand. Based on the sentimental analysis of consumer comments on Facebook brand pages, the findings of this contribution emphasize flexible marketing plans to accommodate changing consumer's expectations.

Part III of this book on Supply Chain Flexibility includes four chapters. The first chapter on channel collaboration in e-commerce investigates the nature of collaboration between the vendors and the e-retailers. It identifies important elements of their trade relationship which contributes to a synergetic relationship and marketing flexibility so that the value chain becomes more adaptive, responsive, and sustainable. The next contribution explores the adoption issues in the ambitious electronic agricultural marketing (eNAM) platform launched by the Indian government. Based on a pilot study of a wholesale market, measures are suggested to promote eNAM adoption by farming community, thereby creating more options for selling their produce. The findings aim at sensitizing policy makers so as to trigger suitable interventions to achieve the intended transformation of the conventional agricultural marketing system through the eNAM initiative. The next chapter presents an analysis of logistics service providers (LSPs) to prioritize practices being followed by them. The study highlights the need for flexible processes to be adopted by both organized and unorganized LSPs in terms of strategic, operational, technical, and societal practices. Finally, the last chapter in this part develops the framework for a green flexible manufacturing system with major components as an application of advanced manufacturing technologies, green process design and green product design.

This book is supported by both quantitative- and qualitative-based research and case applications pertaining to different areas related to government, profit, and not-for-profit organizations. The chapters are authored by academicians as well as serving practitioners.

We are thankful to all the authors and reviewers for their efforts which has made it possible to bring out this volume. We thank the Flexible Systems Management book series editor Prof. Sushil for his constant guidance during the creation of this edited volume. Special thanks are due to faculty members of Delhi School of Management and scholars, particularly Prof. G. C. Maheshwari, Dr. Archana Singh, Dr. Shikha N. Khera, Dr. Vikas Gupta, Mr. Anurag Tiruwa, Ms. Shikha Gupta, Ms. Meenu Chopra, Ms. Sakshi Kukreja, Ms. Niharika, and Ms. Vaishali, for their active support during GLOGIFT 17 which has been the genesis of this volume.

Thanks are also due to Mrs. Rejani Raghu for her tireless efforts in consistently providing support for word processing and formatting of the manuscript.

It is expected that this book will serve as a useful resource for different audiences such as management students, scholars, consultants, and practicing managers belonging to both government and the corporate.

New Delhi, India

P. K. Suri
Rajan Yadav

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About the Editors

Dr. P. K. Suri is a Professor and former Head, Delhi School of Management, Delhi Technological University, Government of NCT of Delhi. Prior to joining academia in 2012, he served at the Central Government for more than twenty-five years. He joined the Indian Statistical Service (ISS) in 1986, initially working at the Department of Tourism. He later joined the National Informatics Centre and worked at different levels ranging from Senior Systems Analyst to Senior Technical Director for strengthening agricultural informatics in the country. He has been the National Coordinator of NIC for the ambitious ongoing e-governance project "Agricultural Marketing Information Network System (AGMARKNET)" sponsored by the Ministry of Agriculture and Farmers' Welfare. He has also served in consulting roles for United Nations bodies, including the World Tourism Organization and the Food and Agricultural Organization. He is member of Governing Council of Global Institute of Flexible Systems Management (GIFT) and has been the Honorary President of this society for the year 2016. He has also contributed to various academic/government committees in the roles of Chairman/Co-Chairman/Member. He has published in international journals and conference proceedings and delivered invited lectures at several government and academic Institutes. He has recently co-authored a book titled "Strategic Planning and Implementation of E-governance", published by Springer.

Dr. Rajan Yadav is a Professor and Head, Delhi School of Management, Delhi Technological University, formerly Delhi College of Engineering. He graduated from Delhi University, obtained his Master's Degree in Business Management from MD University and was awarded a Ph.D. in Organized Retail. Prof. Yadav is actively involved in teaching, research and administration, and his interests include behavioral dimensions of technology diffusion, online social networks and student community-related social marketing issues. He has extensively published for Emerald, Springer, Inderscience and Sage publications. He is a member of the

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Part I
Enterprise Flexibility and Performance Management

Chapter 1
Generic Flexibility Evaluation Model

Sanjai Kumar Shukla and Sushil

Abstract The ability to cope up with the uncertain environment is shaped by organizational flexibility. The flexible organizations sustain the competitive advantage over the period of time. The flexibility in different contexts essentially induces speed and agility in organizational processes. The flexibility evaluation mechanism will help organizations to measure and enhance the organizational flexibility. This study proposes a generalized flexibility evaluation mechanism demonstrated by an example of workforce flexibility measurement by analyzing the impact of flexibility enablers and the business environment. The workforce flexibility contributes significantly to versatility, responsiveness, and the ability of employees to move between jobs. The flexibility evaluation mechanisms available in the literature are industry, organization, and context-specific and not generic in nature and ignore the impact of the business environment.

Keywords Employee flexibility · Flexibility · Measurement of flexibility · Workforce flexibility

1.1 Introduction

The ability to cope up with the uncertain environment is shaped by organizational flexibility. The flexible organizations sustain the competitive advantage over the period. The flexibility in different contexts essentially induces speed in the organizational processes. The flexibility evaluation mechanism will help organizations to measure and enhance the organizational flexibility. This chapter proposes a generic flexibility evaluation model demonstrated by measuring workforce flexibility. Flex-

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ibility enables the organizations to achieve the desired objectives faster and cope up with internal and external changes. The flexibility measurement techniques quantify the select flexibilities for making organizational strategies for competitive advantage. This chapter identifies various types of flexibility measurement techniques available in the literature and proposes a measurement framework which can be applied across industries by analyzing the impact of the interaction between flexibility enablers and the business environment.

1.2 Literature Review

The flexibility evaluation methods available in the literature show a definite trend. These methods examine the outcome of flexibility, while others examine the sources of flexibility for assessing organizational flexibility. Following five categories of measurement techniques of flexibility are identified from the existing literature.

1.2.1 Broad Categorization of Flexibility

In this category, organizational flexibility is put in different broad categories. Garavelli (2003) categorized supply chain flexibility in three categories, i.e., total flexibility, limited flexibility, and no flexibility. The flexibility aspects were mainly related to the performance of an organization. Verdu et al. (2009) proposed four types of managerial flexibility, i.e., external and internal, strategic and structural.

1.2.2 Flexibility Measurement Using Mathematical Formula

In this case, various formulae are proposed for measurement of select flexibilities. The operational means are defined to understand the impact or outcome of the flexibility. Beamon (1999) used the output volume, the percentage of the slack time, the number of different product types, and the delivery time for measuring the delivery, volume, and mix flexibilities. The capacity and load flexibility for manufacturing systems are measured by Teich and Claus (2017). However, the mapping of the characteristic of the manufacturing system and quantification of manufacturing flexibility is difficult (Kahraman et al. 2004). Tsourveloudis (1998) used the fuzzy logic to measure manufacturing flexibility. A rule-based flexibility evaluator has been demonstrated through prototype by Das and Caprihan (2008). Zhang et al. (2017) formulated the measurement of process flexibility of product design by considering requirement variations. Tsai et al. (2017) used entropy-based and Taguchi quality loss for flexibility measurement using a mathematical formula.

1.2.3 Measurement Based Upon Sources and Enablers of Flexibility

The enablers or sources of flexibility are examined for measuring flexibility. The example can be seen in the work of Lin et al. (2006b) who proposed a fuzzy agility evaluation method by examining business operation elements, supply chain capabilities, and agility drivers. Lee and Xia (2005) developed team flexibility measurement using capability and socio-technical perspective. Gligor et al. (2013) devised measures of supply chain agility based on swiftness, alertness, accessibility, and decisiveness. Kandemir and Acur (2012) used the resources, capabilities, and performance to frame strategic decision-making flexibility.

1.2.4 Index-Based Weighted Measurement

The index-based weighted flexibility measurement has been used by many authors, wherein Likert-type scales were used. Swafford et al. (2008) measured each function of the supply chain on this scale. The index for the agility evaluation is used by Yang and Li (2002).

1.2.5 Measurement of Flexibility Through Assessment of Organizational Output

In this category, the outcome due to organizational flexibility is examined. This includes observation of visible characteristics of flexibility. Lin et al. (2006a) have introduced fuzzy principles to evaluate the agility of an organization based on performance and importance of agile capabilities. Gong (2008) suggested analytical models describing the relationships between the degree of flexibility and system-level performance. Ganguly et al. (2009) proposed the agility evaluation using responsiveness, cost-effectiveness, and the market share. The study done by Sheffield and Lemétayer (2013) has identified the factors indicative of software development agility in the organization. Rastogi et al. (2016) indicated the flexibility as a predictor of work—family enrichment. The association between firm performance and HR flexibility is demonstrated by Sekhar et al. (2016).

It can be seen from the literature review that flexibility measurement has taken progression from the basic categorization of flexibility to fuzzy measurement of different types of flexibilities. The flexibility evaluation mechanisms available in the literature are industry and context-specific and not generalized. A generalized model of flexibility evaluation using business, environmental factors, and flexibility enablers is lacking in the extant literature.

1.3 Methodology

The flowing stream strategy by Sushil (2012, 2013) has been used in this chapter for providing theoretical support to flexibility measurement method. This framework compares characteristic of the flowing stream with organizational growth. This framework is used for identifying different types of forces acting on the organization. In the framework of "Flowing Stream Strategy", the major forces that pull the organization toward its continuity are existing infrastructure core ideology, customer base, core competence, brand, technology, and distribution network, culture, and performance. The push toward the change is facilitated by mergers and acquisitions, changing customer needs, competition, globalization, new opportunities, new technology, e-business, government policies, and environmental factors. The result of the assessment is further used for measuring flexibility. The flowing stream strategy operates under seven guiding principles. These principles emphasize strategic changes by leveraging the benefits of the continuity in a dynamic manner. The underlying methodology behind the framework and its principles gives enablement of flexibility. To achieve the next level of performance, the organization requires creative discontent with the present situation and the desired change is enabled by flexibility. The organizations have to show flexibility to incorporate opposite options. During organizational growth, the energy is drained and it needs to be continuously vitalized. The organization encounters a number of hurdles on the way and finds its way by circumventing these hurdles using suitable flexibility. The use of four key strategic channels, i.e., shift, partition, divert, and integrate, is proposed for the organizations. The proposed measurement framework of flexibility requires identification of various forces acting on the organization which are identified as flexibility enablers. The visual depiction is made in Fig. 1.1 for impact of the business environment and flexibility enablers on the organization. The entire process of flexibility evaluation using the example of workforce flexibility has been described in four steps.

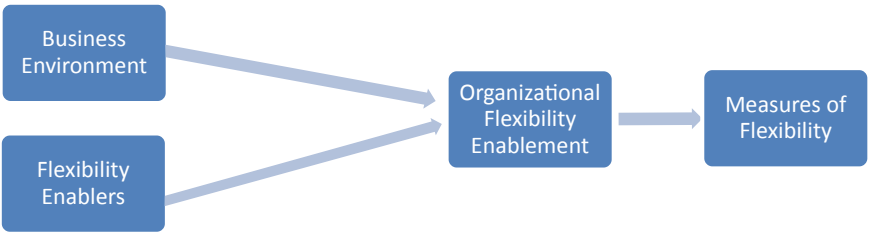

Fig. 1.1 Interaction among business environment and flexibility enablers

1.3.1 Step-1: Identification of Business Environmental Factors Impacting Flexibility

Twenty business environmental factors impacting flexibility are identified using the flowing stream strategy framework (Sushil 2012, 2013). Following are the major continuity and change forces.

i. New opportunities,
ii. E-Business,
iii. Mergers and acquisitions activities,
iv. Product lifetime shrinkage,
v. Quicker delivery time,
vi. Customer needs,
vii. New technology (software),
viii. Government policies and legislation,
ix. New technology (methods),
x. Environmental concerns,
xi. The increasing rate of change in product models,
xii. Competitors,
xiii. Increasing pressure on cost,
xiv. Economies of scale,
xv. Increasing pressure of global market competition,
xvi. Impact of globalization,
xvii. Quick time to market,
xviii. The growth of niche market,
xix. Rapidly changing market, and
xx. Increasing quality expectation.

1.3.2 Step-2: Identification of Enablers of Flexibility Within Organization

Within the given business environment, there are enablers present in the organization which induces the flexibility. The workforce flexibility in information technology (IT) industries plays a major instrument of growth. The enablers of workforce flexibility are utilized from the study done by Yusuf et al. (1999). Ten such enablers to induce flexibility are listed below:

i. Education and skill upgrade,
ii. Integration,
iii. Competence,
iv. Quality,
v. Team building,
vi. Partnership,

vii. Technology,
viii. Change,
ix. Market, and
x. Welfare.

1.3.3 Step-3: Computing Intensity of Continuity and Change Forces

The questionnaire is prepared to make an assessment of continuity and change forces and environmental forces (external and internal) acting on the organization. The key concerns of assessing change and continuity forces for designing the questionnaire are listed below:

- Benchmarks for the planned progress,
- The overall level of understanding of the goals within the organization,
- Additional enterprise-wide support needs for change,
- Best practices from other organizations,
- Planned actions and challenges to employees' understanding,
- Current dynamics of the marketplace and its impact,
- Mechanism to capture signals from customers in advance,
- Ways to better understand customer needs,
- Key processes being worked on and their selection criteria,
- Value enhancement from the customer's perspective,
- Leveraging the strengths of the enterprise,
- Realization of economies of scale, and
- The relative intensity of continuity and change forces.

1.3.4 Step-4: Measurement of Select Flexibility

A matrix is prepared to show the strength of interaction between forces, i.e., the business environment and applicable flexibility enablers in an organization. The value of relevant flexibility is derived from these assessments.

1.4 Evaluation of Workforce Flexibility in Case Organization

The case organization had started from scratch when the information technology hardly existed in India. Currently, it has employee strength of more than one lack. It is located in the Delhi/NCR region of India. It has an enlightened approach

toward employee development. It provides the people whatever they need for success, i.e., expert guidance, talent transformation, inner peace, or empowerment. Its range of offerings span across infrastructure services, product engineering, technology services, BPO, systems integration, hardware, and distribution of technology products. The organization is trying to be the preferred engineering-led global IT service provider. The organization promotes entrepreneurial behavior. This enables to handle rapid changes in the environments and technologies.

1.4.1 Assessment of Workforce Flexibility

The method of measuring workforce flexibility has been demonstrated for case organization in two stages. In the first stage, the impact of flexibility enablers on the business environment is explained for workforce flexibility. If the environment impacts the enabler, then the value "1" is assigned to the matrix cell given in Table 1.2. In the second stage, the intensity of flexibility enablers is computed.

1.4.2 Stage 1: Determination of Impact of Flexibility Enablers on Business Environment

The business environment is used as the flexibility is the predictor of performance in the dynamic business environment (Anand and Ward 2004). The sufficient importance is given to the business environment in this work. In this section, the impact of 20 business environmental factors on ten flexibility enablers is determined and explained theoretically.

i. **Impact of Globalization**: It is forcing organizations to adopt for workforce flexibility. The workforce flexibility is influenced by current practices in the organization like the concurrent execution of activities, multi-venturing capabilities, individuals working in cross-country and cross-functional teams, technology awareness programs, decentralized decision-making, strategic relationship with suppliers and customers, and new product introductions. The impact of globalization touches all enablers; therefore, all the enablers participate in workforce flexibility. Hence, enablers like team building, integration, change, competence, quality, technology, partnership, education, market, and workforce skill upgrade are given the value "1" in matrix cells given in Table 1.2.
ii. **New Opportunities**: Adoption of new practices and scenarios for new opportunities are influenced by the existing skill set. The workforce flexibility is enabled by information accessible to employees, enterprise integration, business practice difficult to copy, the team across company borders, response to

market changes, and customer satisfaction supported by other enablers and accordingly marked in Table 1.2.

iii. **E-Business**: The business environment impacting organization enablers are business practices difficult to copy, cross-functional teams, technology awareness, first-time-right design, products with substantial value addition, and response to market changes. The corresponding heads under enabler are competence integration, partnership, team building, technology, quality, market, and education; these are marked as "1" in Table 1.2.

iv. **Competitors**: Stiff competition forces' redeployment of resources at a certain point of time and workforce flexibility is enabled. All the enablers participate in this case.

v. **Mergers and Acquisitions**: The enabler's heads are competence, market, integration, team building, technology, change, partnership, quality, education, welfare, and workforce skill upgrade. All these enablers participate in workforce flexibility.

vi. **Government Policies and Legislation**: The applicable environment and enablers are enterprise integration, information, and welfare measures along with all other enablers. Hence, enablers like integration, competence, team building, technology, quality, partnership, market, education welfare, and workforce skill upgrade are given value "1" in matrix cells.

vii. **New Technology (Software/Hardware)**: It is creating major impact, and organization's influencers for enabling workforce flexibility are multi-venturing capabilities, technology awareness, skill and knowledge enhancing technologies, development cycle time, learning organization, the culture of change, multi-skilled, and flexible people. Hence, enablers like integration, competence, team building, technology, quality, change, partnership, education, market, and workforce skill upgrade are given the value "1" in matrix cell given in Table 1.2.

viii. **New Technology (Method)**: It is more related to process and has a similar impact as tools as described in the above section of new technology.

ix. **Environmental Concerns**: It induces a major change in organizational business and policies. Hence, enablers like competence, team building, integration, quality, change, technology, partnership, education, market, and workforce skill upgrade are given 1 in matrix cells in Table 1.2.

x. **Economies of Scale**: The applicable influencers, in this case, are the concurrent execution of activities, quality over product life, multi-venturing capabilities, strategic relationship with customers, products with substantial value addition, new product introduction, close relationship with suppliers, customer satisfaction, and response to market changes. Corresponding enablers are competence, integration, team building, technology, quality, partnership, education, change, market, and workforce skill upgrade are assigned the value"1" in matrix cells.

xi. **The Growth of Niche Market**: The empowered individuals working in teams, business practice difficult to copy, technology awareness, and products with substantial value addition are contributors to this process. The enablers

like competence, integration, technology, team building, quality, partnership, change, market, education, welfare, and workforce skill upgrade participate for workforce flexibility and given the value "1" in the matrix cells.

xii. **An Increasing Rate of Change in the Product Models**: The relevant enablers are continuous improvement, customer-driven innovations, and response to market changes. The relevant enablers participate in inducing workforce flexibility and given value "1" in the matrix cells given in Table 1.2.

xiii. **Increasing Pressure on Cost**: The corresponding influencers are short development cycle time, and first-time-right design supported by all other flexibility enablers. The corresponding enablers are given the value "1" in matrix cells in Table 1.2.

xiv. **Product Lifetime Shrinkage**: The major influencers are enterprise integration, concurrent execution of activities, information, multi-venturing capabilities, empowered individuals, leadership in the use of current technology, technology awareness, skill and knowledge enhancing technologies, substantial value addition in products, short development cycle time, first-time-right design, strategic relationship with customers, customer satisfaction, customer-driven innovations, response to market changes, multi-skilled and flexible people, and learning organization. Therefore, all the enablers participate in workforce flexibility and value one assigned is assigned to the matrix cells.

xv. **Rapidly Changing Market**: A product portfolio variability driven by customer requirement is the business environment, and relevant influencers are the culture of change and continuous training and development. All other enablers are effective for inducing workforce flexibility in this case.

xvi. **Increasing Pressure on Cost**: Customer expectation for a value of money is the driver for the adoption of improved processes. The relevant contributors participating to achieve objectives are enterprise integration information, concurrent execution of activities, multi-venturing capabilities, empowered individuals, leadership in the use of current technology, technology awareness, skill and knowledge enhancing technologies, first-time-right design, products with substantial value addition, short development cycle time, strategic relationship with customers, customer satisfaction, customer-driven innovations, learning organization, response to market changes, and multi-skilled and flexible people. All enablers participate for enabling the workforce flexibility and assigned the value "1" in the matrix, except for exceptional decision to compromise on welfare objectives.

xvii. **Quicker Delivery Time**: The faster delivery time is a major focus of IT organizations. The variability in technology domains and experience of individual induces multiple skill sets in an employee. The risk-taking initiative impacts development schedule which is mitigated with help engineers of different technology domains. The relevant influencers for workforce flexibility, in this case, are organizational training and exposure along with other support mechanisms, and relevant enablers are given in Table 1.2.

xviii. **Quick Time to Market**: All types of enablers are required for timely delivery of products. The workforce flexibility is enabled by leveraging the short development cycle of products.

xix. **Increasing Quality Expectation**: High-quality product delivery requires IT organization to have individuals trained in other areas which are required for integration of products for complete solutions. It involves all enablers' support, and hence value "1" is assigned to matrix cells.

xx. **Increasing Pressure of Global Market**: It is a major force acting on organizations to adopt for workforce flexibility due to faster expansion and collaborative work practices. Enablers like integration, competence, team building, technology, quality, change, partnership, market, education, and workforce skill upgrade are required in this case for workforce flexibility. The relevant enablers are marked as "1" in Table 1.2.

1.4.3 Stage 2: Computation of Intensity of Enablers

The study is carried out to find out various change and continuity factors impacting the organization along with the intensity of each factor. All survey items of the continuity and change forces given in Table 1.2 are measured using a 5-point Likert scale (1: Strongly disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly agree). Higher scores indicate higher levels of each force. Thirty-four respondents from case organization working in team leadership and managerial position have completed the questionnaire. The summary of observations is presented in Table 1.1.

The survey has shown that the case organization is operating under moderately high change forces and high continuity forces. The technology- and regulatory-driven forces and customer forces are experiencing high intensity.

1.4.4 Computation of Workforce Flexibility

The final matrixes of enablers and environment are given in Table 1.2 for the measurement of workforce flexibility in the case organization. The sum of all enablers in the cell is multiplied by the weight of factors obtained in continuity and change assessment which are listed in the first row of Table 1.2. The total sum of all enablers is obtained w.r.t maximum score of 1000. This normalized to the scale of 1. For all enablers and environmental forces whose weighted score is required for measurement of flexibility, the nearest value of continuity and change forces assessment from Table 1.1 is used if it is not directly available from the questionnaire.

The workforce flexibility for case organization is 0.7508 on a scale of 1 which is on the higher side. The organization is desired to be competitive. All enablers are interacting with most of the environmental factors within the organizational framework to achieve the desired flexibility.

Table 1.1 Summary of the intensity of continuity and change forces

S. no	Continuity and change forces	Average value of continuity/change forces
Values of continuity forces		
1	Huge customer base	4.42
2	Global supply chain and distribution network	2.90
3	Well entrenched infrastructure	4.40
4	Existing culture	3.41
5	Technology for continuity	3.82
6	Core competence	3.95
7	Internal factors (for continuity)	4.76
8	Performance	3.73
Values of change forces		
1	Competition	3.76
2	New opportunities	3.64
3	Globalization	3.81
4	New technology	4.12
5	Customer needs	3.84
6	Internal factors (for a change)	4.12
7	Government policies	4.20
8	Mergers and acquisitions	3.18
9	E-business	3.72

1.5 Conclusion

This framework assumes that flexibility in an organization is enabled by the external environment. The framework "Flowing Stream Strategy" captures internal and external change forces needed for flexibility and growth of an organization. To face the changing circumstances while maintaining the benefits of existing continuity forces, the flexibility is needed (adaptation flexibility, organizational flexibility, and responsiveness to target market flexibility) in the organization. The intensity of external forces impacts the degree of flexibility. The different combinations of continuity (high and low impact forces) and change forces (high and low impact forces) give the different types of flexibility enablement (strategic flexibility, structural flexibility, total system flexibility, delivery and delivery time flexibility, distribution flexibility, new product flexibility, operational flexibility, response flexibility, state flexibility, system flexibility, adaption flexibility, etc.). It also shows the interdependence among

Table 1.2 Assessment of workforce flexibility

An environment of workforce flexibility (industry influence)										
Weights of business environmental factors impacting organizations**	3.63	3.52	3.86	3.74	3.58	3.28	4.03	4.02	4.02	4.03
Enablers of Workforce flexibility	Impact of globalization	New opportunities	Competitors	Customer needs	E-business	Mergers and acquisitions activities	Government policies and legislation	New technology (software)	New technology (methods)	Environmental concerns* (govt. policies)
Integration	1	1	1	1	1	1	1	1	1	1
Competence	1	1	1	1	1	1	1	1	1	1
Team building	1	1	1	1	1	1	1	1	1	1
Technology	1	1	1	1	1	1	1	1	1	1
Quality	1	1	1	1	1	1	1	1	1	1
Change	1	1	1	1	1	1	1	1	1	1
Partnership	1	1	1	1	0	1	1	1	1	1
Market	1	1	1	1	1	1	1	1	1	1
Education and workforce skill upgrade	1	1	1	1	1	1	1	1	1	1
Welfare	1	1	1	1	0	1	1	0	0	1
Sum of all enablers	10	10	10	10	8	10	10	9	9	10
Sum of all enablers with weight	38.1	36.4	37.6	38.4	29.8	31.8	42	37.1	37.1	42
Workforce flexibility weight on a scale of 1000	750.8									
Workforce flexibility weight on a scale of 1	0.7508									

(continued)

Table 1.2 (continued)

An environment of workforce flexibility (industry influence)										
Weights of business environmental factors impacting organizations**	3.63	3.52	3.74	4.04	3.52	4.04	4.04	4.04	4.04	3.63
Enablers of Workforce flexibility	Economies of scale* (performance)	Growth of niche market* (new opportunities)	Increasing rate of change in product models (technology for continuity)	Product lifetime shrinkage* (internal factors for change)	Rapidly changing market* (new opportunities)	Quicker delivery time* (internal factors for change)	Increasing pressure on cost* (internal factors for change)	Quick time to market* (internal factors for change)	Increasing quality expectation* (internal factors for change)	Increasing pressure of global market competition* (globalization)
Integration	1	1	1	1	1	1	1	1	1	1
Competence	1	1	1	1	1	1	1	1	1	1
Team building	1	1	1	1	1	1	1	1	1	1
Technology	1	1	1	1	1	1	1	1	1	1
Quality	1	1	1	1	1	1	1	1	1	1
Change	1	1	1	1	1	1	1	1	1	1
Partnership	1	1	1	1	1	1	1	1	1	1
Market	1	1	1	1	1	1	1	1	1	1
Education and workforce skill upgrade	1	1	1	1	1	1	0	1	1	1

(continued)

Table 1.2 (continued)

An environment of workforce flexibility (industry influence)										
Weights of business environmental factors impacting organizations**	3.63	3.52	3.74	4.04	3.52	4.04	4.04	4.04	4.04	3.63
Enablers of Workforce flexibility	Economies of scale* (performance)	Growth of niche market* (new opportunities)	Increasing rate of change in product models (technology for continuity)	Product lifetime shrinkage* (internal factors for change)	Rapidly changing market* (new opportunities)	Quicker delivery time* (internal factors for change)	Increasing pressure on cost* (internal factors for change)	Quick time to market* (internal factors for change)	Increasing quality expectation* (internal factors for change)	Increasing pressure of global market competition* (globalization)
Welfare	0	1	1	1	1	1	0	1	1	1
Sum of all enablers	9	10	10	10	10	10	8	10	10	10
Sum of all enablers with weight	33.6	36.4	38.2	41.2	36.4	41.2	33	41.2	41.2	38.1
Workforce flexibility weight on a scale of 1000	750.8									
Workforce flexibility weight on a scale of 1	0.7508									

Note The values of items marked with * are values of equivalent items given in brackets. These values are not directly available
The items marked with ** are average values computed during the assessment of the intensity of continuity and change forces

various flexibilities. It can be seen that various types of flexibilities are required to handle a combination of environmental forces and organizational factors (Kara et al. 2002). The turbulent business environment has a role in shaping organizational flexibility (Camps et al. 2016).

The twenty environmental factors are analyzed for impact on Workforce flexibility, and corresponding values are indicated between (0 and 1) based on the relevance of enabler. In the ideal case, all enablers are present in all types of flexibilities giving 100% flexible organization w.r.t workforce. The workforce flexibility on a scale of 1 is 0.7508. The various continuity forces in organization show the high values due to customer-, infrastructure-, and performance-related issues. The overall intensity of continuity factors is on the higher side due to policy-driven governance and infrastructure availability.

The flexibility evaluation mechanisms available in the literature are industry-, organization-, and context-specific and not generic and ignore the impact of the business environment. The purpose of this study was to examine interactions between environment and organizational enablers to measure flexibility. This mechanism of measuring given a type of flexibility is important because it is generic and can be applied to all types of flexibility. The framework is generic and can be applied to other types of industries with slight modifications and incorporating factors relevant to the industry, but the measurement technique will remain the same. The factors impacting organizational flexibility have been identified by Jain and Raj (2013). The methodology can be applied to any organization for which continuity and change assessment is available. Some organizational surveys are needed to fully explore the given methodology. Organization enablers and industry influence factors are kept at 10 and 20 at present which can be extended. In the present survey, some of the factors are not directly measured, but their equivalent values are taken on the assumption that if these values are measured their values will be closer to assumed values. In the matrix cells, decision is taken to include and exclude a given parameter by giving binary (0, 1) values. The intermediate levels are also required to make this flexibility measurement framework more effective. The workforce flexibility contributes significantly to versatility, responsiveness, and the ability of employees to move between jobs.

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Chapter 2
Strategic Flexibility Through Cross-Border Acquisitions: Market Response in Indian Context

Samta Jain, Smita Kashiramka and P. K. Jain

Abstract The global business organizations are virtually bound to possess strategic flexibility to confront the prevalent economic settings characterized by high volatility and fierce competition. Viewed from this perspective, cross-border acquisitions have become a critical constituent of expansion strategies for corporates, especially in emerging economies. This chapter proposes to evaluate the behavior of capital market around the announcement of international takeovers by firms from emerging economies. To meet these objectives, 110 overseas mergers undertaken by Indian companies over the period from 2012 to 2015 constitute the sample of the study. It has been observed that bidders, on an average, earn positive and statistically significant abnormal returns of 0.49% on the event day. Also, cumulative average abnormal returns (CAAR) examined over alternative period windows indicate significant value creation for Indian bidders. Moreover, the gains are more pronounced when the acquired firm is based in developed markets. This research work endeavors to enhance the understanding of cross-border acquisitions (CBAs) by enterprises from emerging markets (like India).

Keywords Cross-border acquisitions · Developed markets · Emerging markets · Event study India · Share price performance

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2.1 Introduction

The liberalization and globalization of financial markets, fierce competition, and technological developments have made business organizations vulnerable to volatile, uncertain, chaotic, and ambiguous (VUCA) environment (Sushil 2017a). To manage these threats effectively, firms perforce are compelled to be flexible and competent for their strategic processes (Hina et al. 2016). Firms have to move away from the clutches of rigidity and create flexible organizations.

As a concept, flexibility may be defined in terms of access to various options, change mechanisms in various processes/strategies, and freedom of choice (Sushil 2017a, b). In today's turbulent and unpredictable environment, maintaining a competitive advantage with only one option has become an arduous task for business firms. Thus, organizations from emerging economies are exploring multiple options by venturing into overseas transactions.

Exhibiting strategic flexibility, corporates in emerging nations have been rigorously involved in cross-border mergers to make their presence felt at the global level. As a result, there has been a sharp increase in outflow of foreign direct investments (FDI) from developing economies. As per the World Investment Report, developing markets have been the source of 39% of the total outbound FDI, recording an unprecedented level of US$454; 15 years ago, emerging economies contributed only 7% (UNCTAD 2014). In addition, UNCTAD (2014) also reported that there had been an increase in CBAs undertaken by emerging markets with a steep rise in 1 year from US$63 billion to US$109 billion.

Apropos to this, the overseas acquisition has developed as an inevitable ingredient of the expansion strategies by Indian firms seeking diversification of operations and quick access to international markets. These strategic decisions improve the geographical and operational flexibility by allowing firms to develop a network of businesses across various geographies. Since the 1990s with the liberalization and privatization of the Indian economy, Indian companies have been making huge investments in foreign markets to expand their operations across national boundaries.

Figure 2.1 exhibits that the number of CBAs completed by Indian firms has shown, by and large, an increasing trend during 2000–2010. The global financial crisis in 2008 caused a sudden plunge in the number of overseas transactions that regained its momentum in 2010. Since 2010, CBAs have shown an upward trend with 40,400 deals amounting to $3.5 trillion being transacted in 2014 (Swaminathan et al. 2014).

Hitherto, by and large, the literature focusing on mergers and acquisitions (M&As) in the management domain has evolved in developed markets. Filling the void, this academic work seeks to widen the existing knowledge on mergers and acquisitions by analyzing the performance of Indian bidders in terms of the movement in their share price consequent to the occurrence of the event. India, being one of the fastest and largest emerging economies, has been taken as the representative country. Moreover, to understand the pattern of value creation, a disaggregated analysis has also been performed based on the development status of the target country(developed/emerging).

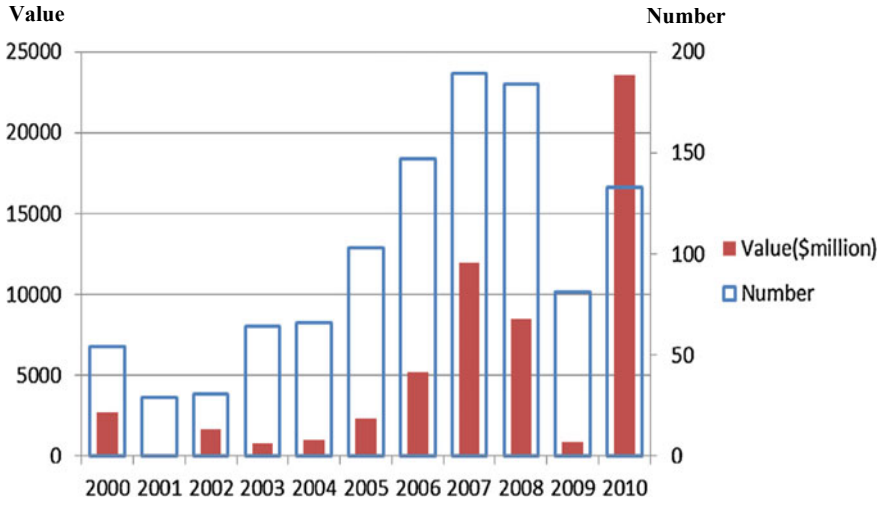

Fig. 2.1 Cross-border acquisitions completed over 2000–2010 by Indian firms. *Source* Nicholson and Salaber (2013)

The remaining chapter has been structured in five sections (including Sect. 2.1). Section 2.2 reports the existing studies and their findings. Section 2.3 describes the methodology and the data used in the study followed by Sect. 2.4 comprising the empirical results and discussion thereof. Lastly, Sect. 2.5 contains the concluding observations.

2.2 Literature Review

A substantial amount of academic studies has been carried out for analyzing the performance of cross-border acquisitions in virtually all domains of management. But most of the studies have evolved in the context of developed economies; the studies in the context of emerging economies provide mixed evidence on the subject. Put differently, whether such strategic decisions successfully increase the market value of bidders or not remains unanswered. Some of these studies indicate significant and positive returns to the acquirers' shareholders, while others point to wealth diminution. Also, there is disagreement concerning the measures used to analyze the performance of cross-border acquisitions. Several scholars have examined synergy gains from cross-border acquisitions in terms of abnormal stock market returns(Gubbi et al. 2010; Rani et al. 2012, 2015; Duppati and Rao 2015; Jain et al. 2017, 2018a, b) in the short-run, while a few researchers focus on long-term performance analysis in terms of financial ratios (Narayan and Thenmozhi 2014). Mittal and Jain (2012) have employed an integrated model, comprising both strategic and financial measures of performance, to assess the acquisition performance.

The principal idea behind the present chapter is to analyze the magnitude of wealth enhancement or erosion for the acquiring entities involved in the process of transnational acquisition activities. Gubbi et al. (2010) and Rani et al. (2015) have reported nonnegative abnormal returns(ARs) with the minimal probability of being insignificant for the Indian acquirers. Further, they noted returns to be relatively higher when target companies happen to be from developed markets. They cited acquisition of strategic and intangible resources including advanced technology, brands, distribution channels, etc., to be the drivers of value creation in CBAs. Rani et al. (2014), Duppati and Rao (2015), and Jain et al. (2017, 2018a, b) have exhibited a favorable market response to the announcement of CBAs by corporates from India.

Among studies involving multiple countries, Bhagat et al. (2011) have evaluated overseas acquisition announcement by the acquirers from emerging markets and observed abnormal returns (AR) of 1.09% which turned out to be statistically significant. On the contrary, Aybar and Ficici (2009) and Narayan and Thenmozhi (2014) have noted a considerable decline in the valuation of the bidders from emerging nations.

Based on the examination of international takeovers from developed economies, Corhay and Rad (2000); Uddin and Boateng (2009) and Cakici et al. (1996) exhibited statistically significant negative returns to the bidding entities. On the other hand, Aw and Chatterjee (2004); Conn et al. (2005); Kohli and Mann (2012) and Rani et al. (2014) have compared the performance of national and international mergers and reported mixed results.

Despite voluminous studies on mergers and acquisitions, the inquisitiveness of various stakeholders, viz., researchers, education intelligentsia, policy-makers, and senior executives about share market reaction to the announcement of CBAs by emerging economies, largely remains an unexplored field. This chapter, therefore, strives to make a valuable addition to the contemporary literature on mergers and acquisitions.

2.3 Data and Methodology

2.3.1 Data and Sample

Cross-border acquisitions announced and completed during 2012–2015 by the Indian companies listed on CNX Nifty 500 constitute the sample of the study. The period of 2011–2012 onward indicated an increasing trend regarding many cross-border acquisitions following the global financial crisis of 2008. Hence, the research period has been taken from 2012 to 2015. Further, preliminary data about the overseas acquisitions by Indian companies have been procured from Bloomberg, a comprehensive financial database with global coverage. For each deal, the database lists the dates of announcement and completion, names of the acquiring and the acquired company, the target country, and other deal-specific information.

Table 2.1 Industrial classification of the acquirers

Industry	Number of CBAs
Mining	8
Transportation, communications, electric, gas, and sanitary service industry	6
Manufacturing	58
Services	37
Wholesale commerce and trade	1
Total	110

Source Compiled by the author

The announcement dates of CBAs have also been manually confirmed with corporate announcements on national stock exchanges including Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). Further, event window around each announcement date has been scrutinized to control for any confounding effects per se major corporate events such as publication (announcement) of financial results and dividend declaration (McWilliams and Siegel 1997). The abovementioned processes about the announcement dates have been conducted to meet the demands of event study methodology. Furthermore, the stock must have been traded for at least 180 days before and 10 days after the event to form a valid sample. In this regard, daily-adjusted closing price and index data have been taken from Bloomberg.

The share price of any entity per se is affected by numerous elements happening both at micro- and macrolevels on a day-to-day basis. To eliminate their effects, the deals which have been noted to be affected by other relevant corporate events have been dropped from the analysis; data about these events have been collected from multiple sources including company websites, archival data at stock exchanges, business magazines, etc. The process yielded a final sample of 110 CBAs undertaken by Indian companies. Based on SIC codes, acquiring firms have been grouped into various industries as shown in Table 2.1.

Out of a total sample of 110 cross-border acquisitions, 82 transactions involved target firms located in developed economies (DE), while 28 deals involved target companies from emerging economies (EE). The target country has been bifurcated into developed or emerging market depending on its current membership status in the Organization for Economic Co-operation and Development (OECD) (Gubbi et al. 2010). Table 2.2 shows the geographic distribution of CBAs embarked upon by Indian companies during 2012–2015.

Table 2.2 Geographic distribution of the sample

Target country	Status*	Number of CBAs	Target country	Status*	Number of CBAs
Azerbaijan	EE	1	Luxembourg	DE	1
Australia	DE	3	Malaysia	EE	2
Brazil	EE	1	Mozambique	EE	1
Bahamas	DE	1	Oman	EE	1
Canada	DE	2	Philippines	EE	1
Chile	DE	1	Mexico	DE	1
Cameroon	EE	1	Netherlands	DE	1
China	EE	1	Sweden	DE	3
Cyprus	DE	1	Switzerland	DE	1
Croatia	EE	1	Turkey	DE	1
Denmark	DE	1	U.K.	DE	5
El Salvador	EE	1	U.S.	DE	38
Ethiopia	EE	1	Russia	EE	2
Finland	DE	1	Singapore	EE	5
France	DE	4	South Africa	EE	5
Germany	DE	12	U.A.E.	EE	1
Italy	DE	3	Uganda	EE	1
Liberia	EE	1	Vietnam	EE	1
Japan	DE	2	Total		110

Source Authors' compilation
*DE = developed economy; EE = emerging economy

2.3.2 Methodology

The valuation consequences of cross-border acquisition announcement for the acquiring firm have been evaluated using the standard event study methodology. According to Mackinlay (1997), the economic effect of any unanticipated corporate event for the firm can be quantified by analyzing the movement of its share price for a relatively short time period around the occurrence of the key event. It is because the equity price of an entity reflects the discounted sum of its expected future flow of returns. Thus, change in share price instead of any event (say acquisition) indicates the amount of additional returns (losses) that are likely to be earned (incurred) on account of the event. In the present chapter, the announcement of cross-border acquisition is the nodal event for study; the event date registered at the national stock exchange has been considered as the date of announcement of the event.

The critical issue in event study methodology is to compute the true counterfactual, that is to say, what would have been the normal returns had this acquisition not announced. It is a general practice to use the market model(Fama 1976; Brown and

Warner 1980, 1985; Kothari and Warner 1997) to estimate the normal (expected) returns. Given the conditions of market efficiency and rational investors, the market model establishes that the return on security at time 't' (R_{it}) is directly proportional to market index return (R_{mt}) as depicted in Eq. (2.1)

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2.1}$$

where ε_{it} is the anomaly distributed error term.

The "normal return" for each acquisition has been estimated with over 150 trading days, comprising a window of 180 to 30 days before the announcement date. The parameters of the market model(α_i and β_i) are estimated using the ordinary least squares (OLS) method of regression. These computed values of parameters are fitted in Eq. (2.1) to get the estimated return $\left(\widehat{R}_{it}\right)$.

The change in share price on account of the observed event, that is, the abnormal return caused by the acquisition announcement is measured using Eq. (2.2)

$$AR_{it} = R_{it} - \left(\hat{\alpha} + \hat{\beta}\, R_{mt}\right) \tag{2.2}$$

where R_{it} is the observed or actual return.

These single-day abnormal returns are further aggregated cross-sectionally to yield "average abnormal return" (AARs) as indicated by Eq. (2.3):

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{2.3}$$

where N represents the number of CBAs.

Later on, to gauge the complete impact of the acquisition event, daily abnormal returns are aggregated cross-sectionally as well as across a specified period (called as "event window") to obtain "cumulative average abnormal returns" as given in Eq. (2.4):

$$CAAR(t_1,\ t_2) = \sum_{t1}^{t2} AAR_t \tag{2.4}$$

where t_1 and t_2 indicate the beginning and ending, respectively, of the event window. For instance, for an event window of 7(−3, +3) days, $t_1 = -3$ and $t_2 = +3$.

Abnormal returns have been computed for alternative windows 3 (−1, +1) days, 7 (−3, +3) days, and 11(−5, +5) days around the event date; this has been done to take into account any leakage effect prior to the formal announcement as well as the factor of inefficiency especially in developing markets such as India, thereby, achieving reliable outcome.

The hypotheses to be tested are as follows:

H_{01}: There are no AAR on the CBAs announcement.

H_{02}: There are no CAAR on the CBAs announcement.

In the event study methodology, parametric tests complement nonparametric tests to check for the significance of abnormal returns. Accordingly, the present study has used a t-test, a parametric test, and generalized sign test, a nonparametric test to obtain robust findings which are invariant to the presence of outliers.

2.4 Results and Discussion

Tables 2.3 and 2.4 illustrate the abnormal returns (AR) gained by the shareholders of Indian companies bidding for overseas organizations. Table 2.3 reports the average abnormal returns (AAR) on the announcement day in addition to the ratio of positive and negative average abnormal return, while cumulative average abnormal returns (CAAR) along with the proportion of positive and negative cumulative abnormal returns have been summarized in Table 2.4. Moreover, the results of parametric and nonparametric tests performed to ensure the robustness of returns have also been presented in Tables 2.3 and 2.4.

Table 2.3 enumerates that shareholders earn positive abnormal returns of 0.49% on the day of announcement of cross-border acquisitions; the results come out to be significant at 5%. Nearly, 60% of the deals has produced nonnegative and significant valuation effects for the Indian bidders. Besides, the acquiring firms have also experienced positive cumulative abnormal returns invariant to different event windows, viz., (−1, +1), (−3, +3), and (−5, +5); significant returns (at 5%) have

Table 2.3 Overall average abnormal returns to acquirers over 11 days (−5, +5) event window, 2012–2015

Days	AR (%)	t-test	Pos:Neg AR	Generalized sign Z
−5	0.29	1.4164	51:59	−0.1744
−4	0.13	0.8424	53:57	0.2075
−3	0.04	0.2178	52:58	0.0166
−2	−0.09	−0.5153	45:65	−1.3204
−1	0.13	0.7449	58:52	1.1625
0	0.49	2.0862**	64:46	2.3085**
1	0.34	1.3236	60:50	1.5445
2	−0.17	−0.7937	48:62	−0.7474
3	−0.35	−1.7386	42:68	−1.8934
4	0.40	1.3841	55:55	0.5895
5	0.24	1.26	63:47	2.1175

Source Author's computation

Note ***, ** and *at 1, 5, and 10% level of significance

Table 2.4 Cumulative abnormal average returns (CAAR) of Indian bidders over different event windows, 2012–2015

Event window	CAAR (%)	t-test	Pos:Neg CAR	Generalized sign Z
(−1, 1)	0.97	2.4452**	66:44	2.6905**
(−3, 3)	0.39	0.7305	52:58	0.0166
(−5, 5)	1.46	2.0144**	63:47	2.1175**

Source Author's computation
*Note****, ** and *at 1, 5, and 10% level of significance

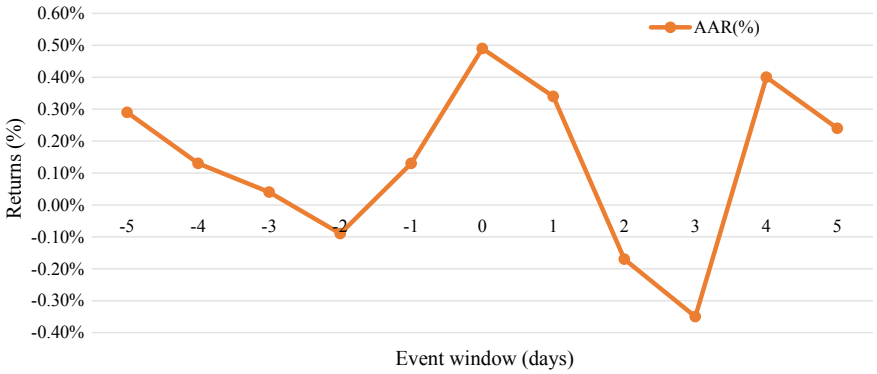

Fig. 2.2 AAR of Indian acquirers over 11(−5, +5) days event window, 2012–2015. *Source* Authors' analysis

been noted for 3 (−1, +1) days and 11 (−5, +5) days windows. These findings are in concurrence with those of Gubbi et al. (2010), Bhagat et al. (2011) and Rani et al. (2015).

Figures 2.2 and 2.3 demonstrate the pattern of average abnormal returns (AAR) and cumulative abnormal returns (CAR) observed during 11 days (−5, +5) event window. As depicted in the graph, abnormal returns begin to show an increasing trend from 2 days before to 2 days after the focal event, yielding the highest return on the day of the announcement.

The impact of the development status (developed/emerging) of the acquired firm's country on the value of the acquiring firm has been compared in Table 2.5. Empirical findings indicate that bidding for a target firm located in developed markets vis-à-vis emerging economies yields higher and statistically significant returns of 1.29% and 1.63% over 3 days (−1, +1) and 5 days (−5, +5) event window. Equally revealing to note is that acquisition of a target firm based on emerging economies also provides positive albeit not statistically significant returns to the bidders during distinct event windows. These findings are similar to the results reported by Rani et al. (2015).

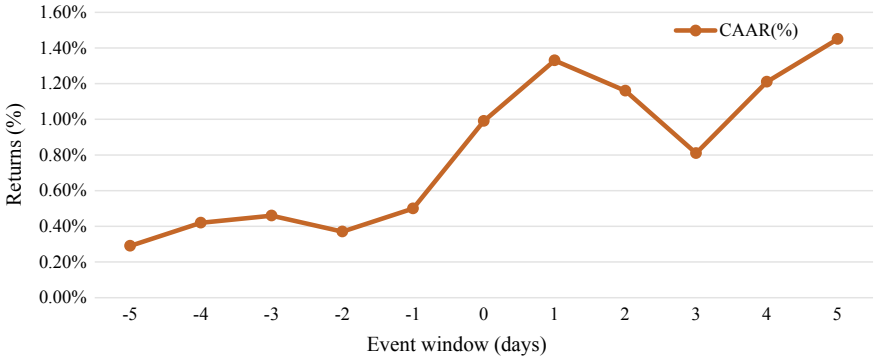

Fig. 2.3 CAAR of Indian acquirers over 11(−5, +5) days event window, 2012–2015. *Source* Authors'analysis

Table 2.5 Development status of the target country and CAAR for Indian acquirers over multiple event windows, 2012–2015

Event window	CAR (%)		t-test		Pos:Neg		Generalized sign Z	
	Developed	Emerging	Developed	Emerging	Developed	Emerging	Developed	Emerging
(−1, 1)	1.29	0.01	2.6016***	0.0175	51:31	15:13	2.8276***	0.4965
(−3, 3)	0.47	0.17	0.6859	0.2461	38:44	14:14	−0.0502	0.1185
(−5, 5)	1.63	0.95	1.8085*	0.8878	46:36	17:11	1.7208*	1.2526

Source Author's computation
*Note****, ** and *at 1, 5, and 10% level of significance

2.5 Conclusion

The existing volatile and chaotic business environment have pushed firms to be more flexible with respect to their strategic management process. With this in mind, the present study has evaluated the impact of the strategic transition from an organic approach to an inorganic mode of expansion across national boundaries. Firms from growing economies have increasingly been using cross-border acquisitions to gain competitive advantage and establish their foothold in the world economy. Moreover, such firms, as against acquirers from developed markets, are motivated by the desire to seek strategic resources rather than exploiting their existing resources and own proprietary knowledge and capabilities.

This academic work measures the market response in terms of share price reaction to the announcement of CBAs by Indian firms. Accordingly, the study attempts to find out whether such acquisitions enhance or destroy the wealth of the bidding firm shareholders. In addition, it has examined if the status of the target country has any significant impact on the returns of the acquirers. In other words, whether acquiring a target firm located in developed market generates more wealth for the acquirers *vis-a-vis* the target firm based on an emerging country.

The short-run share price performance of 110 CBAs announced and completed by Indian companies during 2012–2015 has been assessed. The event study methodology has been applied to evaluate the movement in stock price as a consequence of the announcement of CBAs. The empirical findings suggest that announcement of CBAs has positive wealth effects for the shareholders of the acquiring firms; acquirers experience nonnegative and statistically significant abnormal returns on the announcement day as well as significant and positive cumulative returns have been observed over multiple event windows. Furthermore, returns are higher for acquisition of targets in advanced *vis-à-vis* emerging economies.

Cross-border mergers are more likely to generate synergy gains resulting from economies of scale and scope. Scale economies improve the operational efficiency and flexibility of the firm, creating more benefits for the combined firm. Also, decreasing of risk through geographical diversification, tax benefits, and currency differentials could be the possible antecedents of value creation for the bidding firms.

Emerging market players, more often, venture into cross-border acquisitions with a desire to build and improve their competitive advantage and seek strategic and knowledge-based resources. Such strategic skills and capabilities including technical know-how, superior management skills, innovative attitude, advanced technology, established distribution channels, and natural resources are ingrained in the people, national and organizational culture, and community of the host nation.

Ghemawat (2001) has opined that the quality of assets available in a country is directly proportional to the level of economic development of that country. Hence, acquiring a firm located in advanced economies generates higher value for the bidders' shareholders. Furthermore, developed markets are characterized by stringent investor protection laws (Bhagat et al. 2011), higher governance standards (Khanna and Palepu 2004; Martynova and Renneboog 2008), low levels of corruption, and higher institutional development, encouraging acquirers to bootstrap themselves to higher standards, thus producing positive wealth effects for the shareholders.

The study is expected to provide invaluable insights into the management of firms from emerging economies in general and Indian firms in particular in the context of their overseas expansion strategies. Moreover, it can also have implications for the government and policy-makers of emerging economies while drafting regulations for outward foreign direct investments.

The study is restricted to the analysis of overseas transactions by Indian companies only. Moreover, the focus of the chapter is limited to the returns accruing to the acquiring firms only. This academic work can be extended to a larger number of emerging economies to throw more light on the pattern of risks and returns involved for the acquirer as well as the target firm.

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Chapter 3
Impact of Disinvestment on Transforming the Performance of Indian Public Enterprises

Seema Gupta, P. K. Jain and Surendra S. Yadav

Abstract To improve the commercial strength and bridge the fiscal deficit, the government of India has adopted a flexible system to transform the performance of public enterprises through the route of disinvestment in the 1990s. The chapter is intended to determine the financial strength of the government enterprises referred to as central public sector enterprises (CPEs) after disinvestment during more than two decades. The chapter also analyzes the degree of disinvestment effect on the improvement of the disinvested CPEs. The findings suggest that disinvestment has not brought much change in the parameters of profitability, assets turnover, and capacity utilization even after 8 years of disinvestment; an increase is observed only in the parameters of productivity and liquidity. The improved performance in respect of liquidity, leverage, inventory holding period (IHP), and productivity has been noted due to the higher degree of disinvestment in the disinvested CPEs.

Keywords Disinvestment · Efficiency · Financial performance · Privatization

3.1 Introduction

The need for financial reforms was realized during the 1990s when the economy of India was constantly burdened with massive fiscal debt since the 1980s. The enhanced revenue spending on interest costs, wages and salaries, subsidies, and other expenses left very less money in the hands of government to incur investment on other social and infrastructural aspects. The Indian government was inclined to invest in basic education, health, family welfare, and infrastructure. However, the sizable quantum of money was already invested in many nonstrategic sectors (Gupta et al. 2011a). In order to improve the commercial strength and bridge the fiscal deficit,

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the government of India has adopted a flexible system to transform the performance of public enterprises through the route of disinvestment in 1990s.

Further, due to the unbounded and cumulative financial burden, the Indian economy was running with a serious financial threat and disinvestment was realized as a tool to come out from such a precarious situation. It was expected that the disinvestment process would also act as a catalyst to improve the financial/business performance and management practices as well of these CPEs. Evidently, it was conceived to have bigger implications than disposing the equity capital of the government on the high value. It was also anticipated to bring competition and growth in the Indian economy by attracting global and domestic capital. Participation in equity is also intended to promote the market-friendly economy than the command economy as well as uphold socioeconomic implications at large (Ray and Maharana 2002).

This chapter is aimed at assessing the effect of partial privatization and extent of privatization/disinvestment on the performance of Indian CPEs. The study is categorized into seven parts/sections consisting of the current part. Section two enumerates review of the literature. Section three describes the research methodology. The impact of disinvestment has been examined under section four. Section five measures the extent/degree of disinvested equity on the performance of CPEs. Implications of the study have been explained in section six. Lastly, section seven enumerates the conclusion of the study.

3.2 Literature Review

The select literature relating to various important aspects of privatization and disinvestment, narrating global experiences (with focus on Indian perspective), has been presented in this section.

First one is concerned with the purpose/objective about disinvestment policies (at cross-country and Indian levels). Kay and Thompson (1986) have examined the rationale of privatization of industrial assets at U.K. They observed that it served a multiplicity of objectives such as improving the fiscal aspect of that industry, resolving the consistent issues of management, ensuring better discipline of trades unions, and promoting capitalism by large participation in ownership. Basu (1994) has conducted a study on the developing country's disinvestment policies and states that the basic purpose of disinvestment is to protect the interest of employees, provide a shield to feasible loss-making enterprises, and generate further employment opportunities by inducting private and dynamic practices. Besides this, it is an attempt to induct good corporate governance practices in the system to boost transparency and accountability in the operations.

Kaur and Singh (2005) and Gupta et al. (2011b) state that disinvestment in India helps in slashing down the cost and improves value and operational efficiency in order to push up the growth rate of the economy which, in turn, generates employment opportunities; capital at global and domestic level is also attracted by privatization.

The authors state that some of the sectors are also benefitted as CPEs provide essential inputs to them at the much lower price. Naib (2004) opines for the general perception related to disinvestment across many countries that disinvestment is meant to raise funds for the governments to invest in other essential areas, to decrease the fiscal deficit, and to release money for other vital areas of public investment like primary education and basic health. Nigam and Zhan (2011) suggest that there may be differences in the values and culture related to the management of Indian multinational companies placed at developed countries due to the difference in the cultural and institutional background.

The second aspect deals with the studies specifying conditions, factors, and features of disinvestment policies. Kay and Thompson (1986), Gupta et al. (2000, 2011a) have found empirical evidence for the partial disinvestment to justify that monetary factor generally is the inspiring force for partial privatization, though the ability for optimizing revenues is vested with political interest which made the government relax the employment aspect and has enhanced the ability of the government to pay off the state workers. In the same way, Disinvestment Manual (2007) finds no set method for the disinvestment of shares at national as well as state levels. It was also expected for India to gain knowledge from the good experiences of the West. While the experience of pitfalls from other countries would give direction, one should explore their innovative techniques which appropriately match with their circumstances and the stage of development. Further, disinvestment is also influenced by the cultural, historical, and institutional factors. In the undeveloped market, a mechanism is required to be explored to protect the well-being of consumers and investors.

In determining the surroundings that affect the environment of privatization, Beladi and Chao (2006) have opted a simple model. The data analysis suggests for the pessimistic effect of privatization on the environment. On the contrary, in 1990s transition economy, Wooster (2009) has found the interconnection and dependence on market reforms and foreign direct investment (FDI). FDI mediates with economic reforms and restructuring by acquisitions in host countries. Tripathi et al. (2018) have compared the performance of nonfinancial 260 Indian and 254 Chinese organizations using accounting ratios/measures from 2002 to 2016. Hoekman et al. (2007) have found political considerations and the variation in the swiftness of policy reform among the sectors as well.

Third aspect enumerates the techniques or methods used by several research proponents for determining the performance of the enterprises; Jain (1989) and Keswani and Shackleton (2006) use incremental analysis for performance assessment; Jain (1989) suggests the reason for less profitability, and low rate of return (ROR) in case of Industrial Finance Corporation of India (IFCI) is the existence of backward region of their location; they confront with challenges between developmental functions and economic functions in sustaining profitability. Similarly, for increasing the project value, Keswani and Shackleton (2006) have found disinvestment as a crucial preference. Singla and Singh (2018) have studied the sensitivity of external regulatory requirement related to public and private sector organizations. The authors find substantially low responsiveness in public sector organizations compared to private counterparts.

Sueyosh (1998), Bradbury (1999) and Abelson (2003) have adopted case studies bases to determine the disinvestment impact on CPEs. Bradbury (1999) has examined change in the performance of Government Computing Services (GCS) when a government company is privatized; the key performance ratios used in the study are return on equity and return on assets. The improvement in the financial performance and growth in revenue of GCS have been noticed in post-disinvestment against pre-disinvestment phase. Rumelt (1974), Boardman and Vining (1989) and Karpoff and Rice (1989) have also employed these measures in determining economic performance.

Abelson (2003) has worked on nine cases in Australia related to industry and disinvestment techniques. Among them, the author has found three major findings. Under the first one, the author found low effect/role of long-term financial returns in the decision to disinvest. The transformation/renovation of the organization defines the post-privatization success of that company under the second finding. Similarly, the third finding outlines the regular process of gainers and losers in the privatization. The financial organizations/institutions, private consultants, and new equity holders are the winners, whereas the employees and future taxpayers are primarily the losers in this process. Similarly, Sueyoshi (1998) has studied the pre- and post-disinvestment performance of a Japanese company, Nippon Telegraph and Telephone (NTT). The author has equally outlined the management tribulations, faced due to the partial privatization that affects the productivity of resources by usual decline in the number of employees and high post-privatization management cost.

Further, Yip et al. (2009) have used frontier analysis technique to identify the relative performance and examine the issues in assessing sustainable financial growth in the organizations. This technique provides a good source of analysis and information to the management and analysts in taking fast/speedier decision-making. Likewise, Revolo (2008) has used panel data econometric model to assess the worth in servicing the electric distribution utilities in Latin America during pre- and post-privatization process. He opines that the laid down policies and guidelines generally ignore the quality aspect of services. Kumar (1992) categorizes state-owned enterprises based on efficiency, structure of the market and social liability/obligations. He finds less efficiency in the disinvested organizations due to fulfilling other social obligations. Further, the author recommends setting a statutory corporation, wherein shares can be transformed and offered to the private sector.

The fourth dimension is explicitly confined to the studies related to the pre- and post-disinvestment-based analysis of CPEs; Hammer et al. (1989) examine the management dimension before the state-owned enterprises (SOE) are being privatized. They find a close association between the strategy of disinvestment and on the whole business policy. Further, the disinvestment/privatization policy is required to walk in every sequential procedure in attaining the targets of the state, innovative ways and findings as well as influencing an appropriate set of investors. For utilizing the increase in long-standing earnings, the policy of privatization should align with industry/company policy on the whole.

Megginson et al. (1994) have compared the performance of 61 organizations belonging to 18 countries and 32 industries on pre- and post-disinvestment basis in the

time frame of 1961–1989. The authors have documented noteworthy improvement in the earnings, productivity per employee, capital expenditures, and employment in the after disinvestment vis-à-vis pre-disinvestment phases of 3 years. The probable reasons identified by the authors are the modified payoff, bylaw, and change in the pattern of ownership than investing more cash as input in them raised from new equity issue. Similarly, Martin and Parker (1995) have studied the 11 British organizations disinvested in during 1981–1988; a notable increase in the return on capital employed and growth in value added per employee-hour annually has been recorded in the post-disinvestment phase, whereas mixed outcome has been observed in other measures. Gupta (2005) has examined the 339 manufacturing and service sector organizations in India for the period from 1990 to 2002. The author determined a favorable impact of partial privatization on the earnings, capacity building, output, and investment of the firms; the study found a noteworthy increase in profits, employee efficiency, expenditure and intensity on research and development, asset size, and employment after partial privatization (without layoffs).

Comparative investigation at cross-country level on the basis of disinvested and non-disinvested CPEs has been dealt with under the fifth dimension. Bishop and Kay (1989) have evaluated the performance of UK-based public sector organizations those have opted and non-opted for disinvestment. The authors come across not much improvement in the disinvested firms and have assessed higher ROCE and ROS across the public sector companies in the majority of the cases. However, the performance of these companies was higher before being disinvested. Moreover, it seems from the analysis that the public sector organizations having higher earning capacity were privatized early and those having lower profits have remained in the hands of the government. Lorch (1991) has also conducted an analysis on the sample firms of 24 disinvested textile mills and other 35 non-disinvested government firms based in Bangladesh. The author has concentrated on the four areas, namely, procurement, production, sales, and support to attain the cost-effectiveness and cost-advantage; no significant impact in the efficiency and profitability has been noticed in the textile industry located at Bangladesh after disinvestment.

Boubakri and Cosset (1998) have compared the adjusted and unadjusted economic and operating efficiency of 79 organizations belonging to 21 developing countries that have opted for privatization from the years 1980 to 1992. Substantial enhancement has been recorded in the measures of profitability, efficiency, capital spending, productivity, employment, and payout of dividends. Simultaneously, reduction in debt has been recorded in after disinvestment. Though the reduction is statistically significant in the case of unadjusted leverage ratios only, the significance level becomes lower when the correction is made in adjusting the effect of the market. In addition to the above, an attempt has been made by the authors to analyze the effect of disinvestment on the performance of CPEs in the developing countries. In the same way, Ramamurti (1997) has studied the reformation as well as disinvestment impacts of the Argentine railways—Ferrocarriles Argentinos; the author has recorded implausible 370% increase in the output of the workers as well as observed the 78.7% reduction in the manpower/employment (from 92,000 to 18,682 workers); the author has also given whole credit of performance enhancement to the privatization.

The sixth dimension deals with causes/reasons of failure of disinvestment; in this respect, Kaur and Singh (2005) state that the CPEs operated under the intense burden of nonbusiness responsibilities and limitless unrestricted authority of the government that exploits their sovereignty. They caution that disinvestment does not mean that there is a move to withdraw investment; rather, it is the canalization of the investment in a more productive and efficient way so that it can prove itself as an acceleration of growth. Naib (2004) has discovered a decrease in the required return on the capital invested as well as a reduction in the surpluses; it raises a query to justify whether mere alteration in ownership at SOEs overcomes the problems or not. Gouri (1997) reveals in her study lower proportion of disinvestment in India; it is largely confined to enhance the noninflationary funds. Further, to hit the capital market government is pulling out budgetary assistance from CPEs which bounds them to dilute their equity. At the same time, economic reforms and liberalization have brought competitive practices and grounded a path to compete with performance. Vadlamannati (2007) explores a meager and frail relation between the tiny and slower quantum of disinvestment and its procedure. Arnold et al. (2012) have identified the segments of organizations, wherein high turnover of employees takes place in the name of disinvestment/privatization and competition; apart from that there is an inflow of foreign and local private competitors in the market.

Notwithstanding the above notable works on the subject, no single work has examined in detail the degree of privatization and their impact on the performance of CPEs in India by using key measures of profitability, liquidity, solvency, efficiency, and productivity for the period of more than two decades. This chapter is a modest effort to bridge this gap.

3.3 Research Methodology

The sample is representative in nature, as it represents all the business/industrial units that have opted for privatization of government equity as per the Public Enterprises Survey. The performance of the enterprises has been compared 5 years before and 8 years after the disinvestment for the time span of 23 years (1986–1987 to 2009–2010) on rolling basis; the purpose is to explore any significant change in the financial performance during the long tenure of eight years in the post-disinvestment period due to disinvestment. The timeframe of the study is restricted to the year 2010 due to the change in reporting standard of financial statements from the year 2011–2012 as per revised schedule six of Company Act 1956. This, in turn, has brought change in many figures/constituents of balance sheet and income statement; therefore, we were constrained to have the present study restricted to 23 years (where financial reporting requirements remain virtually same over the study period).

To justify the rationale for opting the cut-off year 2001–2002, the study enumerates three bases. First, during the initial years, disinvestment was done in a piecemeal manner or of the miniature amount, whereas after various reforms and policy modifications, a substantial increase in the percentage of disinvestment has been recorded in

the subsequent years in some of the CPEs; operationally, the growing amount due to disinvestment (up to 2001–2002) seems to be reliable. The next reason relates to the change of disinvestment policy and commencement of strategic disinvestment; the major proportion of strategic disinvestment (disinvestment more than fifty percent) had started from the year 2001–2002 onwards. Third, the purpose of selecting post-disinvestment 8 years time period is to elaborately assess the disinvestment effect on the efficiency and performance of these CPEs in the long run. Therefore, for the statistical purpose, both the phases first (5 years before disinvestment) and second (8 years after disinvestment) are taken as two independent samples.

Secondary data analysis is based on the data collected from the various volumes of the Government of India Public Enterprises Survey. Data have been analyzed at the aggregate and disaggregate levels. In each analysis, the present study has used 19 key accounting ratios belonging to the profitability, operating efficiency, leverage, liquidity, and productivity. It is worth stating that the prime objective of disinvestment is to augment earnings and operating efficiency of these CPEs. Hence, more importance is given to the ratios of profitability and efficiency than the ratios of liquidity and leverage. Therefore, due importance is given while interpreting the results in between pre- and post-disinvestment phases.

Two broad parameters based on the rate of return (ROR) on investment and sales are used to assess the earning/profitability of the sample enterprises. Three ratios have been used to determine the return on investment, namely, return on total assets (ROTA), return on capital employed (ROCE), and return on net worth (RONW). The former two RORs determine the efficiency in the deployment of resources and the latter examines the earnings belonging to the equity owners (mainly government in the case of CPEs).

Further, it is worth mentioning that ROCE and RONW are not taken into computation in the case of CPEs possessing negative net worth and negative capital employed as these ratios will provide an absurd outcome in the case of the negative denominator. Though negative values in the numerator indicate a loss in the capital employed and net worth, therefore for calculation, positive net worth/shareholders' fund as well as capital employed with the negative net or operating profit has been incorporated; it signifies that those companies are considered for the analysis that has positive net worth or capital employed though they may have earned losses.

Similarly, operating profit margin (OPM) and net profit margin (NPM) ratios are used for measuring the ROR based on sales. OPM presents the relation between operating profit or earnings before interest and tax (EBIT) and sales: it gives clarity in viewing the profit margin (undistorted by financing pattern and tax calculation) in terms of sales, whereas NPM indicates an association between prescribed net profit after taxes and net sales. It discloses the potential of the management in running the trade (Helfert 2003). Moreover, it outlines the feasibility to calculate profits.

On the other hand, three aspects have been used to measure the efficiency in the employment of assets. The efficiency of the management in the utilization of assets has been captured under the first aspect. For this purpose, total assets turnover ratio (TATR), fixed assets turnover ratio (FATR), and current assets turnover ratio (CATR) have been used to determine the extent of usage of assets in relation to sales. Lower

proportion indicates underutilization of existing assets as well as the existence of idle capacity. TATR represents the capacity of the organization in terms of utilization of its current and noncurrent assets to produce sales. Normally, the better the TATR of the company, the better the utilization of the assets (Gitman 2009). The respective TATR, FATR, and CATR ratios are the proportion of average net sales and average total assets in use, average fixed assets (excluding depreciation), and average current assets, respectively.

To assess the efficiency of the sub-constituents of current assets, alteration in the holding/collection period of different types of inventories and debtors has been assessed under the second aspect of efficiency. It is based on the concept of minimizing the investment in working capital so as to have control on the inventory; further in view of efficiently meeting the demand, having efficient control on inventory carrying cost and stock-out cost should be optimal. Raw materials inventory holding period (RMIHP), work-in-progress inventory holding period (WIPIHP), and finished goods inventory holding period (FGIHP) are the three sub-aspects of the inventory holding period. RMIHP is the proportion of the usage of raw materials in a year and average raw materials in a year; WIPIHP is the ratio of cost of production and average work-in-progress during the year. Likewise, FGIHP represents the connection between the cost of goods sold (consisting between cost of production + finished goods stock at the beginning of the year-finished stock at the end of the year) and average finished goods. Similarly, debtor collection period (DCP) represents the association of sales (numerator) and average debtors of the year (denominator).

The capacity utilization of fixed assets during the year is measured under the third variant of efficiency. To depict more truthful image relating to the usage of long-term assets and to calculate the change in the capacity utilization (CU) over a year, the long-term assets are categorized into four groups based on the usage of these assets, namely, less than 50%, between 50 and 75%, 75 and 100% and above 100 % capacity utilization.

Further, to capture the position of capital structure and liquidity debt to equity (TD/TE), current assets (CR) and acid/quick (ATR) ratios have been used to assess the practices of CPEs; the ratio of capital structure, i.e., TD/TE, expresses the proportion of external borrowings and shareholders' funds. Similarly, the position of liquidity assessed through CR and ATR describes the respective company's access to the funds at the time of need.

For the successful operation and productivity of CPEs, voluntary retirement scheme (VRS) has been introduced by the government in CPEs in 1988 and 2002 to reduce the extra man source as well as to have progressed in the age and skill mix. At the same time, the effectiveness in the productivity of capital per employee is measured in the study based on the employment level, efficiency in sales (SE), and net income efficiency (NIE) ratios.

Further, computation based on select financial ratios in each sample PSE has been determined based on last year of disinvestment by considering that in organization as zero years; then, the ratios of all the individual enterprises have been aggregated to process further to determine various positional values (on a rolling basis).

For calculating the time variation among the phases of sample organizations, paired t-test is applied; analysis of variance (ANOVA) has also been applied on more than two sets of companies to determine the change within a group (or same set of companies) and with the other group of companies. Statistical Package for Social Sciences (SPSS) is used for analyzing the data. Further, it is important to note that the analysis of survey data is viewed on 15 responses received from disinvested CPEs.

3.4 Disinvested Central CPEs

This section is intended to determine and compare the fiscal performance of disinvested CPEs (before and after) on a rolling basis. In brief, the section tests the following hypothesis:

H1: Disinvestment has improved the fiscal performance of CPEs.

Contrary to the expectation, the sample disinvested enterprises have shown dismal performance; a marginal decline in the mean values of RONW, ROCE, ROTA, NPM, and OPM has been observed during the post-disinvestment against pre-disinvestment periods (Table 3.1 and Fig. 3.1); this decrease is insignificant statistically. Likewise, the decline in TATR, FATR, and CATR has also been noted in the same period (Fig. 3.2). However, disinvested CPEs are able to decrease the manpower employed (pronounced in VRS); the same is found to be significant. Due to that, a notable enhancement has been noted in the productivity ratios (i.e., SE and NIE) in phase-II vis-à-vis phase-I which is significant statistically. Increase in leverage (TD/TA) and liquidity ratios are also worth noting, getting the benefit of a cheaper source of finance and better liquidity position (Figs. 3.3, 3.4 and 3.5).

Further, there is a solace that RMIHP (a variant of inventory efficiency), WIPIHP, and FGIHP have also shown a marginal decline (statistically significant in the case of FGIHP) in holding days of inventory after disinvestment. The median and lower

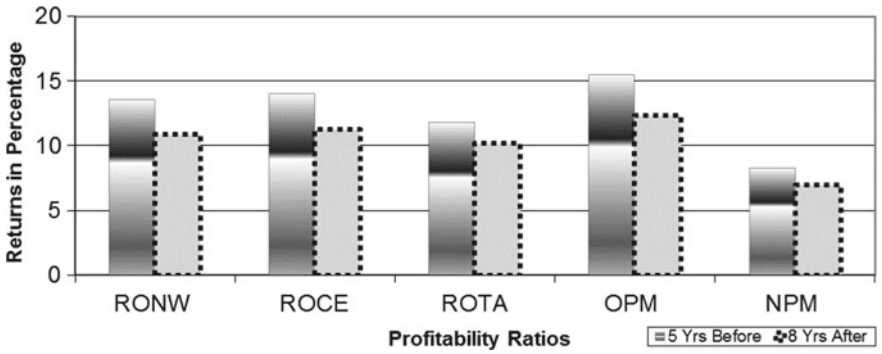

Fig. 3.1 Mean values for pre-disinvestment and post-disinvestment period of profitability ratios (RONW, ROCE, ROTA, OPM, and NPM) of all the disinvested PSEs, 1986–1987 to 2009–2010

Table 3.1 Mean values of key financial ratios of CPEs opted for disinvestment, 1986–1987 to 2009–2010

Variables	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		Significance level	Median 5 yrs before and 8 yrs after of disinvestments		Q1: 5 yrs before and 8 yrs after of disinvestments		Q3: 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After	Before	After	Before	After
Profitability Ratios (in percentage)										
RONW	38(38)	13.58	10.89	0.08	11.74	10.05	5.27	2.39	20.34	21.91
ROCE	38(37)	14.04	11.26	0.12	12.65	9.80	6.33	−0.96	19.25	23.78
ROTA	38(37)	11.83	10.19	0.16	10.86	8.71	7.17	3.26	16.03	17.53
OPM	38(38)	15.49	12.37	0.09	12.62	9.36	6.14	2.76	21.32	22.20
NPM	38(37)	8.27	6.97	0.26	4.79	5.05	2.17	0.35	15.82	15.15
Efficiency ratios (in times)										
TATR	37(37)	1.08	0.99	0.18	0.81	0.70	0.48	0.52	1.48	1.01
FATR	35(35)	3.33	3.31	0.95	2.46	2.19	1.19	1.01	5.20	6.25
CATR	37(37)	1.94	1.72	0.08	1.46	1.36	0.79	0.83	2.68	2.34
DCP@	37(38)	62.13	70.37	0.18	43.56	45.13	14.68	13.99	95.05	128.67
RMIHP@	30(31)	147.56	130.4921	0.08	102.53	110.28	66.12	40.97	246.03	190.03
WIPIHP@	27(27)	23.71	21.14	0.23	9.54	5.68	1.13	1.35	49.26	50.01
FGIHP@	31(31)	28.51	24.13	0.03*	18.83	20.30	20.30	11.59	11.29	15.40
Leverage (in times)										
TD/TE	38(37)	0.99	1.02	0.68	0.74	0.57	0.28	0.14	1.70	2.04

(continued)

Table 3.1 (continued)

Variables	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		Significance level	Median 5 yrs before and 8 yrs after of disinvestments		Q1: 5 yrs before and 8 yrs after of disinvestments		Q3: 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After	Before	After	Before	After
Liquidity (in times)										
CR	38(37)	1.67	1.84	0.19	1.45	1.72	0.95	1.09	2.36	2.57
ATR	38(38)	0.90	0.99	0.32	0.86	0.86	0.35	0.40	1.48	1.60
Productivity/Output										
Sales Eff.!	38(38)	36.97	86.77	0.05*	7.59	16.81	3.79	7.60	43.57	159.28
NIE!	38(38)	2.26	5.36	0.00**	0.82	1.31	0.18	−0.01	1.89	5.56
Employment	38(38)	18,191	15,870	0.01**	7754	6773	2558	2332	19,063	19,757

Notes 1. CPEs having negative net worth have been excluded and RONW has been based on net profit
2. OPM and NPM stand for operating profit margin and net profit margin on sales, respectively
3. ROTA is based on earnings before interest and taxes (EBIT)
4. ROCE is based on operating profit which excludes nonoperating incomes (or other incomes) from EBIT
5. ** and * mark to the significant level at 1% and 5%, respectively
6. # Firms in bracket refers to number of firms after disinvestments and @ refer to the ratios to be calculated in number of days
7. ! represents to be calculated in percentage
8. CR—current ratio, ATR—acid test, ratio, TD/TA—total debt/total assets, TD/TE—total debt/total equity, TATR—total assets turnover ratio, FATR—fixed assets turnover ratio, CATR—current assets turnover ratio, DCP—debtors collection period, RMIHP—raw materials inventory holding period, WIPIHP—work-in-progress inventory holding period, FGIHP—finished goods inventory holding period, ROTA—return on total assets, ROCE—return on capital employed, RONW—return on net worth, OPM—operating profit margin, NPM—net profit margin, NIE—Net Income Efficiency and Sales Eff.—sales efficiency
9. CR consisting value 6 and above, ATR-4 and above, TD/TA-1 and above, TD/TE-6 and above, RMIHP-0, 366 days and above, DCP-0, 270 days and above, TATR-5 and above, CATR-6 and above, FATR-12 and above, RONW-plus/minus 60%, ROCE- plus/minus 50%, ROTA-plus/minus 35%, OPM-plus/minus 50% and NPM-plus/minus 40% are eliminated
These points hold true for other tables mentioned in this section and in other sections

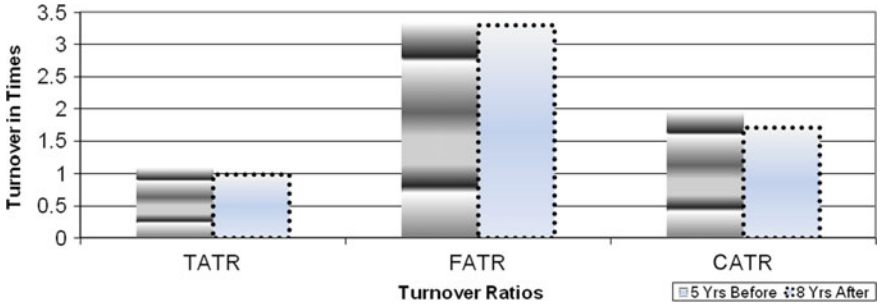

Fig. 3.2 Mean values (for pre-disinvestment and post-disinvestment period) of efficiency ratios (TATR, FATR, and CATR) of all the disinvested PSEs, 1986–1987 to 2009–2010

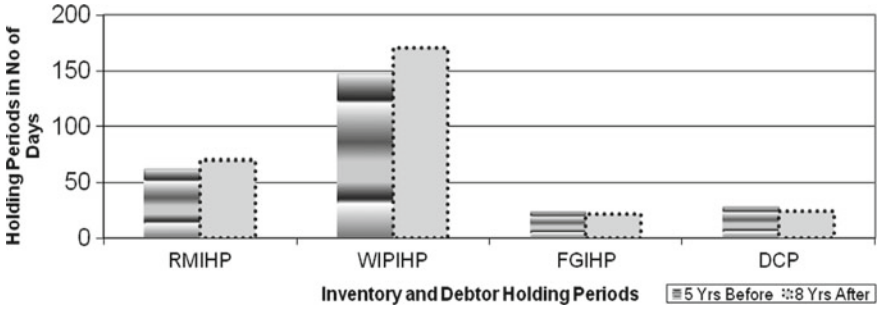

Fig. 3.3 Mean values (for pre-disinvestment and post-disinvestment period) of efficiency ratios (RMIHP, WIPIHP, FGIHP, and DCP) of all the disinvested PSEs, 1986–1987 to 2009–2010

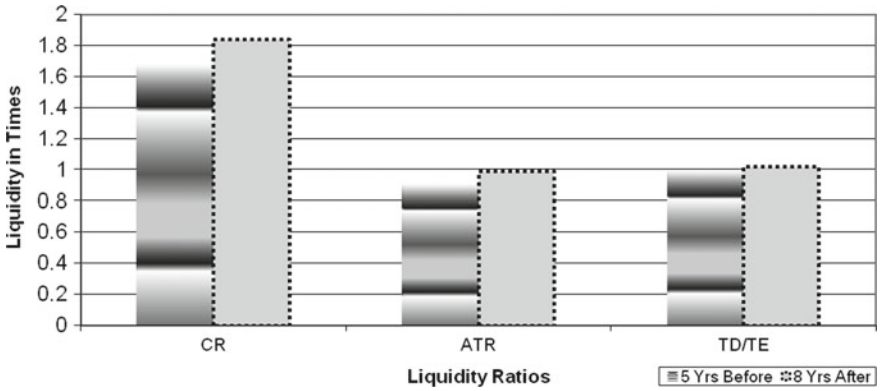

Fig. 3.4 Mean values (for pre-disinvestment and post-disinvestment period) of liquidity (CA/CL and ATR) and leverage ratios of all the disinvested PSEs, 1986–1987 to 2009–2010

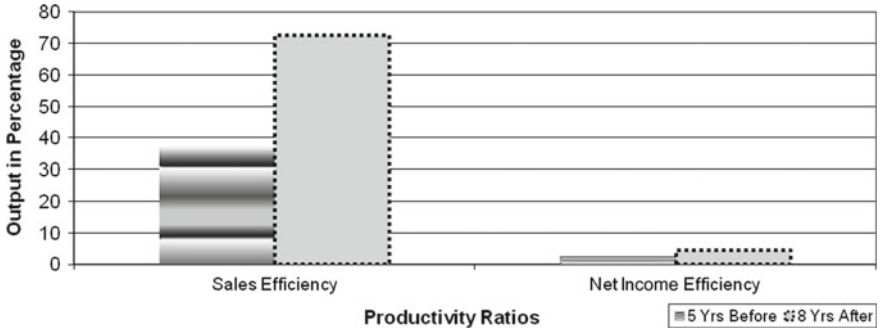

Fig. 3.5 Mean values (for pre-disinvestment and post-disinvestment period) of the productivity ratios (sales efficiency and net income efficiency) of all the disinvested PSEs, 1986–1987 to 2009–2010

quartile values have also almost replicated to the mean results. It is hypothesized that disinvestment would pave the way for better capacity utilization. However, the actual findings are not in conformity with this normal expectation. For instance, capacity utilization of more than four-fifths (23 out of 29) of the CPEs has shown a declining trend (though not statistically significant) after disinvestment (Table 3.2).

Findings are equally revealing in nature for the profitability and efficiency point of view. In fact, the number of such firms showing deterioration in ROR is half or more in the second phase compared to the first phase. Likewise, there is a decrease in all major efficiency ratios (save IHP); in fact, the majority of firms are displaying deteriorating performance vis-à-vis the number of firms showing improvement during the same tenure (Table 3.3). Therefore, the findings are not in tune with the hypothesis of having the better financial performance of disinvested CPEs after disinvestment vis-à-vis before disinvestment in a sizeable number of cases.

Above all, the results conform to many other notable works initiated in this aspect. For instance, Bishop and Kay (1989) have also found improper submissions to prove that disinvestment has yielded improvement in the performance of the company. Likewise, Abelson (2003) derived out of his nine case studies the low association between privatization decision and strategic returns/earnings of the firm. The authors find a constant node of gainers and losers relating to the decision of disinvestment; moreover, the gainers are the financial institutions, newly shareholders and private consultants, whereas employees of the pre-sale organizations and future taxpayers are the primarily loss bearers. Gupta et al. (2011a) have stated that recession in September 2008 has not much impacted to their performance of these enterprises.

Table 3.2 Mean values of capacity utilization ratio of the public sector enterprises (CPEs) opted for disinvestment, 1986–1987 to 2009–2010

Capacity utilization Ratio	No. of firms Before (After)# 1	Mean 5 years		Change in mean 3 − 2	Paired t-test for difference of mean 4	Degree of freedom (df) 5	Firms showing better performance (%) 6	Significance level 7
		Before disinvestment 2	After disinvestment 3					
Below 50%	2(2)	82.7	46.0	−36.7	36.70	1	0	0.48
More than 50 and less than 75%	8(8)	83.6	78.1	−5.5	5.50	7	63	0.47
More than 75 and less than 100%	13(13)	83.8	84.8	1.0	−0.98	12	70	0.78
More than 100%	6(6)	95.4	100.9	5.5	−5.50	5	83	0.42

Firms in bracket refer to number of firms after disinvestment

Table 3.3 Disinvested CPEs showing improvement or deterioration in performance (measured in terms of profitability and efficiency), 1986–1987 to 2009–2010

Variables	No. of firms Before(After)#	Firms showing improvement in performance (in %)	Firms showing deterioration in performance (in %)
Profitability			
ROTA	38(38)	37	63
ROCE	38(38)	35	65
RONW	38(38)	35	65
OPM	38(38)	45	55
NPM	38(37)	55	45
Efficiency			
TATR	37(37)	57	43
FATR	35(35)	51	49
CATR	37(37)	38	62
DCP	38(38)	44	66
RMIHP	30(35)	62	38
WIPIHP	27(27)	63	37
FGIHP	31(31)	72	28

Firms in bracket refer to number of firms after disinvestment

3.5 On the Basis of Degree of Disinvestment

Dewatripont and Roland (1992) and Fluck et al. (1996) have examined the dynamic patterns of disinvestment and its development over the years; the authors have also studied the number of distinctiveness in the different stages of disinvestment. Proponents of gradual privatization (Roland 1994; Katz and Owen 1995) assert for partial privatization and suggest that ongoing process of disinvestment, in general, has smoothened the evolution process and brought fewer problems. It equally enhances the possibility of effective economic growth since the benefit of "learning by doing" effect is associated with them. Naib (2004) states that divestiture will result in shifting the purpose of ownership pattern.

The disinvestment in stages raises certain queries, such as whether higher disinvestment produces higher profitability or not? To what extent, operational efficiency is related to the percentage of disinvestment? i.e., to what extent greater disinvestment generates higher liquidity, profitability, and effective utilization of existing resources? Hence, this section deals with determining the impact of gradual disinvestment (or degree of disinvestment) on the performance of CPEs.

H3: It is hypothesized that the higher quantum of disinvestment would yield better operating and financial performance.

The impact of disinvestment has been measured by dividing degree of disinvestment into six segments, i.e., out of total share capital the percentage of disinvestment

(a) less than five 5%, (b) more than 5 and less than 10%, (c) more than 10 and less than 20%, (d) less than 20 and more than 30%, (e) less than 30 and more than 40%, and (f) more than 40 and less than 50%. A corresponding number of disinvested CPEs are 9, 8, 7, 4, 6, and 4, respectively. For each segment, mean values have been computed (on before–after basis) for all the ratios. ANOVA test has also been applied to determine the relations among them.

3.5.1 Disinvestment up to 5%

The decrease is substantial in all the parameters of profitability and marginal in almost all efficiency ratios during the post-disinvestment phase against pre-disinvestment phase (Table 3.4). Leverage (TD/TE) ratio has also shown a marginal increase. However, capacity utilization of these enterprises has revealed the positive results, nearly 90% of these enterprises have enhanced their capacity utilization; it, in turn, would have moderately and positively impacted to the inventory holding period of these enterprises. In sum, no improvement due to disinvestment has been observed except in RMIHP, FGIHP, leverage, sales efficiency, and NIE after disinvestment.

3.5.2 Disinvestment in the Range of 5–10%

On the contrary, disinvested CPEs in the range of 5–10% (as per Table 3.4) have shown unfavorable performance in the ratios belonging to assess the profitability and operating efficiency; the decrease has been recorded in profitability, assets turnover, and capacity utilization during the post-disinvestment period compared to pre-disinvestment period; it would have adversely impacted the holding period of inventory and DCP, as an increase has been observed in holding periods of raw material and DCP after disinvestment. The only positive notable features have been in respect of the increase in productivity (in terms of sales efficiency and NIE) and liquidity during the similar time frame.

Moreover, there has been no improvement in these enterprises due to higher disinvestment. The findings in the subsection indicate that minor increase in the percentage of disinvestment (of 5–10%) does not yield improved performance of disinvested CPEs.

3.5.3 Disinvestment in the Range of 10–20%

It has been analyzed that higher disinvestment (10–20%) has brought improvement in the economy of the CPEs. As enhancement in the profitability ratios, the primary measure of financial performance has been determined (except RONW and NPM)

Table 3.4 Mean values of key financial ratios of the CPEs on the basis of extent of disinvestment below 5%, between 5 to 10% and between 10 to 20%, 1986–1987 to 2009–2010

Ratios	Disinvestment below 5%			Between 5 and 10%			Between 10 and 20%		
	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After		Before	After
Profitability ratios (in percentage)									
RONW	9(9)	11.75	6.99	8(7)	11.18	7.58	7(7)	12.73	12.62
ROCE	9(9)	10.61	6.94	8(7)	11.19	5.89	7(7)	10.50	13.42
ROTA	9(9)	11.35	8.16	8(8)	10.40	6.27	7(7)	9.61	12.34
OPM	9(9)	14.78	10.96	8(8)	14.26	7.24	7(7)	16.93	17.89
NPM	9(9)	8.62	5.29	8(7)	6.96	6.48	7(7)	9.89	9.60
Efficiency ratios (in times)									
TATR	9(9)	1.06	1.00	8(8)	1.15	0.92	7(7)	0.96	0.91
FATR	8(8)	2.94	2.82	8(8)	3.74	3.45	7(7)	3.11	2.72
CATR	9(9)	1.70	1.60	8(8)	1.86	1.34	7(7)	1.92	2.05
DCP (in days)	8(9)	56.49	70.67	8(8)	83.32	105.10	7(7)	41.88	35.49
RMIHP (in days)	7(9)	209.65	148.85	6(5)	84.59	138.13	5(6)	153.28	159.84
WIPIHP (in days)	6(6)	21.58	22.29	7(7)	25.52	19.93	3(3)	2.02	2.72
FGIHP (in days)	7(7)	26.54	23.30	7(7)	36.87	25.21	5(5)	31.75	31.36

(continued)

Table 3.4 (continued)

Ratios	Disinvestment below 5%			Between 5 and 10%			Between 10 and 20%		
	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After		Before	After
Capacity utilization (in percentage)									
Below 50%	1(1)	72.8	70.2	1(1)	92.6	21.8	0		
Between 50 to 75%	1(1)	74.6	85.0	3(3)	86.6	80.3	1(1)	105.4	79.6
Between 75 to 100%	3(3)	93.9	103.5	2(2)	92.5	88.5	2(2)	70.6	79.4
More than 100%	1(1)	74.0	93.4	0			2(2)	97.1	107.6
Leverage (in times)									
TD/TE	9(9)	0.71	0.97	8(7)	1.16	1.11	7(7)	1.04	1.28
Liquidity (in times)									
CR	9(9)	2.06	2.12	8(7)	1.78	1.92	7(7)	1.46	1.67
ATR	9(9)	1.12	1.16	8(8)	0.94	1.05	7(7)	0.97	0.90
Productivity/Output									
Sales Eff. (in %)	9(9)	18.05	31.61	8(8)	28.93	47.71	7(7)	43.62	124.59
NIE (in percentage)	9(9)	1.00	1.18	8(8)	0.83	1.27	7(7)	2.37	9.87
No of employees	9(9)	7059.11	6037.24	8(8)	10,866.23	9121.09	7(7)	23,258.54	21,113.77

which is more than 5% (in OPM), above 25% in ROCE and ROTA during phase-II vis-à-vis phase-I of disinvestment. Further, a sizable increase in liquidity (CR), capacity utilization (80% of the firms), and productivity (SE and NIE due to a decrease in employment) ratios has also been observed during the same phase. However, the performance has deteriorated only in the case of efficiency measures as decrease in assets turnover and increase in inventory holding period have also been noticed.

3.5.4 Disinvestment from 20 to 30%

The results of the study are against the normal perception of better performance (in respect of profitability) with a higher degree of disinvestment. Mean profitability and capacity utilization have reported a decline (Table 3.5). As far as assets turnover, liquidity and productivity ratios are concerned, improvement has been noted in all of them, and RMIHP, WIPIHP, and FGIHP have also shown a moderate decrease.

Capacity utilization suggests that 3 out of 4 disinvested sample enterprises have decreased their capacity utilization over the phase-II vis-à-vis phase-I. It may be recalled that better performance has been observed for CPEs having disinvestment (between the ranges of 10–20%). The findings in this subsection do not reinforce the contention that disinvestment improves profitability. However, operational efficiency, liquidity, and productivity position have registered a marginal improvement.

3.5.5 Disinvestment in the Range of 30–40%

Table 3.5 indicates mixed results. There has been a marginal decrease in operational efficiency in the majority of assets turnover ratios; capacity utilization has also decreased in four-fifths of the sample CPEs, though figures related to the leverage, liquidity, RMIHP, DCP and SE, and NIE ratios have shown improved results after disinvestment. Similarly, a marginal increase in two profitability ratios (RONW and NPM) has also been recorded.

3.5.6 Disinvestment from 40 to 51%

Substantial improvement in productivity and a marginal increase for the liquidity ratios as well as capacity utilization is seen after disinvestment than before disinvestment period; in the same way, there is a decline in all the three inventory holding ratios during the same time frame. Though assets' utilization and profitability have disclosed a declining trend in all types of ratios, the mean capacity utilization of the sample CPEs is operating at their capacity below 100%.

Table 3.5 Mean values of key financial ratios of the public sector enterprises on the basis of extent of disinvestment between 20 and 30, 30 and 40, and 40 and 50%, 1986–1987 to 2009–2010

Ratios	Between 20 and 30%			Between 30 and 40%			Between 40 and 50%		
	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After		Before	After
Profitability ratios (in percentage)									
RONW	4(4)	10.98	7.65	6(6)	19.43	20.09	4(4)	17.82	11.91
ROCE	4(4)	15.09	8.47	6(6)	22.61	22.06	4(4)	19.72	14.57
ROTA	4(4)	10.03	8.67	6(6)	16.88	16.04	4(4)	13.87	11.55
OPM	4(4)	16.10	10.68	6(6)	13.76	13.75	4(4)	18.99	15.74
NPM	4(4)	7.53	3.12	6(6)	7.10	8.32	4(4)	9.79	8.80
Efficiency ratios (in times)									
TATR	4(4)	0.63	0.82	5(5)	1.46	1.24	4(4)	1.18	1.13
FATR	4(4)	2.45	3.92	5(5)	4.48	4.84	4(4)	3.22	2.56
CATR	4(4)	1.23	1.35	6(5)	2.63	2.24	4(4)	2.56	1.88
DCP (in days)	4(4)	95.62	102.63	6(6)	66.34	61.53	4(4)	26.69	42.25
RMIHP (in days)	4(4)	205.75	185.63	5(6)	118.12	84.16	3(3)	90.57	74.15
WIPIHP (in days)	4(4)	45.88	35.18	4(4)	27.60	30.91	3(3)	10.68	8.30
FGIHP (in days)	4(4)	37.71	30.99	5(5)	12.36	12.89	3(3)	22.86	21.10

(continued)

Table 3.5 (continued)

Ratios	Between 20 and 30%			Between 30 and 40%			Between 40 and 50%		
	No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No. of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments		No of firms Before (After)#	Mean 5 yrs before and 8 yrs after of disinvestments	
		Before	After		Before	After		Before	After
Capacity utilization (in percentage)									
Below 50%	0			0			0		
Between 50 and 75%	1(1)	67.8	69.8	1(1)	79.0	64.5	1(1)	82.2	84.8
Between 75 and 100%	1(1)	79.6	53.8	3(3)	74.8	74.0	2(2)	89.0	90.4
More than 100%	2(2)	96.2	85.9	1(1)	111.8	125.0	0		
Leverage (in times)									
TD/TE	4(4)	1.01	1.09	6(6)	0.84	0.71	4(4)	1.34	0.89
Liquidity (in times)									
CR	4(4)	1.85	1.95	6(6)	1.34	1.66	4(4)	1.22	1.51
ATR	4(4)	0.81	0.88	6(6)	0.84	1.11	4(4)	0.41	0.63
Productivity/Output									
Sales Eff. (in %)	4(4)	43.62	124.59	6(6)	96.79	221.53	4(4)	23.18	88.54
NIE (in %)	4(4)	0.62	0.75	6(6)	7.88	16.87	4(4)	0.94	2.37
No of employees	4(4)	16,242.45	16812.09	6(6)	17427.70	12852.81	4(4)	52115.80	45896.50

As far as financial performance relating to the six groups is concerned, mixed results have been observed among all the six groups related to the degree of disinvestment and various parameters of financial performance. For instance, a marginal increase in some of the ratios related to profitability has been noted in a few of the cases. The positions of liquidity, leverage, and efficiency ratios have shown improvement due to a higher amount of disinvestment in the majority of the cases. Other parameters, such as assets turnover (current as well as fixed, save 20–30% disinvestment), have pronounced declining trend, and DCP has reflected the increasing trend.

The findings in this part contradict to the perception that higher disinvestment brings out higher productivity in the employment of the existing assets, which, in turn, raises profitability at all the levels. Further, for determining the relationship and effect of degree of disinvestment across the six categories, the technique of ANOVA is used in this study (Table 3.6) to measure the noteworthy variation among almost all the parameters related to profitability (except OPM and NPM), efficiency (i.e., assets turnover, IHP and DCP), and liquidity ratios. The findings to a great extent corroborate and justify to the hypothesis—better performance is associated with higher degree of disinvestment.

Table 3.6 ANOVA results of the disinvested CPEs on the basis of degree of disinvestment, 1986–1987 to 2009–2010

Parameters		Sum of squares	df	Mean square	F	Sig.
RONW	Between groups	175.97	5	35.19	5.15	0.04*
	Within groups	41.04	6	6.84		
ROCE	Between groups	287.13	5	57.43	5.71	0.03*
	Within groups	60.37	6	10.06		
ROTA	Between groups	87.38	5	17.48	4.92	0.04*
	Within groups	108.70	11			
OPM	Between groups	69.66	5	13.93	1.60	0.29
	Within groups	52.37	6	8.73		
NPM	Between groups	27.70	5	5.54	1.99	0.21
	Within groups	16.66	6	2.78		
TATR	Between groups	0.44	5	0.09	7.22	0.02*
	Within groups	0.07	6	0.01		
FATR	Between groups	4.85	5	0.97	3.91	0.06
	Within groups	1.49	6	0.25		

(continued)

Table 3.6 (continued)

Parameters		Sum of squares	df	Mean square	F	Sig.
CATR	Between groups	1.82	5	0.36	4.73	0.04*
	Within groups	0.46	6	0.08		
RMIHP	Between groups	21043.05	5	4208.61	6.01	0.02*
	Within groups	4200.76	6	700.13		
WIPIHP	Between groups	1865.91	5	373.18	27.41	0.00**
	Within groups	81.68	6	13.61		
FGIHP	Between groups	644.33	5	128.87	7.92	0.01**
	Within groups	97.57	6	16.26		
DCP	Between groups	7285.55	5	1457.11	16.97	0.00**
	Within groups	515.33	6	85.89		
TD/TE	Between groups	0.27	5	0.05	1.83	0.24
	Within groups	0.18	6	0.03		
CR	Between groups	0.73	5	0.15	7.52	0.01**
	Within groups	0.12	6	0.02		
ATR	Between groups	0.44	5	0.09	7.32	0.02*
	Within groups	0.07	6	0.01		
Sales Efficiency	Between groups	28524.12	5	5704.82	2.53	0.14
	Within groups	13521.43	6	2253.57		
NIE	Between groups	216.24	5	43.25	3.72	0.07
	Within groups	69.68	6	11.61		

Note ** and * signify to significant difference at 1% and 5% level respectively

3.6 Implications of the Study

The study recommends for the government to opt for strategic disinvestment since partial and little quantum of disinvestment is not going to yield good rewards. Further, it has also been opined that the interference from the government end in the operational and administrative functioning should be given least preference. It has also been suggested to bring major structural modifications in the privatized organizations consisting of change in leadership, performance-based incentives, the responsiveness of management, and managers for encouraging competitiveness in the organization.

It has also been suggested to the government to opt for a specific strategy for the closure of loss-making CPEs. For a number of times, the government faces difficulties in the closure of sick or loss-making CPEs for the social cause. Therefore, under these circumstances, the government may opt for selling such CPEs to the private organizations by inviting tenders. Normally, getting the positive price in such cases is difficult. Therefore, the government can dispose of such CPEs at the least negative tender price as followed in Germany (Gupta 2005).

3.7 Conclusion

As expected, disinvestment has not yielded desired results. The findings indicate an insignificant increase in almost all the measures reflecting profit generating ability, capacity building, and utilization of assets even after 8 years of disinvestment. However, an enhancement has been seen only in the parameters of productivity as well as liquidity. Prima-facie, the results do not confirm the general expectation of better performance from the disinvestment. Probably high government involvement and lesser autonomy could be one of the factors of low performance. The other reasons may be lesser profit margin, market competition, controlling administrative prices, and decline in usage of debt (Gupta et al. (2011a). Under partial disinvestment, control continues to remain with government and hampers faster decision-making which leads to an adverse impact on the performance of CPEs.

However, the extent of disinvestment has shown mixed results in the parameters of profitability across the six groups. No uniform pattern has been observed. The position of liquidity, leverage, inventory holding period (IHP), and productivity have shown improvement to a large extent due to higher disinvestment. ANOVA test has also corroborated a positive relation between the quantum of disinvestment with higher financial performance.

In sum, it is worth stating that partial disinvestment has not derived the results which were expected from them. It may be due to number of issues encountered by CPEs during the post-disinvestment period. Some of these are ineffective and soaring cost, noncompetitive business base, operational ineffectiveness because of high intervention of governmental, surroundings limitations, lower proportion of disinvestment due to bridging the budgetary deficit, and control in the capital market. Sueyoshi (1998) enumerates that the performance and commercial activities of the company are not only assessed through firm's ownership structure but also governed by various exterior factors, such as corporate regulations/deregulations, customer bases, and types. A government company facing high competition may work like a private enterprise and a private company with high government bylaws behaves like government company. Koen (1998) and Abelson (2003) have ascribed that disinvestment of public enterprises is not a proper solution of better governance as well as earnings belonging to the longer period play less importance in the disinvestment decision. On the contrary, Das (1999) has found a decrease in the earnings/profitability, liquidity, and assets turnover ratios.

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Chapter 4
Effect of Vital Organizational Processes on Flexibility

Sumant Kumar Bishwas and Sushil

Abstract The business scenario has changed a lot in the current knowledge era. Uncertainty and complexity in the environment are changing day by day due to globalization, more informed customers, technological advancement, and availability of a skilled workforce. Satisfying the varied and changing customers' demands is one of the key parameters to decide about organization survival and growth. Flexibility gives strength to an organization for managing these changes. Learning, innovation and entrepreneurship are the three vital processes for organization success and affect the degree of flexibility. This chapter has explored the integration aspects of learning, innovation, and entrepreneurship with a focus on flexibility. This empirical study has been done based on the survey conducted on selected companies from IT and automobile industry in India. Stepwise regression method has been used to analyze the effect of the three identified processes on flexibility aspects. The final integrated model explains the effect of learning, innovation, and entrepreneurship factors on flexibility.

Keywords Entrepreneurship · Flexibility · Innovation · Integration · Learning

4.1 Introduction

Satisfying the diverse and changing customer demands is one of the primary concerns for the industry in the current knowledge era (Valle et al. 2011). Organizational success is determined by the extent it can manage the changes (Folami and Powers 2009). Competing in this uncertain environment, while some organizations survive

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as well as remain on the growth trajectory, there are examples of organizations that struggled for their existence or even failed to survive (Drucker 1985). Importance of survival and growth issues was also discussed in theories related to the organization life cycle.

System theory defines an organization as a complex system with various subsystem within itself, and the integration of these subsystems has been described as one of the important aspects of the system's performance. An integrated view of these subsystems helps to remain ahead in the competition. Scott (1961) in his modern organizational theory, explained the identification of important organizational processes and understanding of their interrelationships, as one of the important means to better understand the organization. Organizations are expected not only to identify these processes but also to think about integration aspects of these for effective functioning, considering it as a system. Lane et al. (2006) have discussed the integration process of learning and innovation with organizational structure concern. Similarly, the integration of HRM, leadership, and strategy with organization change has been explained by Stace and Dunphy (1992). Importance of process integration has been further explained by Bishwas and Sushil (2017) in their study about integration of critical processes for organizational innovation.

This study has explored the integration aspects of three vital organizational processes with flexibility in the organization. The three critical processes (learning, innovation, and entrepreneurship) and its effect on flexibility have been explained with the help of stepwise regression analysis.

4.1.1 Learning, Innovation, Entrepreneurship, and Flexibility

Learning has been considered as one of the requisites for succeeding in the competition (Prahalad and Hamel 1990). It increases the renovation and adaptive capability of the organization (Sushil 2004), helps in understanding the external and internal environment and acts accordingly, and has been defined a necessity for organizational survival (Epstein 2003). Continuous learning supports to stay ahead in the competition and is described as one of the keys for growth (Maurer and Weiss 2010).

Learning is one of the vital processes where failure results in declining performance and increased survival risk (Senge 1990). It has been defined as the main cause of organizational failure. As per Kotter and Cohen (2002), information availability, readiness to learn, and innovation-oriented solution are some of the substantial concerns to empower the organization for long-term survival. Jitnom and Ussahawanitchakit (2010) explained learning as one of the organizational strategic capability. According to Schwandt and Marquardt (2000) findings, in the next 10 years, only the organizations with learning orientation will survive and rest will be in trouble. Learning leads to improved mutual understanding toward any integrated action in

the organization (Campbell and Armstrong 2013). As per Ortenblad (2004), organizational learning, learning structure, learning climate, and work learning are the three dimensions that decide whether the learning process will be effective or not.

Managing the quick demand changes by diverse customers requires a continuous focus on new innovative solutions. Findings of Xu et al. (2011) that "two-third per cent of the prosperous companies' revenue derive from novel services and products emerged within five years' frame," strengthens this view. Continuous learning process intensifies creativity leading to innovation. learning facilitates knowledge acquisition that affects innovation level significantly (Chermin and Nijhof 2005).

In the current VUCA world, innovation can be seen as a source of strength where learning facilitates the novel product development leading to customer satisfaction (Baker and Sinkula 1999; Vicenzi and Adkins 2000), and organizational ability to develop innovative solutions provides strength for its survival (Sushil 2004, 2013). Learning and innovation affect both financial and nonfinancial performance, including CRM and customer satisfaction (Goh et al. 2012; Battor and Battour 2013; Pantouvakis and Bouranta 2013).

Customer satisfaction has been acknowledged as a vital aspect where innovation plays a significant role to satisfy customer's demands. Organization's innovation orientation rests on the degree of customer satisfaction aspects (Ruggles and Little 1997). Innovative organization explores the possible opportunities from the uncertain environment because of its capability to attract new customers and markets better than their competitors (Michael and Pearce 2009). Sushil (2003) has highlighted that innovation and learning are strongly interrelated with each other which strengthen the organization for its long-term growth. Calisir et al. (2013) have explained the effect of learning on innovation. Innovation in an organization can be promoted through the effective learning process (Hung et al. 2010). Incorporating a flexible approach in an organization facilitates the process to manage the change (Heilbrunn 2008).

Flexibility has been acknowledged as one of the critical organizational resources (Dreyer and Gronhaug 2004). Eriksson et al. (2017) suggested that project management practices with a focus on flexibility, learning, and adaptation increase performance. According to Maisel (1992), innovation and flexibility are the two vital parameters for measuring growth. Importance of flexibility has been further discussed by Sushil (2004, 2013), considering it as an instrument for managing the environmental uncertainty. The author has further highlighted flexibility as one of the major issues related to other critical aspects like learning and innovation. Volberda (1998) has explained the concept of flexibility as organizations' capability to change and develop products, and strategies to manage environmental uncertainty. Camps et al. (2016) found that employee flexibility with organizational learning capability affect individual performance in a turbulent environment. Sharma et al. (2010) have provided a detailed review on flexibility and its significance for the organization.

Effect of environment uncertainty during strategic development is usually very high, and flexibility concern has been seen as a crucial aspect during that phase. Flexibility has been considered as a tactic to gain more control in the turbulent environment. The concept of "flexibility mix" classified flexibility into operational, strategic, and structural flexibility which explain significance and types of flexibil-

ity considering strategic, structural, and operational dimensions (Volberda 1997). As per Verdu and Gomez (2009), flexibility escalates the responsive ability of an organization that is linked with internal, external, structural, and strategic flexibility. Eppink (1978) suggested it as an important aspect to maintain a right fit between the organization and its environment. Flexibility, linked with other aspects, develops collaborative culture and competence required in the changing environment.

Flexibility related to workforce supports to deal with the workforce-related uncertainty (Looise et al. 1998). Workforce-related flexibility, i.e., labor flexibility is about managing the uncertain demand and supply of labor in an efficient manner (Upton 1995). Other than labor flexibility, strategic flexibility is another important flexibility dimension that enhances the likelihoods of survival (Hitt et al. 1998; Sushil 2014). Innovation and flexibility have been described as vital processes for survival and growth (Bishwas and Sushil 2013).

Innovation and entrepreneurship are complementary to each other. According to Zhao (2005), combination of both is essential for organizational success in an uncertain and complex environment. Michael and Pearce (2009) described interrelatedness of entrepreneurship and innovation process. As per Molina and Callahan (2009), entrepreneurial orientation encourages risk-taking that raises a degree of innovation and finally leads to organizational performance.

The mantras of LIFE suggested by Sushil (2007, 2013) can be seen as a managerial tool toward organization vitality and identification of the processes relevant to achieve the high vital position. The first LIFE mantra discussed the importance of the integration of learning, innovation, flexibility, and entrepreneurship that have been acknowledged as four critical organizational processes. These processes have been further explained as the vitalization process for the organization that contributes to survival and growth (Bishwas 2011). This study strengthens the previous results on process integration with a specific focus on flexibility.

4.2 Methodology

This chapter is based on empirical research based on a survey conducted on selected IT and automobile industries in India. Judgmental, convenience, and snowball sampling techniques have been used for selection of the companies and respondents. The questionnaires for this study have been chosen from Bishwas (2015a, b, c). Questionnaires were mailed to the respondents wherever personal interaction was not possible due to time and availability constraints. Stepwise regression analysis has been used to explain the effect of learning, innovation, and entrepreneurship factors on flexibility. SPSS 20 software package has been used for the analysis. Three stepwise regression models have been developed considering three flexibility factors as dependent variable one by one, and rest all as independent variables. The final model has been presented as a combination of all three regression results. Table 4.1 presents the respondents' details.

Table 4.1 Respondents details

Industry (n = 225)	***IT***		***Automobile***	
	116 (51.55%)		109 (48.45%)	
Average work experience	***Total***	***Within current organization***		
	10.75 years	6.47 years		
Gender		***Qualification***		
Male	Female	Graduate	Masters	Doctorate
198 (88%)	27 (12%)	69 (30.66%)	142 (63.11%)	14 (6.22%)

From Table 4.1, it can be seen that the respondents are well experienced to answer related to the chosen processes.

4.3 Results and Discussion

The outcomes of stepwise regression analysis have been used to develop an integrated model which highlights the effect of learning, innovation, and entrepreneurship factors on flexibility. Stepwise regression analysis has been discussed in detail.

4.3.1 Regression Analysis

Three stepwise regression models have been developed considering three flexibility factors as dependent variables one by one (in a separate manner) and factors of other processes as independent variables (details provided in the appendix). Table 4.2 provides the stepwise regression analysis results (details in Appendix 1).

Figure 4.1 summarizes all the three stepwise regression models considering flexibility factors as dependent variables. The results reflect the effect of learning, innovation and entrepreneurship (micro-level factors) on flexibility factors. From the summary model, we can see that learning, entrepreneurship and innovation factors significantly affect flexibility factors where innovation factors are having a higher effect compared to the other two processes. This strengthens the view that innovation and flexibility are highly interrelated processes and innovation-focused organizations usually are more flexible compared to less innovative ones.

Stepwise regression models, considering flexibility factors as dependent variables separately, replicate its interrelationships with other processes. The model suggests that strategic flexibility (VPF1) is effected by innovation (*access to facility and resources, skills variety*), entrepreneurship (*proactiveness*), and other two flexibility factors (*flexible resource usage*, *adaptive capacity of leadership*). Similarly, flexible resource usage (VPF2) is affected by learning (*organizational learning*,

Table 4.2 Regression analysis summary

Dependent variable	Independent variable	B-value	R^2	SEE	Significance
Strategic flexibility (VPF1)	Flexible resource usage (VPF2)	0.356	0.748	0.44219	0.000
	Access to facility and resources(VPI2)	0.197			0.000
	Adaptive capacity of leadership (VPF3)	0.238			0.000
	Proactiveness (VPE1)	0.242			0.000
	Skills variety (VPI3)	−0.086			0.024
Flexible resource usage (VPF2)	Strategic flexibility(VPF1)	0.419	0.741	0.45217	0.000
	Collaborative environment (VPI1)	0.202			0.000
	Skills variety (VPI3)	0.133			0.001
	Proactiveness (VPE1)	0.287			0.000
	Organizational learning (VPL2)	−0.218			0.000
	Learning structure (VPL3)	0.136			0.007
Adaptive capacity of leadership (VPF3)	Strategic flexibility (VPF1)	0.394	0.649	0.50434	0.000
	Learning Structure (VPL3)	0.348			0.000
	Skills variety (VPI3)	0.161			0.000
	Entrepreneurial intensity (VPE3)	0.118			0.024

learning structure), innovation (*collaborative environment, skills variety*), and one entrepreneurship (*proactiveness*) as well as flexibility factor (*strategic flexibility*). Adaptive capacity of leadership (VPF3) is positively affected by strategic flexibility (flexibility factor), learning structure (learning factor), skills variety (innovation factor), and entrepreneurial intensity (entrepreneurial factor).

Results suggest that flexible resource usage, adaptive leadership capability, and proactiveness affect the degree of *strategic flexibility* in a highly significant manner. Further, the negative value for skills variety supports the view that degree of

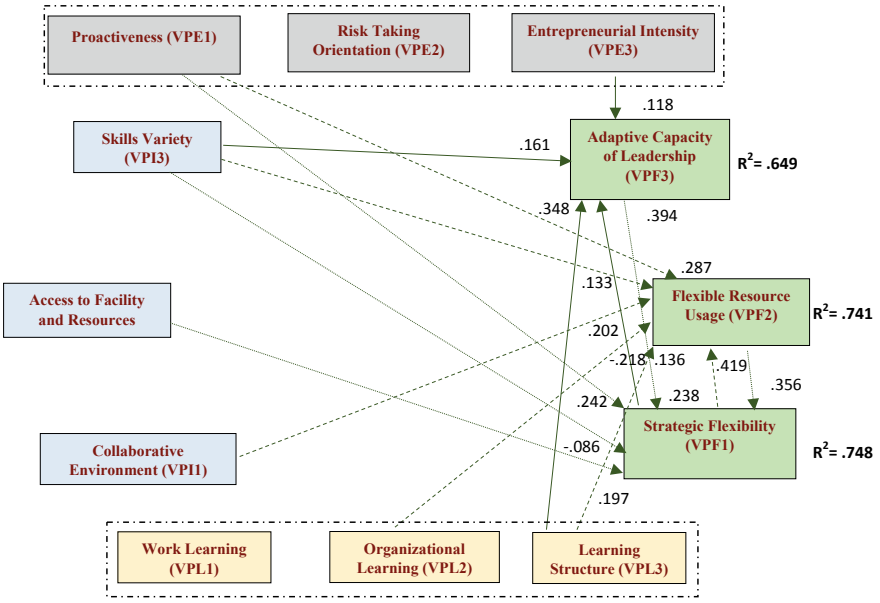

Fig. 4.1 Summary of stepwise regression models with flexibility factors as dependent variable

skills diversity may restrict the strategic flexibility process. The next flexibility factor, *flexible resource usage*, is highly affected by strategic flexibility followed by a collaborative environment in the organization. Organizational learning factor is negatively related to flexible resource usage which shows that high organizational learning (well defined and rigid) decreases flexibility in resource usage. *Adaptive capacity of leadership* (third flexibility factor) is again highly affected by strategic flexibility factor followed by learning structure. From all the three regression models, we can conclude that out of the three factors strategic flexibility is highly affecting the two other flexibility factors which suggest that strategic flexibility needs to be considered as the central concern.

The outcomes of this chapter strengthen the previous researchers' views which talked about interrelationships of critical organizational processes (Pascle 1991; Baker and Sinkula 1999; Chermin and Nijhof 2005; Calisir et al. 2013).

4.4 Conclusion

Flexibility has emerged as one of the strategic resources for an organization in the current uncertain and complex environment. Organizations which are ready to adopt the changes sooner will be able to succeed in the competition. Organizational processes like learning, innovation, and entrepreneurship have emerged as vital for organiza-

tional survival and growth, which have a strong effect on flexibility. An integrated view of these processes strengthens organizations for long-term survival and growth. Strategic flexibility has appeared as the major factor which is strongly affecting other flexibility dimensions. Further, innovation is strongly related to flexibility followed by learning and entrepreneurship. An integrated view of learning, innovation, and entrepreneurship will help in developing a flexibility focus that will ultimately lead to organizational success.

This study can be perceived as a fundamental work for research in process integration with a specific focus on micro-level flexibility analysis to manage the environment changes. This can be further extended to other industries for developing a more generalized model. Focused detailed case study for a specific organization can be conducted to validate the model. Various external variable's effect can also be considered as an extension of this study. The final model can be taken as a guiding framework for implementing flexibility aspects in an organization. The final model may guide the practitioner in terms of providing a better understanding about interrelated factors to flexibility, and the factors where the organization should focus more during the planning and implementation process. Further, the model can be helpful for non-governmental organizations (NGO) to manage these four processes in a more effective and efficient way.

Appendix 1: Stepwise Regression Models

Flexibility Factors as Dependent Variable

(1) Strategic Flexibility as Dependent (VPF1)

Model summary				
Model	R	R^2	Adjusted R^2	SEE
1	0.782[a]	0.612	0.610	0.54360
2	0.828[b]	0.685	0.683	0.49043
3	0.848[c]	0.719	0.715	0.46453
4	0.861[d]	0.742	0.737	0.44639
5	0.865[e]	0.748	0.742	0.44219

[a]Predictors: (Constant), VPF2
[b]Predictors: (Constant), VPF2, VPI2
[c]Predictors: (Constant), VPF2, VPI2, VPF3
[d]Predictors: (Constant), VPF2, VPI2, VPF3, VPE1
[e]Predictors: (Constant), VPF2, VPI2, VPF3, VPE1, VPI3
[f]Dependent variable: VPF1

ANOVA						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	103.822	1	103.822	351.347	0.000[b]
	Residual	65.896	223	0.295		
	Total	169.718	224			
2	Regression	116.323	2	58.161	241.817	0.000[c]
	Residual	53.395	222	0.241		
	Total	169.718	224			
3	Regression	122.030	3	40.677	188.506	0.000[d]
	Residual	47.688	221	0.216		
	Total	169.718	224			
4	Regression	125.880	4	31.470	157.930	0.000[e]
	Residual	43.838	220	0.199		
	Total	169.718	224			
5	Regression	126.896	5	25.379	129.796	0.000[f]
	Residual	42.822	219	0.196		
	Total	169.718	224			

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.697	0.153		4.552	0.000
	VPF2	0.777	0.041	0.782	18.744	0.000
2	(Constant)	0.177	0.156		1.137	0.257
	VPF2	0.559	0.048	0.563	11.626	0.000
	VPI2	0.377	0.052	0.349	7.209	0.000
3	(Constant)	−0.024	0.153		−0.159	0.874
	VPF2	0.422	0.053	0.425	8.006	0.000
	VPI2	0.300	0.052	0.278	5.812	0.000

(continued)

(continued)

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
	VPF3	0.273	0.053	0.264	5.143	0.000
4	(Constant)	−0.105	0.148		−0.713	0.476
	VPF2	0.322	0.056	0.324	5.798	0.000
	VPI2	0.229	0.052	0.212	4.384	0.000
	VPF3	0.230	0.052	0.223	4.440	0.000
	VPE1	0.235	0.053	0.237	4.396	0.000
5	(Constant)	0.163	0.188		0.868	0.387
	VPF2	0.353	0.057	0.356	6.230	0.000
	VPI2	0.213	0.052	0.197	4.073	0.000
	VPF3	0.246	0.052	0.238	4.740	0.000
	VPE1	0.239	0.053	0.242	4.524	0.000
	VPI3	−0.094	0.041	−0.086	−2.280	0.024

Dependent variable: VPF1

(2) Flexible Resource Usage as Dependent (VPF2)

Model summary				
Model	R	R^2	Adjusted R^2	SEE
1	0.782[a]	0.612	0.610	0.54743
2	0.813[b]	0.661	0.658	0.51273
3	0.829[c]	0.687	0.682	0.49403
4	0.840[d]	0.706	0.700	0.47998
5	0.856[e]	0.732	0.726	0.45886
6	0.861[f]	0.741	0.734	0.45217

[a]Predictors: (Constant), VPF1
[b]Predictors: (Constant), VPF1, VPI1
[c]Predictors: (Constant), VPF1, VPI1, VPI3
[d]Predictors: (Constant), VPF1, VPI1, VPI3, VPE1
[e]Predictors: (Constant), VPF1, VPI1, VPI3, VPE1, VPL2
[f]Predictors: (Constant), VPF1, VPI1, VPI3, VPE1, VPL2, VPL3
[g]Dependent variable: VPF2

ANOVA						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	105.290	1	105.290	351.347	0.000[b]
	Residual	66.827	223	0.300		
	Total	172.117	224			
2	Regression	113.755	2	56.877	216.351	0.000[c]
	Residual	58.363	222	0.263		
	Total	172.117	224			
3	Regression	118.179	3	39.393	161.404	0.000[d]
	Residual	53.938	221	0.244		
	Total	172.117	224			
4	Regression	121.434	4	30.358	131.776	0.000[e]
	Residual	50.683	220	0.230		
	Total	172.117	224			
5	Regression	126.006	5	25.201	119.690	0.000[f]
	Residual	46.111	219	0.211		
	Total	172.117	224			
6	Regression	127.545	6	21.258	103.970	0.000[g]
	Residual	44.572	218	0.204		
	Total	172.117	224			

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.845	0.151		5.598	0.000
	VPF1	0.788	0.042	0.782	18.744	0.000
2	(Constant)	0.343	0.167		2.056	0.041
	VPF1	0.591	0.052	0.587	11.288	0.000
	VPI1	0.323	0.057	0.295	5.674	0.000
3	(Constant)	−0.190	0.204		−0.932	0.352
	VPF1	0.589	0.050	0.585	11.671	0.000
	VPI1	0.253	0.057	0.231	4.414	0.000

(continued)

(continued)

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. Error	Beta		
	VPI3	0.191	0.045	0.173	4.258	0.000
4	(Constant)	−0.256	0.199		−1.291	0.198
	VPF1	0.455	0.061	0.452	7.492	0.000
	VPI1	0.216	0.057	0.197	3.823	0.000
	VPI3	0.169	0.044	0.153	3.846	0.000
	VPE1	0.214	0.057	0.215	3.759	0.000
5	(Constant)	0.032	0.200		0.161	0.872
	VPF1	0.451	0.058	0.448	7.766	0.000
	VPI1	0.280	0.056	0.255	5.018	0.000
	VPI3	0.136	0.043	0.124	3.206	0.002
	VPE1	0.309	0.058	0.310	5.317	0.000
	VPL2	−0.199	0.043	−0.207	−4.660	0.000
6	(Constant)	−0.030	0.198		−0.149	0.881
	VPF1	0.422	0.058	0.419	7.269	0.000
	VPI1	0.221	0.059	0.202	3.744	0.000
	VPI3	0.146	0.042	0.133	3.473	0.001
	VPE1	0.286	0.058	0.287	4.945	0.000
	VPL2	−0.210	0.042	−0.218	−4.972	0.000
	VPL3	0.136	0.049	0.136	2.744	0.007

Dependent variable: VPF2

(3) Adaptive Capacity of Leadership as Dependent (VPF3)

Model summary				
Model	R	R^2	Adjusted R^2	SEE
1	0.723[a]	0.523	0.520	0.58427
2	0.785[b]	0.616	0.613	0.52505
3	0.800[c]	0.641	0.636	0.50909
4	0.806[d]	0.649	0.643	0.50434

Predictors: (Constant), VPF1
Predictors: (Constant), VPF1, VPL3
Predictors: (Constant), VPF1, VPL3, VPI3
Predictors: (Constant), VPF1, VPL3, VPI3, VPE3
Dependent variable: VPF3

ANOVA						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	83.316	1	83.316	244.064	0.000[b]
	Residual	76.126	223	0.341		
	Total	159.442	224			
2	Regression	98.241	2	49.120	178.178	0.000[c]
	Residual	61.201	222	0.276		
	Total	159.442	224			
3	Regression	102.164	3	34.055	131.397	0.000[d]
	Residual	57.278	221	0.259		
	Total	159.442	224			
4	Regression	103.483	4	25.871	101.709	0.000[e]
	Residual	55.959	220	0.254		
	Total	159.442	224			

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	1.065	0.161		6.612	0.000
	VPF1	0.701	0.045	0.723	15.623	0.000
2	(Constant)	0.617	0.157		3.928	0.000
	VPF1	0.467	0.051	0.482	9.093	0.000
	VPL3	0.375	0.051	0.390	7.358	0.000
3	(Constant)	0.050	0.211		0.235	0.815
	VPF1	0.433	0.051	0.446	8.559	0.000
	VPL3	0.365	0.049	0.379	7.371	0.000
	VPI3	0.172	0.044	0.163	3.891	0.000
4	(Constant)	−0.029	0.212		−0.139	0.890
	VPF1	0.382	0.055	0.394	6.986	0.000
	VPL3	0.335	0.051	0.348	6.592	0.000
	VPI3	0.170	0.044	0.161	3.880	0.000
	VPE3	0.116	0.051	0.118	2.277	0.024

Dependent variable: VPF3

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Chapter 5
Employers' Perception on the Antecedents of Graduate Employability for the Information Technology Sector

Nidhi Sehgal and Saboohi Nasim

Abstract This chapter aims to analyze the perceptions of the employers in the Information Technology (IT) sector in India on the antecedents of graduate employability. With an increased emphasis on organizational flexibility in today's volatile and complex business environment, the employability of the workforce has gained crucial significance. Flexibility has been acknowledged as a predictor of organizational performance (Sushil, Global J Flex Syst Manag 16(4):309–311, 2015) and its strategic driver (Sharma et al., Global J Flex Syst Manag 11(3):51–68, 2010). Flexible strategies and business plan often demand the need to scale up the quality of manpower or shift the required skill set to swiftly adapt to the market changes accordingly. This flexibility is not confined to the quantity of manpower only but also encompasses the quality of skills deployed by the manpower (Srivastava, Global J Flex Syst Manag 17(1):105–108, 2016). Therefore, it is imperative for the potential job seekers to understand and continuously adapt to the changing knowledge and skill requirements of the employers to develop and maintain their employability. The employers in this dynamic sector demand a range of knowledge, skills, and other attributes from potential job seekers. However, the graduates passing out of higher education institutions fail to meet these expectations of the employers. Therefore, the sector is struggling with the challenges of talent crunch and qualitative demand—supply mismatch of manpower. The identification of factors that influence graduate employability is based on literature review. This chapter is empirical and examines the perceptions of the employers on the factors that impact employability and validates the association between the research constructs. Opinion surveys are used to elicit responses from a sample of 236 respondents, i.e., technical/HR personnel at the middle-level/upper middle-level management positions spanning across 71 reputed IT companies in India. These respondents are actively involved in the staffing of graduates seeking technical jobs in IT sector. The perception of these employers has been

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investigated using bivariate and multivariate analysis techniques. The key insights drawn in this chapter enable potential job seekers to clearly understand the employer demands in the IT sector and equip themselves with the required knowledge and skills. This also contributes to enhancing the manpower flexibility in organizations. The chapter has significant implications for the policy-makers and key stakeholders to bridge the employability gap in this sector.

Keywords Employability gap · Employer perceptions · Information technology sector · Skill gap

5.1 Introduction

The world of work has witnessed radical changes in recent times and has become far more demanding and challenging for graduate job seekers. The term "employability" has gained crucial significance in the corporate landscape which is characterized by constant changes like globalization, technological advancements, and intense competition. These fast-paced changes demand the need of such organizational structures that can support an organization's flexibility and adaptability, and hence imply new requirements concerning the competencies and adaptability of the workforce (Van Dam 2004).

Though employability is a multidimensional construct, it can be defined in simple terms as "having the capability to gain initial employment, maintain employment and obtain new employment if required" (Hillage and Pollard 1998). There has been an increasing thrust by the companies to hire graduates who possess the necessary knowledge, skills, and competencies that aid their effortless transition in jobs and meets the demands of the competitive business world. Hence, it has become essential for these graduate job seekers to couple their academic degrees with significant skills, competencies, and attributes that make them employable for the job market and meet the rising talent demands of the recruiters.

Although graduate employability is crucial to ensure a steady supply of skilled manpower to companies, yet, Indian economy is witnessing a growing skill gap and demand–supply mismatch across many sectors. The Information Technology (IT) sector manifests a more pronounced gap. Though the IT sector has made an enormous contribution to the growth of the Indian economy, however, the sector is struggling with the challenges of employability gap and talent supply mismatch to compete globally. Staffing IT professionals in India and retaining them has become complex and challenging due to the shortage of competent professionals (Kummamuru and Murthy 2016). Furthermore, the constant and volatile technological advancements and the changing skill demands of the employers are further broadening this gap. The vital factors like talent crunch, demand–supply mismatch, and the changing manpower needs of this sector along with the changes in technology underline a strong need for the organizations to manage flexibility to cope up with the human resource challenges. The flexibility to adapt to challenges, particularly in terms of people,

processes, and offerings, has become crucial for today's IT companies (Raghuveer et al. 2014). Hence, it becomes imperative to understand the paradigm change in the perceptions of the recruiters in this sector. The National Association of Software and Service Companies (NASSCOM 2012) reports that the IT sector in India is confronting a significant employability gap. NASSCOM (2014) further reports disparity in terms of demand and supply of manpower. The research study reveals that only around 25% of the candidates who seek jobs in areas like IT Services, research and development, engineering, software products, and allied fields are deemed employable by the sector.

With the backdrop of this widening skill gap, perception and expectation gaps have been revealed by various research studies. These disparities in perceptions subsist both in general and in the context of the IT sector. Through a comparison of the perceptions of the different stakeholders in the context of Sri Lanka, Wickramasinghe and Perera (2010) found that the three key groups, i.e., university graduates, faculty, and employers prioritize the importance of various employability skills differently. In the US context, Dupre and Williams (2011) identified a gap in the competency areas that are sought by the employers and the student beliefs of their abilities in those areas. Concerning the IT/IS sector, Lee et al. (2002) found that with reference to the skills required from graduates, there exist significant differences in the perceptions of IS academics and practitioners. Through the data collected from IS managers, IS consultants and IS professors, Trauth et al. (1993) inferred a gap between the needs of the industry and the abilities of the graduates. Highlighting these perception gaps, McMurtrey et al. (2008) indicated that understanding the skill set expected from IT employees is significant for both academia and industry. The dynamic changing and fast-paced nature of this sector bring about a change in technology and the IT practices, and in turn, this alters the skills required from IT professionals.

The perceptual differences between the key stakeholder groups on the predictors of employability call for a need to measure the perceptions of these stakeholders and further understand the gaps between them. Such an analysis aims to reach the ground roots of "perceptions" to explore the employability gap that evolves out of it and further investigate its nature and cause rather than scanning this issue at the surface or macro-level. With this backdrop, this chapter aims to capture the perceptions of employers that constitute a key stakeholder group, on the employability skills deemed significant for graduates in IT and allied areas. The conceptual model of research drawn from the qualitative review of the literature has been empirically validated from the standpoint of employers, and their perceptions on the predictors of employability have been captured and further examined.

This chapter has been organized into different sections. Section 5.2 highlights the antecedents of graduate employability in context of the IT sector, Sect. 5.3 elucidates the research approach, Sect. 5.4 discusses the findings of the study, Sect. 5.5 discusses the implications for academia, practitioners, and policy-makers, and Sect. 5.6 underlines the conclusions of this study.

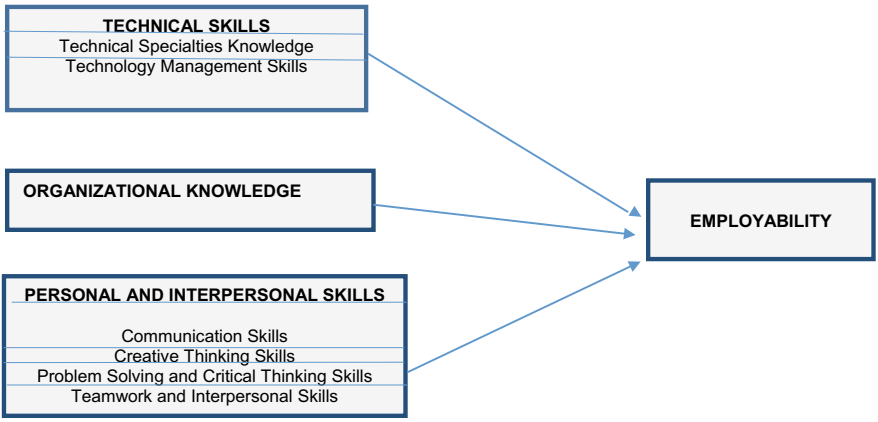


Fig. 5.1 Conceptual model of research. *Note* Adapted from "Predictors of graduate employability in the Indian information technology sector" by Sehgal and Nasim (2017), Copyright 2017 by Inderscience

5.2 Antecedents of Graduate Employability for the IT Sector

The significance of the various predictors of employability from the perspective of employers in IT sector has been apprehended by deploying the sector-specific conceptual model of the factors that influence employability advocated by Sehgal and Nasim (2017). The model highlights that three key knowledge and skill areas, i.e., Technical Skills, Organizational Knowledge, and Personal and Interpersonal Skills influence employability. Employability is thus the dependent variable, and the three identified knowledge and skills areas are the independent variables at the macro-level that predict employability. Various other knowledge and skill areas constitute these macro variables. Majority of these independent variables have also been highlighted by Byrd and Turner (2001) as the determinants of IT infrastructure flexibility. The authors reveal that the flexibility of IT infrastructure can be measured in terms of technical and human IT infrastructure. The measures of the human side of IT infrastructure flexibility include technology management, business knowledge, management knowledge, and technical skills dimension (Byrd and Turner 2001). The model is shown in Fig. 5.1 which illustrates the association between the variables.

Further, the research variables in the conceptual model are illustrated below (Table 5.1).

Table 5.1 Macro and micro variables of research

Macro variables	Micro variables	References
Technical skills	Technical Specialities knowledge	Lee et al. (1995)
	Technology management skills	Nelson (1991), Trauth et al. (1993), Yen et al. (2001), Lee et al. (2002), Aasheim et al. (2009, 2012)
Organizational knowledge		Nelson (1991), Yen et al. (2001), Bassellier and Benbasat (2004), Fang et al. (2005), Aasheim et al. (2009)
Personal and interpersonal skills	Problem-solving and critical thinking	Yen et al. (2001), Lee et al. (2002), McMurtrey et al. (2008), Tesch et al. (2008), and Wickramasinghe and Perera (2010)
	Communication skills	Lee et al. (1995), Woratschek and Lenox (2002), Fang et al. (2005), McMurtrey et al. (2008), Tesch et al. (2008), Aasheim et al. (2009), Eom and Lim (2012)
	Creative thinking	Yen et al. (2001), Lee et al. (2002), McMurtrey et al. (2008), Tesch et al. (2008), Wickramasinghe and Perera (2010), and Aasheim et al. (2012)
	Teamwork and interpersonal skills	Teamwork skills: Woratschek and Lenox, (2002), Fang et al. (2005), Bailey and Mitchell (2006), McMurtrey et al. (2008), Tesch et al. (2008), Aasheim et al. (2009, 2012), and Interpersonal skills: Nelson (1991), Trauth et al. (1993), Bassellier and Benbasat (2004), Aasheim et al. (2012), Rosenberg et al. (2012)
Employability		Hillage and Pollard (1998), Harvey (2001), Fugate et al. (2004), Heijde and Van der Heijden (2006), Dacre Pool and Sewell (2007), Fugate and Kinicki (2008), Bridgstock (2009)

Note Adapted from "Predictors of graduate employability in Indian information technology sector'" by Sehgal and Nasim (2017), Copyright 2017 by Inderscience

Table 5.2 Summary of hypotheses for macro variables

Independent macro variable	Associated with variable	Hypotheses code
Technical skills	Employability	HATE
Organizational knowledge	Employability	HAOE
Personal and interpersonal skills	Employability	HAPIE

5.3 Research Methodology

This is an empirical study that captures the perceptions of employers in the IT sector on the antecedents of employability. Opinion surveys have been used to collect data from the respondents. These surveys, on one hand, gauge the opinions of the employers on the antecedents of employability and on the other hand, empirically validate the relationship between the research constructs that have been anticipated in the research model from the standpoint of employers. The data that has been gathered from the employers is further statistically examined. Statistical Package for Social Sciences (SPSS) has been used for analysis. Hypotheses of association formulated for further investigation have been tested through correlation and regression analysis techniques.

5.3.1 Hypotheses Formulation

The hypotheses of association have been envisaged to capture the perceptions of employers. These have been formulated as below:

Hypotheses of Association for Macro Variables

Null hypotheses: One macro independent variable is not a predictor of the dependent variable.
Alternate hypotheses: One macro independent variable is a predictor of the dependent variable.

This is elaborated below:

HATE: Technical skills are predictors of employability.
HAOE: Organizational knowledge is the predictor of employability.
HAPIE: Personal and interpersonal skills are predictors of employability.

The hypotheses for macro variables have been summarized in Table 5.2.

Hypotheses of Association for Micro Variables

Null hypotheses: One micro independent variable is not a predictor of the dependent variable.

Table 5.3 Summary of hypotheses of association for micro variables

Independent micro variable	Associated with dependent variable	Hypotheses code
Technical specialties knowledge	Employability	HAT1E
Technology management skills	Employability	HAT2E
Problem-solving and critical thinking skills	Employability	HAPI1E
Creative thinking skills	Employability	HAPI2E
Communication skills	Employability	HAPI3E
Teamwork and interpersonal skills	Employability	HAPI4E

Alternate hypotheses: One micro independent variable is a predictor of the dependent variable.

Based on the same, the alternate micro-hypotheses with technical skills factor may be formulated as follows:

HAT1E: Technical specialties knowledge (T1) is a predictor of employability.
HAT2E: Technology management skills (T2) is a predictor of employability.

The alternate micro-hypotheses are formulated as follows:

HAPI1E: Problem-solving and critical thinking skills (PI1) is a predictor of employability.
HAPI2E: Creative thinking skills (PI2) is a predictor of employability.
HAPI3E: Communication skills (PI3) is a predictor of employability.
HAPI4E: Teamwork and Interpersonal Skills (PI4) is a predictor of employability.

The summary of hypotheses for micro variables is depicted in Table 5.3.

5.3.2 Questionnaire Design and Pretesting

The questionnaire for the opinion survey of employers has been designed using a five-point Likert scale to capture the perception of the respondents and test the hypotheses of association listed in the preceding section. Using the Likert scale, the respondents were asked to specify their degree of agreement or disagreement with the enumerated statements in the questionnaire on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). These statements recorded the perceptions of the respondents on

the importance of the different factors that are deemed crucial for employability. To enhance the clarity of the designed questionnaire and avoid ambiguity, the questionnaire has been pretested using Questionnaire Appraisal System (QAS) developed by Research Triangle Institute. It is a check-list-based method with different dimensions for recognizing and plugging in the flaws before the survey is fully administered. An informal discussion with the respondents was done on their feedback, and the expert comments from the questionnaire appraisal form were taken into consideration for finalizing the questionnaire. The reliability of the questionnaire has been measured using Cronbach's alpha. The value of Cronbach's alpha is high (greater than 0.9) for all macro and micro variables indicating high reliability. The validity of the designed questionnaire has been tested through Exploratory Factor Analysis (EFA). Factor loading for all items was found to be greater than 0.6, and hence none of them was dropped. KMO index was found to be greater than 0.5 for all macro variables. Furthermore, the significance value for Bartlett's test of sphericity was found to be 0.000 for all macro variables. The values of univariate statistical analysis were all found within range and data were normally distributed.

5.3.3 Sample Design

The designed questionnaire was administered to the employers in the IT sector that hire graduates for technical jobs. The employers chosen for this study largely include NASSCOM member companies in Delhi/NCR region in India. Among the others, these include top IT companies that employ a vast majority of the workforce. Data has been collected from HR and technical personnel at the middle-level/lower middle-level/upper middle-level positions in these companies who are actively involved in the staffing of graduates. This includes HR personnel, Project Managers, IT Managers, Group Managers, Delivery Managers, Senior HR Executives, Assistant Manager, Consultants, Group Team Leaders, Team Leaders, Senior Team Leaders, and allied positions depending on the designation schemes adopted by different companies.

It is quite evident that the population for this group is very large and thus was assumed unknown. Response from a sample of 236 respondents from across 71 reputed IT companies has been elicited for this study. Out of these 71 companies, data has been captured from multiple locations where these companies have their branches. This aggregates to 81 companies spread across multiple locations from where the sample for the opinion survey of employers has been drawn. Barlett et al.(2001) argue that for using multiple regression analysis, the number of observations should be greater than five times the number of independent variables. However, Halinski and Feldt (1970), Miller and Kunce (1973) suggest a conservative ratio of ten observations for each independent variable. The chosen sample size is justified from the perspective of statistical techniques, i.e., correlation and regression that have been used for the data analysis. The KMO (Kaiser–Meyer–Olkin) measure of sample

adequacy has been tested. It has been found to be within the acceptable range (0.5–1). A combination of judgmental, convenience, and snowball sampling techniques has been used for sample selection.

5.4 Findings

The data collected through the opinion surveys have been analyzed using correlation and regression analysis techniques. Correlation analysis is a technique used to measure the nature of the relationship among the variables of the study. The correlation coefficient is a measure of a linear relationship among variables. Karl Pearson's correlation coefficient is one of the extensively used measures of linear dependence among variables. This Pearson's coefficient has been used to analyze the relationship among the proposed variables. The coefficient value ranges from -1 to $+1$. A negative value of the correlation coefficient signifies that the variables are inversely related, whereas a positive value of the correlation coefficient indicates a direct relationship between the variables. The following subsections discuss the results of the same.

5.4.1 Results of Correlation Analysis

At the macro-level, the results of correlation analysis reveal the association between the dependent and independent variables. It can be noted from the results of the correlation analysis depicted in Annexure I that the coefficient of correlation is greater than 0.7 for all macro variables. The strongest association is exhibited by personal and interpersonal skills (0.84) closely followed by technical skills (0.83) and organizational knowledge (0.78). Hence, the values of the correlation coefficient signify that all independent macro variables possess a strong positive correlation with the dependent variable of study, i.e., employability.

With regard to the micro variables of technical skills, it can be noted that technical specialties knowledge bears the strongest relationship with employability (0.805) closely followed by technology management skills (0.795). Also, in the category of personal and interpersonal skills, communication skills (0.735), problem-solving and critical thinking skills (0.775), and teamwork and interpersonal skills (0.795) exhibit strong relationships with employability. Further, the multi-collinearity test (Annexure III) indicates that Variance Inflation Factors (VIF) is well within the acceptable range (<10).

5.4.2 Results of Regression Analysis

The data has been analyzed using regression analysis, and the results have been discussed in the subsections below.

5.4.2.1 Regression Analysis for Macro Variables

It can be noted from the results of a regression analysis for macro variables (Annexure II) that the coefficient of determination, R-square, for the independent macro variables is 0.755. This shows that 75.5% of the variation in employability can be accounted from the variability in the independent macro variables. The results indicate validation at 95%. The beta values of personal and interpersonal skills (0.354), technical skills (0.349), and organizational knowledge (0.210) are all found significant.

5.4.2.2 Regression Analysis of Micro Variables

The findings from the regression analysis of the micro variables are discussed below.

Regression Analysis of Technical Skills
It can be noted from the regression analysis results for the micro variables of technical skills (Annexure II) that the coefficient of determination, R-square was found to be 0.705. This shows that 70.5% variation in employability is accounted from the variability in technical specialties knowledge and technology management skills. The results indicate validation at 95%. The beta values for technical specialties knowledge (0.467) and technology management skills (0.414) are found significant.

Regression Analysis of Personal and Interpersonal Skills
The regression analysis results for the micro variables of personal and interpersonal skills (Annexure II) show that the coefficient of determination, R-square is 0.712. This implies that 71.2% variation in employability is accounted from the variability in micro variables of personal and interpersonal skills. The results indicate validation at 95%. Beta values for teamwork and interpersonal skills (0.259), problem-solving and critical thinking skills (0.281), communication skills (0.228), and creative thinking skills (0.158) are found significant.

Regression Analysis of Controlled Impact of All Independent Micro Variables
Regression analysis is undertaken with the employability and its predictors (Annexure II). The R-square for the variables together is 0.758. This indicates that 75.8% variation in employability is accounted from the variability of all the micro variables taken together. The results indicate validation at 95%. For all micro variables except creative thinking skills, the beta values are found to be significant.

Table 5.4 Results of testing macro-hypotheses from employer perspective

Independent variable	R-Square	Beta value	Significance	Hypotheses code	Status of alternate hypotheses
Personal and interpersonal skills	0.755	0.354	0.000	HAPIE	Accepted
Technical skills		0.349	0.000	HATE	Accepted
Organizational knowledge		0.210	0.001	HAOE	Accepted

Dependent variable: Employability

5.4.3 Summary of Results for Hypotheses Testing

The preceding section discusses the findings of correlation and regression analysis. The subsections below summarize the obtained results.

5.4.3.1 Summary of Results of Hypotheses Testing for Macro Variables

It can be concluded from the preceding section that all the three macro independent variables, i.e., personal and interpersonal skills, technical skills, and organizational knowledge influence employability. The results of testing the macro-hypotheses of association are presented in Table 5.4.

5.4.3.2 Summary of Hypotheses Testing Results for Micro Variables

The results of hypotheses testing for micro variables show that all the micro variables of technical skills and personal and interpersonal skills strongly influence employability. Table 5.5 summarizes the results of testing micro-hypotheses of association.

The validated models of macro variables, their micro variables, and controlled impact of all the micro variables are included in Annexure II.

5.5 Implications for Key Stakeholders

The results of this perception analysis of employers have implications for the policy-makers and the key stakeholders that include graduate job seekers, academia, and industry. The unemployment of youth is a critical policy issue for any country. Considering the present scenario of qualitative demand–supply mismatch and the changing needs of the IT industry, there is a need for the policy-makers to inte-

Table 5.5 Summary of hypotheses testing of micro variables from employers' perspective

Independent macro variable	Independent micro variable	R-Square	Beta	Significance	Hypotheses code	Status of alternate hypotheses
Technical skills	Technical Specialties knowledge	0.705	0.467	0.000	HAT1E	Accepted
	Technology management skills		0.414	0.000	HAT2E	Accepted
Personal and interpersonal skills	Communication skills	0.758	0.228	0.001	HAPI3E	Accepted
	Problem-solving and critical thinking skills		0.281	0.000	HAPI1E	Accepted
	Creative thinking skills		0.158	0.027	HAPI2E	Accepted
	Teamwork and interpersonal skills		0.259	0.000	HAPI4E	Accepted

Dependent variable: Employability

grate employability development with the course curriculum, contents, and course learning outcomes. Though employability skills are imparted to graduates by the Higher Education Institutions (HEI), however, a more regulated and robust approach is required. The course curriculum can be integrated with work readiness certification encompassing significant employability development modules. Such certification programs can include practical training in areas like soft skills and business functional knowledge that are considered critical for employability by employers. Also, such certifications should be standardized and embedded into the course curriculum with measurable results. This would help in stabilizing the uneven quality of graduates produced by different colleges. Accordingly, employability profile of the student can be developed on completion of the program in collaboration with the industry that may be presented to the prospective employers for securing jobs. This would act as an index for the employability of the candidate upon graduating.

Meeting the skill demands of the industry and further bridging the demand—supply gap calls for a strong, all-encompassing coalition between the academic and professional practitioners. Such a coalition should involve key stakeholders like fac-

ulty, HEI management, students, and industry professionals. The alliance can address crucial areas like curriculum amendment workshops, faculty development programs, research development, student internships, and projects.

The significance of different knowledge and skill areas highlighted in this study implies that the students should make well-informed career decision and choice of higher education institution for studies in line with the demands of the employers. It is important for the students to self-assess themselves and analyze if they possess the fundamental abilities, interest, and the learning capacity to make a career in IT sector rather than just joining the bandwagon. Further, the choice of HEI is indeed a crucial decision while pursuing further studies. As the demand for professional education has increased and public sector has limited access, the higher education sector has witnessed a plethora of entrepreneurs and business organizations that have landed in the education business (Prasad and Suri 2011). The students must assess the course curriculum, teaching methodologies, essential resources, training, internships, placements, and other vital means of industry exposure offered by these institutions. This would ensure that the offerings of the chosen HEI match with the requirements of the industry. Also, once they join a particular HEI, the entire focus should not be to attain a degree. Rather, it is essential for these graduates to focus on their technical skills and also participate in co-curricular activities that offer them robust platforms to develop and nurture their non-technical skills, get corporate exposure and make themselves job ready.

The higher education institutions play a vital role as the breeding grounds for employability. Thus, the study has implications for HEIs. Imparting knowledge and skills in line with the industry demands requires a strong academia–industry collaboration. These HEIs must build close collaboration with the industry in the areas like curriculum design, curriculum revisions and up-gradations, faculty development, student internships, guest lectures, projects, and final placements. Furthermore, it is important that for a volatile and fast-paced sector like IT, the speed of curriculum change must align with the speed of technology change. This may call for frequent curriculum changes in contrast to the present system. The process of acquiring knowledge and education adopted at the higher technical education should be robust enough so that both students and faculty can deliver to best of their knowledge and skills (Bhatia and Bhatia 2008). Also, the faculty should be engaged in regular development programs and industry interaction platforms to upgrade their technical skills, understand the changing demands of the corporate, and enhance their proficiency to further impart it to the students. Analyzing the skills valued by employers at the workplace, there is a need for qualitative improvement in education.

5.6 Conclusion

The study about perceptions of the employers in the Information Technology (IT) sector in India on the antecedents of graduate employability has revealed the following:

- There exists a strong correlation between employability and its identified predictors (three macro variables and six micro variables of research).
- All the three macro variables and six micro variables are perceived significant by the employers. Therefore, the employers deem that these factors have a substantial influence on the employability of graduates.
- Although the employers consider all the macro and micro variables of study significant for employability, however, the level of significance for employability attached to these variables is different.
- As compared to organizational knowledge, the employers consider that technical skills and personal and interpersonal skills are stronger predictors of employability.
- At the micro-level, the employers consider that technical specialties knowledge has a stronger influence on employability as compared to technology management skills.
- The employers perceive that each of the seven independent micro variables is significant for employability when considered separately; however, one of them, i.e., creative thinking skills was not found to be significant when all the micro variables were taken together.
- Analyzing the controlled impact of variables, i.e., when all the micro variables are taken together, highlighted the relatively greater importance attributed to technical specialties knowledge and also the insignificance of creative thinking skills.

The above conclusions have been drawn by examining the perceptions of the employers on the key technical knowledge areas and soft skills that are important for graduate employability. Further, there exists a scope to extend the study considering the volatile, uncertain, complex, and ambiguous nature of the information technology sector. The development of disruptive technologies in this dynamic sector is changing the way we work and live. Such developments demand constant shift of skills from the manpower to cope up with the technological and market changes. The factors like the advent of new technologies, changing business scenario, and the fourth industrial revolution necessitate the potential job seekers to be flexible, responsive and adaptive to such fast-paced changes and developments. Hence, the "flexibility" of individuals can have a serious implication on their employability and sets forth a stimulating area of further research.

Appendices

Annexure I: Results of Correlation Analysis

Correlations											
		AVGPISCS	AVGPISPC	AVGPISCT	AVGPISTI	AVGTSTM	AVGTSTK	AVGOK	AVGE	AVGPIS	AVGTS
AVGPISCS	Pearson Correlation	1	0.683**	0.728**	0.773**	0.727**	0.722**	0.721**	0.735**	0.891**	0.761**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGPISPC	Pearson Correlation	0.683**	1	0.808**	0.814**	0.800**	0.770**	0.775**	0.775**	0.884**	0.824**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGPISCT	Pearson Correlation	0.728**	0.808**	1	0.829**	0.852**	0.813**	0.737**	0.766**	0.917**	0.874**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGPISTI	Pearson Correlation	0.773**	0.814**	0.829**	1	0.819**	0.795**	0.772**	0.795**	0.945**	0.846**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGTSTM	Pearson Correlation	0.727**	0.800**	0.852**	0.819**	1	0.817**	0.760**	0.795**	0.874**	0.955**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGTSTK	Pearson Correlation	0.722**	0.770**	0.813**	0.795**	0.817**	1	0.796**	0.805**	0.848**	0.951**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGOK	Pearson Correlation	0.721**	0.775**	0.737**	0.772**	0.760**	0.796**	1	0.785**	0.822**	0.816**

(continued)

(continued)

Correlations

		AVGPISCS	AVGPISPC	AVGPISCT	AVGPISTI	AVGTSTM	AVGTSTK	AVGOK	AVGE	AVGPIS	AVGTS
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGE	Pearson Correlation	0.735**	0.775**	0.766**	0.795**	0.795**	0.805**	0.785**	1	0.841**	0.839**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGPIS	Pearson Correlation	0.891**	0.884**	0.917**	0.945**	0.874**	0.848**	0.822**	0.841**	1	0.903**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	N	236	236	236	236	236	236	236	236	236	236
AVGTS	Pearson Correlation	0.761**	0.824**	0.874**	0.846**	0.955**	0.951**	0.816**	0.839**	0.903**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	236	236	236	236	236	236	236	236	236	236

**Correlation is significant at the 0.01 level (2-tailed)

Annexure II: Results of Regression Analysis

Regression Analysis of Macro Variables

Model summary				
Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.841[a]	0.708	0.706	0.49960
2	0.861[b]	0.742	0.740	0.47028
3	0.869[c]	0.755	0.752	0.45929

[a]Predictors: (Constant), AVGPIS
[b]Predictors: (Constant), AVGPIS, AVGTS
[c]Predictors: (Constant), AVGPIS, AVGTS, AVGOK

ANOVA[d]						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	141.333	1	141.333	566.225	0.000[a]
	Residual	58.408	234	0.250		
	Total	199.740	235			
2	Regression	148.210	2	74.105	335.075	0.000[b]
	Residual	51.530	233	0.221		
	Total	199.740	235			
3	Regression	150.800	3	50.267	238.286	0.000[c]
	Residual	48.941	232	0.211		
	Total	199.740	235			

[a]Predictors: (Constant), AVGPIS
[b]Predictors: (Constant), AVGPIS, AVGTS
[c]Predictors: (Constant), AVGPIS, AVGTS, AVGOK
[d]Dependent variable: AVGE

Coefficients[a]				
Unstandardized coefficients		Standardized coefficients	t	Sig.
B	Std. error	Beta		
−0.033	0.147		−0.223	0.823
0.870	0.037	0.841	23.795	0.000
0.037	0.139		0.269	0.788
0.466	0.080	0.450	5.805	0.000
0.400	0.072	0.433	5.576	0.000
0.043	0.136		0.318	0.751
0.366	0.083	0.354	4.391	0.000
0.322	0.073	0.349	4.387	0.000
0.197	0.056	0.210	3.504	0.001

Regression Analysis of Micro Variables of Personal and Interpersonal Skills

Model summary				
Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.795[a]	0.632	0.631	0.56041
2	0.825[b]	0.681	0.678	0.52311
3	0.840[c]	0.706	0.702	0.50302
4	0.844[d]	0.712	0.707	0.49877

[a]Predictors: (Constant), AVGPISTI
[b]Predictors: (Constant), AVGPISTI, AVGPISPC
[c]Predictors: (Constant), AVGPISTI, AVGPISPC, AVGPISCS
[d]Predictors: (Constant), AVGPISTI, AVGPISPC, AVGPISCS, AVGPISCT

ANOVA[e]						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	126.250	1	126.250	401.997	0.000[a]
	Residual	73.490	234	0.314		
	Total	199.740	235			
2	Regression	135.982	2	67.991	248.470	0.000[b]
	Residual	63.758	233	0.274		
	Total	199.740	235			
3	Regression	141.037	3	47.012	185.799	0.000[c]
	Residual	58.703	232	0.253		
	Total	199.740	235			
4	Regression	142.274	4	35.569	142.977	0.000[d]
	Residual	57.466	231	0.249		
	Total	199.740	235			

[a]Predictors: (Constant), AVGPISTI
[b]Predictors: (Constant), AVGPISTI, AVGPISPC
[c]Predictors: (Constant), AVGPISTI, AVGPISPC, AVGPISCS
[d]Predictors: (Constant), AVGPISTI, AVGPISPC, AVGPISCS, AVGPISCT
[e]Dependent variable: AVGE

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.624	0.142		4.389	0.000
	AVGPISTI	0.691	0.034	0.795	20.050	0.000
2	(Constant)	0.358	0.140		2.558	0.011
	AVGPISTI	0.423	0.055	0.486	7.637	0.000
	AVGPISPC	0.345	0.058	0.380	5.964	0.000
3	(Constant)	−0.019	0.159		−0.119	0.906
	AVGPISTI	0.281	0.062	0.323	4.533	0.000
	AVGPISPC	0.308	0.056	0.339	5.479	0.000
	AVGPISCS	0.275	0.062	0.254	4.470	0.000
4	(Constant)	−0.023	0.158		−0.145	0.885
	AVGPISTI	0.226	0.066	0.259	3.404	0.001
	AVGPISPC	0.256	0.061	0.281	4.222	0.000
	AVGPISCS	0.247	0.062	0.228	3.961	0.000
	AVGPISCT	0.140	0.063	0.158	2.230	0.027

[a]Dependent variable: AVGE

Regression Analysis of Micro Variables of Technical Skills

Model summary				
Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.805[a]	0.648	0.647	0.54810
2	0.840[b]	0.705	0.703	0.50278

[a]Predictors: (Constant), AVGTSTK
[b]Predictors: (Constant), AVGTSTK, AVGTSTM

ANOVA[c]						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	129.444	1	129.444	430.889	0.000[a]
	Residual	70.296	234	0.300		
	Total	199.740	235			
2	Regression	140.841	2	70.420	278.577	0.000[b]
	Residual	58.899	233	0.253		
	Total	199.740	235			

[a]Predictors: (Constant), AVGTSTK
[b]Predictors: (Constant), AVGTSTK, AVGTSTM
[c]Dependent variable: AVGE

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.757	0.131		5.765	0.000
	AVGTSTK	0.721	0.035	0.805	20.758	0.000
2	(Constant)	0.444	0.129		3.443	0.001
	AVGTSTK	0.418	0.055	0.467	7.573	0.000
	AVGTSTM	0.358	0.053	0.414	6.715	0.000

[a]Dependent variable: AVGE

Regression Analysis of Controlled Impact of all Micro Variables

Model summary				
Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.871[a]	0.758	0.751	0.46017

[a]Predictors: (Constant), AVGOK, AVGPISCS, AVGPISCT, AVGPISPC, AVGTSTK, AVGTSTM, AVGPISTI

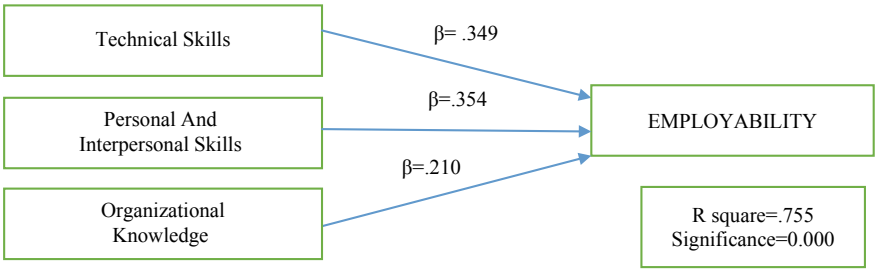
ANOVA[b]						
Model		Sum of squares	df	Mean square	F	Sig.
s1	Regression	151.460	7	21.637	102.181	0.000[a]
	Residual	48.280	228	0.212		
	Total	199.740	235			

[a]Predictors: (Constant), AVGOK, AVGPISCS, AVGPISCT, AVGPISPC, AVGTSTK, AVGTSTM, AVGPISTI
[b]Dependent variable: AVGE

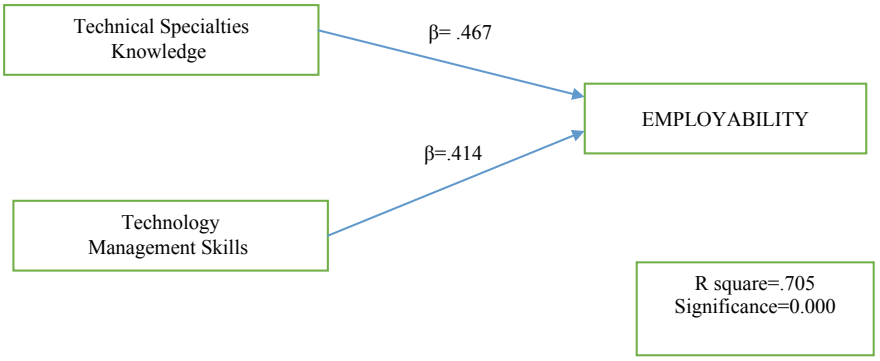
Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.018	0.146		0.126	.900
	AVGPISCS	0.138	0.060	0.127	2.297	0.023
	AVGPISPC	0.123	0.060	0.136	2.058	0.041
	AVGPISCT	−0.013	0.066	−0.015	−0.200	0.841
	AVGPISTI	0.121	0.063	0.139	1.909	0.057
	AVGTSTM	0.146	0.063	0.169	2.320	0.021
	AVGTSTK	0.203	0.061	0.227	3.337	0.001
	AVGOK	0.171	0.058	0.183	2.945	0.004

[a]Dependent variable: AVGE

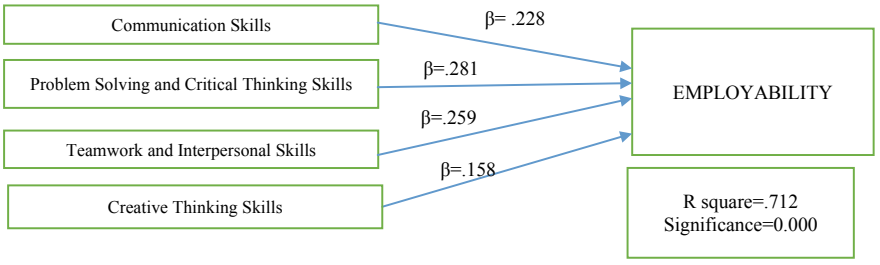
Validated Macro-model of Research from Employers' Perspective



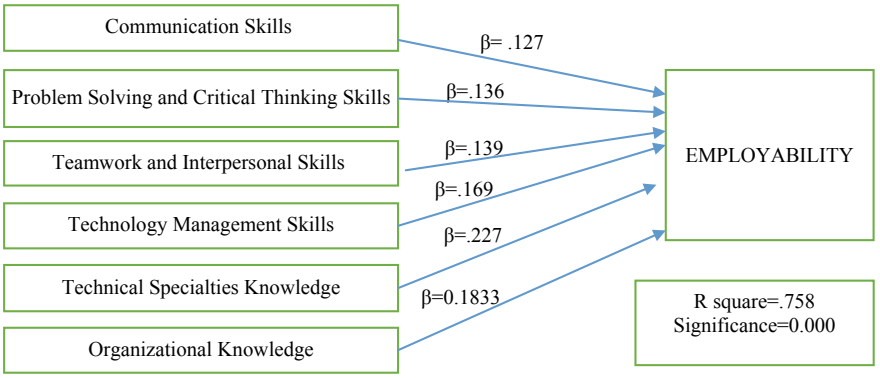
Validated Model of Micro Variables of Technical Skills from Employers' Perspective



Validated Model of Micro Variables of Personal and Interpersonal from Employers' Perspective



Validated Micro-model of Controlled Impact of all Independent Variables from Employers' Perspective



Annexure III: Results of Collinearity

Collinearity Results—Macro Variables

Variables entered/removed[b]			
Model	Variables entered	Variables removed	Method
1	AVGTS, AVGOK, AVGPIS[a]		Enter

[a]All requested variables entered
[b]Dependent variable: AVGE

Coefficients[a]			
Model		Collinearity statistics	
		Tolerance	VIF
1	AVGOK	0.295	3.390
	AVGPIS	0.163	6.153
	AVGTS	0.167	5.980

[a]Dependent variable: AVGE

Collinearity diagnostics[a]							
Model	Dimension	Eigenvalue	Condition index	Variance proportions			
				(Constant)	AVGOK	AVGPIS	AVGTS
1	1	3.937	1.000	0.00	0.00	0.00	0.00
	2	0.044	9.462	0.80	0.09	0.00	0.02
	3	0.014	16.730	0.06	0.90	0.07	0.23
	4	0.005	27.368	0.14	0.01	0.93	0.75

[a]Dependent variable: AVGE

Collinearity Results—Micro Variables

Variables entered/removed[b]			
Model	Variables entered	Variables removed	Method
1	AVGTSTK, AVGPISCS, AVGPISPC, AVGTSTM, AVGPISTI, AVGPISCT[a]		Enter

[a]All requested variables entered
[b]Dependent variable: AVGE

Coefficients[a]			
Model		Collinearity statistics	
		Tolerance	VIF
1	AVGPISCS	0.360	2.780
	AVGPISPC	0.261	3.836
	AVGPISCT	0.196	5.113
	AVGPISTI	0.202	4.939
	AVGTSTM	0.202	4.946
	AVGTSTK	0.253	3.946

[a]Dependent variable: AVGE

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Part II
Transformational Strategies and Organizational Competitiveness

Chapter 6
Big Data: Enabling Transformation Through Empowerment

Charu Verma and P. K. Suri

Abstract Macro variables influencing the performance of e-governance projects using big data were identified through a review of literature. Experts from the domain were interviewed for further inputs. A research questionnaire was developed, and the survey was conducted to measure the performance of e-governance projects and S-A-P variables in the context of the selected project of CGHS under Ministry of Health and Family Welfare (MOHFW). Survey data were analyzed to assess the influence of S-A-P variables on the performance of e-governance projects using big data. The analysis revealed that the e-governance projects using big data with a high value of conceptualized S-A-P variables are characterized by high performance. This implies that conceptualized S-A-P variables for big data do influence the performance of e-governance projects. Also, the citizen empowerment is enhanced through citizen participation. The chapter proposed a framework that was conceptualized on the basis of a pilot study for a G2C e-governance projects like CGHS. It may be a good idea to study more such e-governance projects making use of big data to validate and generalize the proposed framework. Also, though GCHS does have a huge set of data, it is still not being analyzed to the fullest to support citizen-centric services. The analysis results may be relevant to the policy-makers or practitioners for e-governance projects to improve the performance of the implementation of these projects. This may be further compared with similar projects in health care like DGEHS run by Delhi government. This is of much relevance to the academicians.

Keywords Big data · E-governance · E-government · Government transformation · Innovative government · Performance of E-governance projects · SAP-LAP

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6.1 Introduction

There have been changing paradigms for science, technology, and management impacting the way we live and the way we are getting governed. India is the world's most populous democracy and has much to gain from this wave. India has very aggressive plans for the digital knowledge society. India jumps 23 notches, now at rank 77 in ease of doing business. The jump shows how digital technologies and innovations are impacting the organizations and fueling the Indian economy. But we still need to work hard to improve our telecommunication as well as the human capital index. This makes it imperative to empower our citizen that comprises a large number of youth, which is our future human capital. Citizen participation is one of the key enablers for the fully evolved stage of e-government. This is not an easy task to accomplish as India apart from being populous also observes an extensive set of diversity be it in terms of religion, region, language, age, and many more parameters (linguistic, genetic, cultural diversity, etc.).

There is a plethora of data generated at an exorbitant speed with disparate sources from a multitude of stakeholders. This is called big data because of associated Vs (different forms of data called variety, the scale of data called volume, the speed of data called velocity, the uncertainty of data called veracity, and finally the worth called value). Big data makes it imperative to design a new architecture, algorithms, and analytic techniques to extract hidden value and knowledge from that humongous amount of data with large-scale diversity and complexity.

Big data necessitates large-scale enormous repositories to be designed that can be used by complex procedures to get useful and hidden knowledge. Scientific computing is one of the applications of big data as scientists and researchers generate an exorbitant amount of data like in bioinformatics simulations, high-energy physics experiments like God particle experiment, etc. DBMS or related tools are insufficient to make sense of big data. A new set of tools and techniques are required to transform this large-scale heterogeneous data stored in disparate sources into structured and easy to interpret format for data analytics. This data-driven approach in areas of bioinformatics, biomedicines, citizen-centric policies, and social sciences is replacing the traditional approach of hypotheses-driven research in science.

Data play a pivotal role for citizen empowerment through the transformation of the governments. Knowledge out of big data in e-governance projects across the world makes the governments more Innovative! The changing role of governments causes citizen engagement through technological enablement and utilization of big data enabled governance. This has given rise to new sets of data like crowdsourcing and Internet of Things (IoT) to engage public talent. But there are challenges as well as issues such as data quality, ownership, privacy, etc. apart from a dearth of talent for data analytics.

There are studies for measuring the e-governance projects in terms of outcomes like reduced costs, the speed of delivery, performance effectiveness of implementation, etc. or others parameters measuring the performance directly in terms of transparency, accountability, and citizen participation. But there is a dearth of empirical

studies to measure the influence of using big data on the performance of e-governance projects. But before we try to see the influence of using big data, it is important to explore the variables affecting the performance of e-governance projects using big data. This chapter explores these variable based on Situation–Actor–Process (S-A-P) framework. Further, the SAP-LAP framework is used for developing the conceptual model of inquiry that will exhibit the systemic flexibility for e-governance performance measurement. The chapter objectives are as follows:

- To develop a conceptual framework for assessing the performance of G2C e-governance implementations/projects using big data.
- To assess the effect of the conceptualized variables on the performance of e-governance implementations/projects.

The chapter has an introduction on the subject area followed by the discussion on the basis of a literature review about e-governance, big data, and how to assess the performance of e-governance projects. This is followed by the methodology and the conceptual framework to assess the performance of e-governance implementations/projects, a description of the selected project into consideration and then how the questionnaire was developed and data was collected. The last section presents the analysis. Finally, the research findings and conclusions are presented.

6.2 Literature Review

6.2.1 E-Governance

Government is a heterogeneous mixture with dynamic goals, structure as well as processes (Pardo 2000). E-Governance, an idea by former US Vice President Al Gore, to link the citizen to the government to access automated government services through ICT that reduces cost, improves performance, speed, and implementation effectiveness (Almarabeh and AbuAli 2010). E-governance transforms governance into a transparent, responsive, citizen friendly, and efficient regime.

As per the World Bank (2009), e-government may be referred to the use of IT by the government to transform their relations with different stakeholders like citizens, industry, and different government departments. Globally, different countries are using different terms for e-government according to their changing situations (Verdegem and Verleye 2009). Researchers have explained the difference in e-governance and term e-government in various ways. As per Sheridan and Riley (2006), e-governance has a larger scope and deals with interlinking within various government departments through ICTs, whereas e-government has a limited scope of only online services. That means e-government works on institutional approach, whereas e-governance works on procedural approach. However, e-governance is used frequently throughout this chapter considering the Indian context in view (Planning Commission 2007).

6.2.2 Performance Measures of E-Governance

E-governance may be categorized as an effective way of delivering information and services to citizens thereby providing opportunities to governments to bring services closer to citizens and be cost-efficient, effective, accountable, and transparent. There are different sets of models to gage the maturity level of e-governance.

E-governance can enhance the relationship among public, businesses, and government and may enable effective policy outcomes, high-quality services, and larger participation of the citizens in our country. It has been seen that the government departments work in silos and are not integrated to provide a single line of service to the citizens. If the departments are virtually integrated through the service providers, then that can be an effective model for delivering citizen-centric e-governance solutions (Al-Khouri et al. 2011; Kietzmann et al. 2011). E-government implementation is a continuous process, and hence the development has to be conceptualized in various stages. E-governance is using ICTs for government processes to create SMART governance. This means processes that are simple, a government with morals, a government that is accountable, also responsive and is transparent (ARC 2008).

E-government projects are implemented to raise the performance levels of governments by upgrading the level of services imparted to citizens and enhancing the effectiveness of government work internally. Different sets of indicators for measuring/assessing the performance of e-governance projects are used by different researchers (Suri 2009). Indicators for measuring benefits of e-government are information dissemination to various stakeholders, continuous communication, various kinds of efficient services delivered, integration, leaders participation, high-level security, usability, etc. (Holzer and Kim 2007). E-government is also modeled as a value chain showing the way inputs are converted into outputs (Heeks 2002). To realize e-governance maturity models either for vertical and horizontal integration or transformation, the use of big data is required.

6.2.3 Big Data

Big data is characterized by 3 Vs consisting of "Volume" signifying large amounts of data taking huge storage, "Velocity" as the data generation rate, and "Variety" meaning data generated from a set of disparate sources with different formats and also contain multidimensional data fields (Russom 2011). Another V for "Value" was thought of to emphasize the importance of getting economic benefit out of huge data set of data (IDC 2012; Oracle 2012) and "Veracity" to emphasize the data quality and credibility of these sources of data (Forrester 2012; White 2012). The values created by big data are multifold (Wamba et al. 2015) like creating transparency, enable need discovery, enable performance improvement, better customization on population segments, data-driven decisions, new business models, new products, new services, etc. Big data has a multitude of benefits highlighted by various authors. It has been

defined as "next big thing in innovation" (Gobble 2013), "fourth paradigm of science" (Strawn 2012), "next management revolution" (McAfee and Brynjolfsson 2012), and facilitator for a revolution in S & T (Ann Keller et al. 2012). This is possible because it has the power to change the competition by process transformation (Brown et al. 2011) and unearth business value (Davenport et al. 2012). On the other hand, there are issues as well related to use of big data (Wamba et al. 2015) like data security and ownership policies, related technology, techniques, organizational transformations, market dynamics, etc.

6.2.4 Use of Big Data in E-Governance

Considering the diversity of India, it has become a necessity to implement e-governance to realize the dream of Digital India. But the effective e-governance implementation requires a lot more than just utilizing the latest means of ICT. There is a conspicuous and remarkable difference in the e-government implementations in developed and developing countries. Developing countries are still not mature for the e-government implementations, and there is very little research to appraise their impact on target groups. But the assessment of impact is necessary to justify the expenditure on such initiatives using public fund. Therefore, a need was felt to design and develop the e-government assessment framework for developing countries. In a country like India, with so much diversity, it is difficult to attain the global standards of good governance like outlined by UN. Need for the use of data to track the minute level of every citizen transaction is there to analyze it and improve on continuous basis from the feedback (ARC 2008).

One of the outcomes of effective e-governance is to empower the citizens by meeting all the Critical success Factors (CSFs) and improvise the services by analyzing their transactional data. But there is a huge set of citizen transactional data that is getting generated on a daily basis through a magnitude of services provided by government departments in India. It is therefore imperative to make use of big data for effective e-governance. Big data analytics can change the paradigms of governance. Despite these deep impacts on strategy and operations, there is a lack of empirical research to assess the benefits of using big data for enhancing the performance of e-governance (Wamba et al. 2015). There is a paucity of empirical study for success factors in India for using big data in e-governance. The models described in the literature are generally without a base of the data in e-governance. This chapter attempts to develop a conceptual framework for assessing the performance of the e-governance projects by using big data. The conceptualized model will integrate the benefits of big data after taking due care of the challenges posed by big data.

There are inherent differences in e-government using traditional systems and e-government systems using big data as listed in Table 6.1 (Rajagopalan and Solaimurugan 2013).

Table 6.1 Comparison between e-government using traditional systems and big data

Factors	Based on traditional systems	Based on big data
System architecture	Central system with distributed information	Distributed system with direct access to data as well as information
Data design	Schema based	Without schemas
Data type	Structured data	Raw data with mix of unstructured, semi and structured
Data analytics	Statistical/traditional analytics with known condition and relationship	• Discovery of hidden business value • Unstructured data (images, videos, PDA compliant, etc.)
Software	No special requirements	Specialized algorithms and software required
Data size	Terabytes	Unstructured and messy large datasets
Applications	Batch mode and sequential	Real time with heavy data analytics
Types of operation	Relational and conditional	Analytics: sentimental, predictive, behavioral, machine learning
Reporting	Static and ad hoc query report	Dynamic and data-driven reports

Source Adapted from Rajagopalan and Solaimurugan (2013)

6.2.5 Challenges in E-Governance Using Big Data

There are many challenges involved like scaling data, auditing, replication, disaster recovery, performance, etc. Hence, there are following requirements for using big data in e-governance:

- Reliable, consistent, fast, and efficient big data,
- Efficient policies,
- Data quality, and
- Handling unstructured data including applications running in silos.

6.2.6 Performance Measures of E-Governance Using Big Data

Once the use of big data for e-governance becomes popular, the next set of challenges will be to measure the impact of adoption by devising the Key Performance Indicators (KPIs). E-government added transparency, accountability, citizen participation for government performance (Mohammad et al. 2009), and enhanced citizen participation in the process of decision-making which may be the starting KPIs. Using big

data in e-governance can be a challenging task and may have different set of requirements. Zoughbi (2017) defines various infrastructure requirements for e-governance using big data as follows:

- Support for large data volume for the long duration.
- Generation of high-speed data.
- Appropriate mechanisms to distribute and replicate disparate set of data.
- Support of e-governance agencies/communities.
- High-level data security including storage and retrieval.
- Data with integrity, high confidentiality, and accountability.

Every e-government project needs effective, efficient processes, and high-end technology with a strong data foundation for success (Dhoot 2014). But all this requires data sharing, learning from data, grouping, mining, etc. The big data framework for e-governance requires the following:

- Management of disparate resources,
- Data management,
- Data analytics for hidden value and knowledge, and
- Dynamic reporting.

E-governance performance may be measured in terms of transparency, accountability, and citizen participation that include interactivity, decision-making or support, and empowerment (Suri 2016a; Suri and Sushil 2017). The chapter will show how this is enhanced by the use of big data. There are similar sets of indicators for measuring the success of big data projects. The conceptualized variables to measure the e-governance performance using big data are shown in Table 6.2.

6.3 Methodology

A literature review was conducted for understanding the indicators for measuring the e-governance performance with or without the use of big data. Hardly any study on assessing the use of big data in e-governance projects could be traced in literature. Macro variables influencing the performance of e-governance projects using big data were identified through a review of literature. Experts from the domain were interviewed for further inputs. Macro variables expected to influence the performance of e-governance projects were compiled and categorized on the basis of situation, actors, and processes. The objective is to design a framework to assess the performance of e-governance projects by considering the conceptualized variables that may influence the performance of such projects. These variables are based on the Situation Actor Process (SAP)—Learning–Action–Performance (LAP) framework (Sushil 2000). SAP-LAP framework (Sushil 2000) has been used as managerial inquiries can be systematically modeled using this framework. A survey was conducted to measure the performance of e-governance projects. The questionnaire for the survey was designed on the basis of S-A-P variables and was used in the context of

Table 6.2 Conceptualized variables to measure e-governance performance

Macro variables	Micro variables	Literature review
Transparent systems (TS)	Sharing: Policies, processes, expenses, agreements, tenders, data, and related information	Harrison et al. (2011), DeitY (2008)
	Current information (quality)	Suri and Sushil (2011), DeitY (2008)
	No ambiguity	Suri and Sushil (2011), DeitY (2008)
	Easily accessible data from anywhere	DeitY (2008)
	Reduced corruption (online and no middlemen)	DeitY (2008)
	Enhanced trust	Kearns (2004), DeitY (2008)
Accountable government (AG)	System availability	DeitY (2008), Pina et al. (2010)
	Accessibility: easy access to services	DeitY (2008), Pina et al. (2010)
	Objectives framed as per the needs	DeitY (2008), Pina et al. (2010)
	Met stated objectives	DeitY (2008), Pina et al. (2010)
	Reduced poverty	DeitY (2008), Pina et al. (2010)
	Increased response	DeitY (2008), Pina et al. (2010)
	Safeguard interests	DeitY (2008), Pina et al. (2010)
	Effective	DeitY (2008), Pina et al. (2010)
	Efficient • Accuracy • Reliability • Minimal data loss • Speed of delivery/faster • Speed of response to queries • Improved service quality/performance • Cost reduction (doctor, medicines, travel, etc.) • Reduced proportion of cost to citizen (subsidy)	Almarabeh and AbuAli (2010), DeitY (2008), Suri and Sushil (2006), Suri and Suhsil (2011), Suri (2014)

(continued)

Table 6.2 (continued)

Macro variables	Micro variables	Literature review
Enhanced citizen participation (ECP)	Enhanced interactivity	Napitupulu and Sensuse (2014), DeitY (2008)
	Data-driven (based) decision-making	Napitupulu and Sensuse (2014), DeitY (2008)
	Citizen empowerment	Napitupulu and Sensuse (2014), DeitY (2008)
	Participation in government processes and major decisions	Suri and Sushil (2012), Napitupulu and Sensuse (2014), DeitY (2008)
	Increased number of transactions executed electronically	Napitupulu and Sensuse (2014), DeitY (2008)
	Provision for submission of proposals on government plans	Napitupulu and Sensuse (2014), DeitY (2008)
	Free and open dialogues with government through various online platforms	Napitupulu and Sensuse (2014), DeitY (2008)

a selected project of CGHS under Ministry of Health and Family Welfare (MOHFW). The questionnaire was circulated to around 56 respondents but was completed by 47 respondents. Survey data have been analyzed to assess the influence of SAP variables on the performance of e-governance projects using big data.

6.3.1 Conceptualized Variables

It is imperative for citizens to visit the service center to avail the services related to e-governance projects in the context of many e-governance projects in India. So government institution (here CGHS Dispensary) providing service can be viewed in the context of management where a citizen visiting would face situations like taking an appointment, queuing for the turn, visits the doctor. The citizen interacts with employees called actors involved at the service center like doctors, pharmacists, and support staff who are providing the services by using a set of processes like medicine indent, distribution, etc. Therefore, citizens develop a perception about the e-governance performance based on the interplay of situation, actors, and processes variables. The CSFs affecting performance of the e-governance projects using big data and SAP-related variables are mapped with literature in Tables 6.3 and 6.4, respectively.

These explored variables were mapped onto as S-A-P variables which are stated in Table 6.4.

Table 6.3 CSFs affecting the performance of the e-governance projects using big data

Macro variable	Micro variables	Studies
Information and data (ID)	Accuracy	Napitupulu and Sensuse (2014)
	Consistency	Napitupulu and Sensuse (2014)
	Completeness	Napitupulu and Sensuse (2014)
	Appropriateness	Napitupulu and Sensuse (2014)
Information technology (IT)	Infrastructure	Almarabeh and AbuAli (2010), Dada (2006)
	Accessibility	Almarabeh and AbuAli (2010)
	Availability	Almarabeh and AbuAli (2010), Napitupulu and Sensuse (2014)
	Privacy and security	Almarabeh and AbuAli (2010), Smith et al. (2006), Napitupulu and Sensuse (2014)
	Usability	Almarabeh and AbuAli (2010), Napitupulu and Sensuse (2014)
	Interoperability	Almarabeh and AbuAli (2010), Smith et al. (2006)
	Training/capacity building	Almarabeh and AbuAli (2010), Dada (2006), Napitupulu and Sensuse (2014), Suri (2016b)
	Information, system, and service quality	Almarabeh and AbuAli (2010), Napitupulu and Sensuse (2014)
Organizational and managerial (OM)	Management/government support	Napitupulu and Sensuse (2014)
	Strong leadership	Napitupulu and Sensuse (2014)
	Clear vision, objectives, targets, and outcomes	Sukyoung et al. (2008)
	Skilled resources	Sukyoung et al. (2008)
	Project planning and management	Napitupulu and Sensuse (2014), Ziemba et al. (2013)
	BPR	Sukyoung et al. (2008)
	Training to resources	Almarabeh and AbuAli (2010)

(continued)

Table 6.3 (continued)

Macro variable	Micro variables	Studies
Social governance (SG)	Political will and support	Almarabeh and AbuAli (2010)
	Budget allocation and disbursement	Napitupulu and Sensuse (2014), Ziemba et al. (2013)
	Accountability	Napitupulu and Sensuse (2014)
	Transparency	Napitupulu and Sensuse (2014)
	Capacity building	Almarabeh and AbuAli (2010)
	Coordination between government agencies	Napitupulu and Sensuse (2014), Ziemba et al. (2013)
	Monitoring and time bound deliverables	Napitupulu and Sensuse (2014), Ziemba et al. (2013)
	Flexible policy/legal frameworks	Napitupulu and Sensuse (2014)
Financial and operational (FO)	Project mode: PPP	Almarabeh and AbuAli (2010), Ziemba et al. (2013)
	Standardization and benchmarking	Ziemba et al. (2013)
	Cost structures and budgeting	Almarabeh and AbuAli (2010), Ziemba et al. (2013)
	Reduction in duplicate tasks	Napitupulu and Sensuse (2014)
	Reduced dependencies on multiple departments	Dada (2006), Ziemba et al. (2013)
	Efficiency	Napitupulu and Sensuse (2014)

The review of literature facilitated to draw a conceptualized framework (Fig. 6.1) showing the set of major variables affecting the performance of e-governance projects using big data (Yeoh and Koronios 2010). The framework takes into account the Critical Success Factors (CSFs) of e-governance projects using big data. These CSFs are depicted as the input variables and are further mapped into the situation–actor–process variables. These S-A-P variables influence the performance of the e-governance projects that is measured in terms of transparency, accountability and citizen participation.

Table 6.4 SAP-related conceptualized variables and their mapping with literature

Macro variables	Micro variables (mapping with CSFs in Table 6.3)	Studies
Improved situation (IS)	Wellness Center (WC): central location and transport connectivity (FO)	Vellakkal et al. (2012)
	WC: Distance from home (FO)	Vellakkal et al. (2012)
	Number of trips made for the service (FO)	DeitY (2008), Gupta and Suri (2017)
	Proper/comfortable sitting arrangement (OM)	Vellakkal et al. (2012)
	Cleanliness of center and washrooms (OM)	Vellakkal et al. (2012)
	Availability of safe drinking water (OM)	Vellakkal et al. (2012), DeitY (2008), Gupta and Suri (2017)
	Grievances redressal (OM)	Vellakkal et al. (2012)
	Overcrowding of space with patients (SG)	Vellakkal et al. (2012)
	Time to take appointment (FO)	Vellakkal et al. (2012)
	Average waiting time to meet service provider (OM)	Vellakkal et al. (2012), DeitY (2008), Gupta and Suri (2017)
	Availability of medicines in stores (SG)	Vellakkal et al. (2012), DeitY (2008)
	Online facility to check medical and medicine history (ID)	Vellakkal et al. (2012), DeitY (2008)
	SMS with the name of the concerned doctor, token number and estimated time for the turn (ID)	Vellakkal et al. (2012), DeitY (2008)
Efficient actors[a] (EA)	Availability of service providers: attendance, punctuality, and continuous presence during service hours (OM) • Doctors • Pharmacists • Support staff	Vellakkal et al. (2012), Gupta and Suri (2017)
	Competence of service providers (OM)	Vellakkal et al. (2012), Gupta and Suri (2017)
	Knowledge level of service providers (OM)	Vellakkal et al. (2012), Gupta and Suri (2017)
	Faster response because of online systems (OM)	Suri (2014)
	Behavior: doctors attentive and sympathetic (OM)	Vellakkal et al. (2012)

(continued)

Table 6.4 (continued)

Macro variables	Micro variables (mapping with CSFs in Table 6.3)	Studies
	Communication skills (OM)	Vellakkal et al. (2012), Gupta and Suri (2017)
Effective process (EP)	Flexibility in the process of taking appointment (FO)	Lovelock (1983)
	Provision for laboratory services (SG)	Vellakkal et al. (2012)
	Provision for uninterrupted services in case of technical fault (IT)	Lovelock (1983), DeitY (2008), Suri (2014)
	Provision to change rooms if service provider unavailable (IT + ID)	Vellakkal et al. (2012)
	Flexibility of indent process (OM)	Vellakkal et al. (2012)
	Availability of prescribed medicines (SG)	Vellakkal et al. (2012)
	Adequate working hours to eliminate overcrowding and faster turns (SG)	Vellakkal et al. (2012)
	Adequate number of doctors and other support staff (SG)	Vellakkal et al. (2012)

[a]Doctors, pharmacists, and support staff

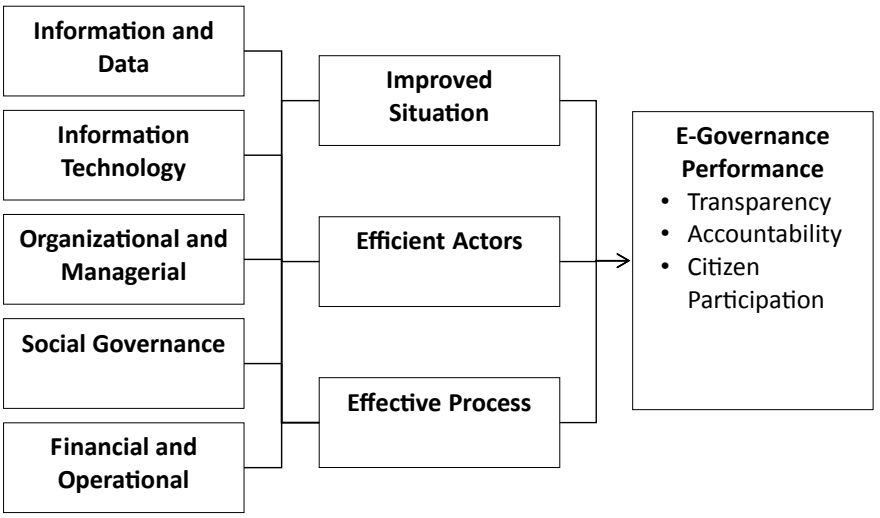

Fig. 6.1 Conceptual framework showing the set of variables affecting the performance of e-governance projects

Table 6.5 Summary of selected e-governance project

Attribute	E-governance project: CGHS description
Objective	To give health facilities for employees, pensioners of the central government, and their dependents in CGHS covered cities
Scope	Processes in CGHS dispensaries only
Coverage	All CGHS dispensaries across India, CGHS approved hospitals, and laboratories/diagnostic centers
Department	Ministry of Health and Family Welfare
Expected benefits	Automated medical and family welfare services
Services	As stated above
Status	CGHS portal is online since November 2005

6.4 Project Description

6.4.1 Central Government Health Scheme (CGHS)

CGHS was set up to provide a holistic set of healthcare facilities to employees, pensioners of central government along with their dependents in India in 1954. It is currently operational in more than 25 cities across India. The medical facilities under allopathic and other medicines systems like yoga, Ayurveda, Siddha, Unani, and homeopathy are provided through wellness centers or dispensaries/polyclinics. CGHS e-governance project portal was open for public in November 2005 as part of Mission Mode Project (MMP) under NeGP.

The main components of CGHS are as follows:

- Wellness center or dispensary medical services.
- Family, mother, and child health and welfare services.
- Specialist consultation including laboratory examinations and test like X-Ray, ECG, etc.
- Hospitalization.
- Provision for medicines purchase, inventory, distribution, supply, and other requirements.
- Health education imparted to beneficiaries.

A summary is presented in Table 6.5.

CGHS is using the data analytics in an organized manner to utilize the huge datasets available with them for decision support. The screenshot (Fig. 6.2) shows the extent of information given to different levels of stakeholders. The dashboard may be useful for monitoring to project teams and policy-makers. Even beneficiaries can be benefitted from the same.

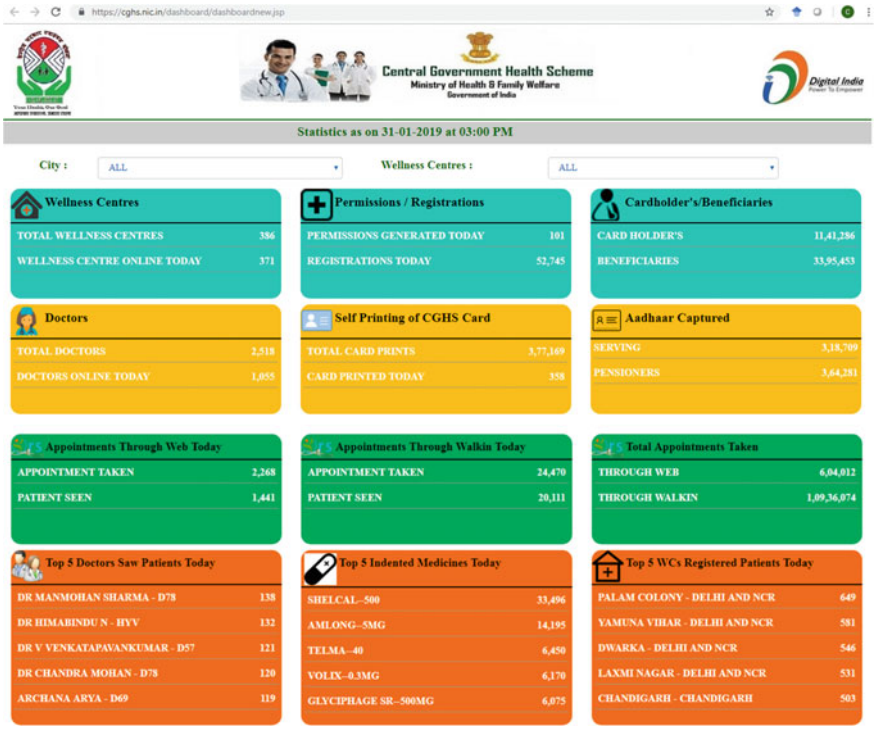

Fig. 6.2 CGHS dashboard (as on January 31, 2019)

Fig. 6.3 CGHS analytic reports/charts (as on January 31, 2019)

The portal gives the facility to create analytical charts based on the selections for city, dispensary, and that too on multiple parameters like total registrations, appointment taken through the web, appointments taken through walk-ins, patients seen, etc. as shown in Fig. 6.3.

Fig. 6.4 CGHS online map-based dispensary locator

CGHS also offers an online map-based dispensary locator for the beneficiary as shown in Fig. 6.4.

An MIS is for the use of stakeholders. The portal provides a separate login-based application for beneficiaries. This application can be used to view beneficiary's information, track plastic card status, claim status, view beneficiary medical history and update mobile number, Aadhaar number, email, change the password, etc.

6.5 Questionnaire Development and Data Collection

The questionnaire designed was based on the expert interviews and understanding developed through a review of the literature. The draft questionnaire was finalized after incorporating the inputs and feedback from four experts. The finalized questionnaire (Appendix 1) was given to respondents. The questionnaire was floated among 56 respondents but was completed by 47 respondents.

6.6 Reliability and Validity Analysis

Cronbach's alpha is used for measuring the internal consistency of questionnaire items in a construct. The Cronbach's alpha values of constructs, i.e., performance of e-governance projects and S-A-P variables were found to be more than 0.85, respectively. Acceptable values for the empirical research of this kind are above 0.6 (George and Mallery 2011).

Table 6.6 Observed mean values of macro variables for CGHS e-governance project (N = 47)

Macro variable	Range	Minimum	Maximum	Mean	Std. error
TS	0.53	2.77	3.30	3.025	0.084
AG	1.83	1.36	3.19	2.664	0.109
ECP	0.47	2.79	3.26	3.023	0.064
IS	1.47	1.85	3.32	2.439	0.112
EA	0.64	2.55	3.19	2.929	0.079
EP	0.66	2.13	2.79	2.439	0.090

6.7 Analysis and Discussion

The descriptive statistics consisting of the values of the range, mean, and standard error for the variables studied are shown in Table 6.6. Relatively higher values of the observed mean for Transparent Systems (TS) and Enhanced Citizen Participation (ECP) may indicate their higher significance. This may be because of the use of big data in the e-governance project that may have influenced the performance of the e-governance project. It is seen that the standard error values associated with the macro variables were negligible.

6.8 Research Findings

6.8.1 Research Findings

This chapter proposes a framework for analyzing the performance of citizen-centric e-governance projects where big data is being used. The research proposed the S-A-P variables that may influence the e-governance performance measured using conceptualized variables Transparent Systems (TS), Accountable Government (AG), and Enhanced Citizen Participation (ECP). One citizen-centric e-governance project on CGHS (a Mission Mode Project in India's National eGovernance Plan) was selected for the study. A survey of respondents was conducted for measuring the performance of CGHS project and associated S-A-P variables. Univariate analysis was performed on the survey data. As per the results of the pilot study, CGHS has a high value of performance as well as S-A-P variables. This is indicative of a positive relationship between the performance of e-governance project and the corresponding S-A-P variables. The result suggests that it may be possible that the use of big data in e-governance is helping in improving situation-, actor-, and process-related factors which expectedly influence the performance of the e-governance projects. The following alternate research hypotheses formulated on the basis of this study are proposed to be tested by studying a few more e-governance projects. This shall help in the validation of the proposed framework.

HA1: Use of big data for e-governance projects improves the situation that influences the performance of e-governance projects.
HA2: Use of big data for e-governance projects improves the efficiency of actors that influence the performance of e-governance projects.
HA3: Use of big data for e-governance projects improves the effectiveness of processes that influence the performance of e-governance projects.

6.8.2 Research Implication

The findings and conceptualized framework may be useful for practitioners of citizen-centric e-governance implementations like Delhi Government Employee Health Services (DGEHS), Passport Seva Project (PSP), and Aadhaar project of Unique Identification Authority of India (UIDAI). The framework can be further strengthened by studying more such projects.

6.8.3 Limitations

Since the proposed framework in the chapter is based on a specific pilot study with limited scope, it is required to study more such projects to empirically validate and generalize this framework.

6.9 Conclusion

Benefits of e-governance projects are realized by countries across the world. However, the intended benefits are not reaching the citizens to the desired extent. The literature reflects a high failure rate of e-governance projects particularly in the context of developing countries. Big data analytics can play a significant role in providing the required insights for the use of decision-makers in government for improving the performance of e-government projects. But there are very few e-governance projects across the world, which make use of big data. Whether the e-governance uses big data or not the challenge is that the anticipated benefits by the policy-maker and implementers do not reach the end user or beneficiary. It important for the government organizations to assess the performance of ongoing or existing e-governance initiatives, enhance it using big data, and identify the variables that influence the performance after implementation using big data. In this chapter, it has been attempted through literature review and a pilot study to address the research gap of identification of S-A-P variables that may be expected to influence the performance of e-governance projects using big data. A conceptual framework has been developed for further validation. The hypotheses formulated on the basis of learning issues from

the study need to be empirically tested by conducting a detailed study. It is learned from the pilot study that performance of e-governance projects can be enhanced by using big data that will further enhance the citizen empowerment through citizen participation. Further investigation is required to see the influence of using big data on citizen participation. This study may be used in other areas that require the service orientation and use of big data to improve the e-governance projects' performance like national healthcare portal for tracking family welfare records, mother–child tracking, etc.

Appendix 1: Questionnaire

Please tick () on the scale below to express your opinion about CGHS: 0 = Nil, 1 = Small extent, 2 = Medium extent, 3 = Large extent, 4 = Very large extent						
		0	**1**	**2**	**3**	**4**
	In your opinion, the extent to which there is:					
TS1	Sharing: policies, processes, expenses, agreements, tenders, data, and relevant information					
TS2	Current information					
TS3	No ambiguity					
TS4	Easily accessible data from anywhere					
TS5	Reduced corruption (online and no middlemen)					
TS6	Enhanced trust					
	In your opinion, the extent to which there is:					
AG1	System availability					
AG2	Accessibility: easy access to services					
AG3	Objectives framed as per the needs (affordable basic health care for all)					
AG4	Met stated objectives					
AG5	Reduced poverty					
AG6	Increased response					
AG7	Safeguard interests					
AG8	Effective					

(continued)

(continued)

	Efficient					
AG9	Accuracy					
AG10	Reliability					
AG11	Minimal data loss					
AG12	Speed of delivery/faster					
AG13	Speed of response to queries					
AG14	Improved service quality/performance					
AG15	Cost reduction (doctor, medicines, travel, etc.)					
AG16	Reduced proportion of cost to citizen (subsidy)					
	In your opinion, the extent to which there is:					
ECP1	Enhanced interactivity					
ECP2	System helps to use data for medical decisions					
ECP3	Citizen empowerment					
ECP4	Participation in government CGHS processes and health decisions online					
ECP5	Increased number of transactions executed electronically					
ECP6	Provision for feedback on government plans online					
ECP7	Free and open dialogues with government through various online platforms					
	In your opinion, the extent to which there is:					
IS1	Wellness Center (WC): central location and transport connectivity					
IS2	WC: Distance from home					
IS3	Number of trips made for the service					
IS4	Proper/comfortable sitting arrangement					
IS5	Cleanliness of center and washrooms					
IS6	Availability of safe drinking water					
IS7	Grievances redressal					
IS8	Overcrowding of space with patients					
IS9	Time to take appointment					
IS10	Average waiting time to meet service provider					
IS11	Availability of medicines in stores					
IS12	Online facility to check medical and medicine history					
IS13	SMS with name of concerned doctor, token number, and estimated time for turn					

(continued)

(continued)

	In your opinion, the extent to which doctors, pharmacists and support staff are efficient and capable in terms of:					
EA1	Availability of service providers: attendance, punctuality, and continuous presence during service hours					
EA2	• Doctors					
EA3	• Pharmacists					
EA4	• Support staff					
EA5	Competence of service providers					
EA6	Knowledge level of service providers					
EA7	Faster response because of online systems					
EA8	Behavior: doctors attentive and sympathetic					
EA9	Communication skills					
	In your opinion, the extent to which there is:					
EP1	Flexibility in process of taking appointment					
EP2	Provision for laboratory services					
EP3	Provision for uninterrupted services in case of technical fault					
EP4	Provision to change rooms if service provider unavailable					
EP5	Flexibility of indent process					
EP6	Availability of prescribed medicines					
EP7	Adequate working hours to eliminate overcrowding and faster turns					
EP8	Adequate number of doctors and other support staff					

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Chapter 7
E-Assessment—A Digital Solution for Promoting e-Governance

Saurabh Gupta, Ashesh Agarwal and Amita Srivastava

Abstract Department of Commercial Taxes, Government of Uttar Pradesh, follows one extract from VidurNiti that quotes "The King should collect his taxes without hurting his subjects even as a bee collects honey without harming the flowers". Considering the same, one digital solution VarnijYakar Automation System (VYAS), has been designed and developed for computerization of various services of the department. A person (dealer), who does trading in Uttar Pradesh State, needs to get registered and acquire a Trader Identification Number (TIN) from the Department, if the dealer is liable to pay taxes according to the legal rules of trading. Enforcement division of the department carries out the audit and assessment of dealers with the objective of reducing tax evasion and enhance the State Revenue. E-Assessment is an important automation under VYAS for the purpose of assessing the registered dealers. The assessment is done on the basis of the returns filed by them with respect the sales/purchases done as part of trading in the state of Uttar Pradesh. Integration of E-Assessment and Recovery Challan/Certificate (RC) Registers automation completes the entire assessment procedure. This has eliminated the repetitive task of typing same language for issuing notice/orders for different dealers. It ensures timely delivery of notices/orders to dealers that enable them to take appropriate actions in time so as not to receive penalty or adverse consequences therein. Recovery Challan cer-

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tificates are issued with raised additional demand as per the returns filed in respective assessment year. Various registers related to assessment like RC-Recovery Challan (Register R3), Court Cases for appeal against RC (Register R6), RC which have got returned (Register R27), Issued notices (R5A register), and Issued orders (R5B register) are also generated. Digitally signed notices and orders are served to dealers on its registered mobile number and email as URL, clicking on which, the notice/order gets displayed to them which they can save as PDF on their mobiles or desktop. The issued notices, order and RCs are made available on personalized Services Portal of dealer. In the country, Uttar Pradesh (UP) is the only State to implement Online Assessment with the feature of issuing digitally signed orders/notices online. The state unit of National Informatics Centre (NIC) (www.nic.in) has extended technical support for this challenging e-governance project.

Keywords Digital · Signature certificate · E-assessment · Green-governance · NIC · Online services portal · SDC · VYAS

7.1 Introduction

Department of Commercial Taxes, Uttar Pradesh (UP), used to administer the following Acts before Goods and Services Tax (GST). Presently the automated system is working for dealers trading in non-GST materials.

- UP VAT (Value Added Tax) Act, 2003
- UP Sales Tax Act, 1994
- Central Sales Tax Act, 1956.

Around INR 587.26 billion revenue is earned by the Department in the financial year 2017–2018, which is about 59% of the total revenue of the UP State.

The basic objective of this computerization was to make progressive use of the Information technology to develop an effective and efficient system of collection of taxes and to build a compatible ambience for Trade and Commerce to flourish in the State. VarnijYakar Automation System (VYAS) has been a successful implementation since January 01, 2008 as a Department Web Portal with several built-in web applications like Officials' Services dashboard and Citizen Online Services Portal.

These web applications are contributing to the central repository, partitioned SQL Server database at the back end via dedicated secure Virtual Private Network environment and One thousand three hundred forty nine (1349) Commercial Tax\sector offices at Ninety Five locations in Seventy Five districts of the State. At each of ninety five locations, one 'VyapariSuvidha Kendra' is established as a single window to provide all business-related services under one roof for registered dealers.

There are two major categories of inter-related web-applications in VYAS:

(a) Office Intranet web VYAS includes the following automated services:

- Acknowledgement Receipt, Hearing, Survey, Registration Issuance {Taxpayer Identity Number-TIN/Service Provider Number-SPN/Tax Deduction Number-TDN}
- Registration Information Amendment, Dealer certificate transfers, Registration suspension, restoration and cancellation
- Issuance of trade-related Forms online, Submission of Challan and/or Returns online
- Automated operations and control system of Enforcement division of the department that includes Record of Detention Memo-Panji5, working of Mobile Squad units and Special Investigation Branch.
- Automated dealer assessment i.e. E-Assessment.

(b) Online services for registered Dealers, available on Internet anytime from anywhere.

- Online Returns, Online Payments, Online filling up the trading forms and its downloads,
- Automated Registration System (E-Registration and its Amendment).
- Online Services Portal for registered dealers.
- A rich Reporting Module to assist higher authorities.

7.2 Manual System—An Overview

One major Activity of the department is to audit and assess its dealers on business activities in the State in order to increase state revenue and reduce tax evasion by the dealers. Assessment of a dealer is done as per the last 3 years tax returns filed by the dealer and objectionable material found on its business places. One demand notice is served to defaulter dealer on the basis of the assessment and its compliance is ensured via respective district administration through Ameen, responsible for collecting penalty amount in demand notice from dealers. Adjustment of payments against any other demands may also be made and payment of refund after adjustment may also be realized.

Assessment starts with marking dealers on annual turnover slab, return frequency and assessment on the basis of pre-decided parameters. Accordingly, dealers are marked as deemed, deemed ousted and pending for decision. Orders for the same are reflected on the portal for dealers download. Another system enables new 7 reason marking of dealers based on filed returns and the defaulter cases have got integrated to r5a (Notice) registers and notices/orders are generated against such cases.

7.2.1 Gaps in Manual System

The limitations of the conventional system are as follows:

- In Manual Case Register, Officers have to make multiple attempts to open registers and look into the various hand-written information for the dealer assessment.
- Generation of notice and order used to take much time of officials.
- There was no streamlined procedure to train dealers on how to submit various trades' related information online and also there was no standard format to enter information is various assessment registers.
- Serving the notice and/or orders to dealers via speed post or through office carriers was time consuming, costly.
- Old ways of serving notices/orders carry no assurance of timely delivery of the same.
- There was no way of tracing the dealers in case notice/orders get lost and that usually resulted in loss of revenue.
- There was no proper monitoring of revenue collection and work of officials at distant locations.
- No proper management and maintenance of assessment registers.
- It was very difficult to monitor the complete chain of assessment against one dealer and reaching to final outcome in the form of recovery challan, its disposal and amendment on the case to case basis.

7.2.2 Notices Under VAT Act Considered for Automation

The following notices under VAT Act were considered for automation:

- Notice u/s 17 of UPVAT Act 2008—Closure Notice
- Notice u/s 25(1)—Notice 25
- Notice u/s 28 of UPVAT Act 2008—Notice 28
- Notice u/s 29 of UPVAT Act 2008—Notice 29
- Notice u/s 9(2) of CST—Notice CST 9(2)
- Notice u/s 9(4) of UP Entry Tax Act 2007—Notice Entry Tax 9(4)
- Notice u/s 9(2) Central Sales Tax (CST) Act 1956 for provisional tax—Notice CST 9(2) Provisional
- Notice u/s 10(1) of UP Entry Tax Act 2007—Notice 10
- Notice u/s 54(1)(14) of UPVAT Act 2008—Notice 54(1)(14)
- Notice u/s Sec 54(1)(2) of UPVAT Act 2008—Notice 54(1)(2)
- Notice u/s Sec 45(5) of UPVAT Act 2008—Notice 48(5)
- Notice u/s 8A of CST Act 1956—Notice 8-A
- Notice u/s 10A of CST Act 1956—Notice 10-A
- Notice u/s 45(13)A of UPVAT Act 2008—Notice U/s 45(13)

7.2.3 Orders Under VAT Act, Considered for Automation

The orders considered for automation are as follows:

- Order u/s 12 of Sec 17 of UPVAT Act 2008—Order of Suspension
- Order u/s 28(2)(i) of UPVAT Act 2008—Order 28(2)(i)
- Order u/s 28(2)(ii) of UPVAT Act 2008—Order 28(2)(ii)
- Refund Payment Order(Form-33)—Refund order
- Order u/s 9(2) CST Act 1956—Order CST 9(2)
- Order u/s 9(4) UP Entry Tax Act 2007—Order Entry Tax 9(4)
- Provisional Tax Assessment Order u/s 25(1)—Order 25 (i)
- Order u/s 10(1) UP Entry Tax Act 2007—Order 10
- Order u/s 54(1)(14) of UPVAT Act 2008—Order 54(1)(14)
- Order u/s 54(1)(2) of UPVAT Act 2008—Order 54(1)(2)
- Order u/s 48(5) of UPVAT Act 2008—Order 48(5)
- Order u/s 8(A) of UPVAT Act 2008—Order 8-A
- Order u/s 10(A) of UPVAT Act 2008—Order 10-A
- Adjustment order and voucher Form 33(A)—Refund Order(Form 33A)
- Order for Composition for Work ContrAct or Under UPVAT Act 2008—Work Contract or Order
- Order for Composition of Tent Dealers in UPVAT Act 2008—Tent Order
- Order u/s 22/33 of UPVAT Act 2008—Order Section 7.22/31
- Order u/s 54(1) to 54(22) of UPVAT Act 2008—Order Section 54
- Order for Notice Cancellation—Cancellation Order
- Order u/s 32 of UPVAT Act 2008—Order u/s Application 32
- Miscellaneous Order Under UPVAT Act 2008—Miscellaneous Order.

7.2.4 Inputs to Dealer Assessment

The inputs to dealer assessment are depicted in Fig. 7.1.

7.3 Solution Based on Process Re-engineering

E-Assessment, a process re-engineering model of dealer assessment has computerized around thirteen notices, twenty orders and various registers related to assessment like for Notices, R5A register, Orders, R5B register and recovery Challan certificates (RC), etc.

This automation includes, the absolute work flow from generation of notice, then order, after that demand notice, then recovery certificate, then ST 45 generation for the raised demand and after amount collection and submission via e-challan by

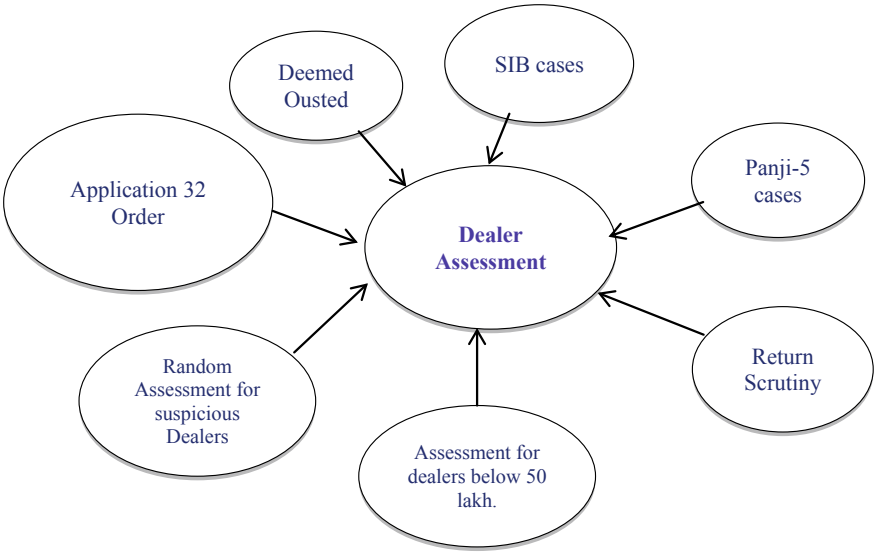


Fig. 7.1 Inputs to dealer assessment

Ameen, receipt submission at receipt counter. SMS and Email have also been enabled in the automated system.

Departmental officials have been facilitated to register their Digital Certificate/Signature to generate the digitally signed notices, orders and Recovery Challan certificates. Enforcement work, i.e. survey, investigation by Special Investigation Branch (SIB), record of detention memo (Panji5) has been integrated with E-Assessment.

'Returns Scrutiny Assistance System' has been developed for officials to scrutinize the returns filed by dealers according to some pre-defined parameters like in-complete Returns, difference, observed in rate of tax, non-deposition of admitted tax, un-verified principal purchases, wrong claim of ITC, etc. This has been integrated with E-Assessment to mark the defaulters and take proper action against them.

On top of the E-Assessment system, a rich MIS has been built. 'E-services portal for dealers' has been developed, so that dealers can view all business related activities done with the department in different financial years and also the notices and/or orders issued.

During the year 2017–2018, the assessment is done as per the business activities and returns filed by the dealers in financial year 2014–15 as assessment is based on last 3rd years' filed returns by dealers. Dealers active till July 2017 under VAT Act, before GST, need to be assessed in the financial year 2020–21.

7.3.1 Key Features of Dealer E-Assessment

The key features of dearer e-assessment are as follows:

- From August 01, 2014 onwards, the assessment notices and/or orders are digitally signed and generated online.
- There is one unique Assessment order number assigned to each notice/order issued to different dealers on the case basis.
- All raised demands carry a unique Recovery Certificate (RC) number.
- Due to assigned unique order number, it is quite convenient to trace the post-assessment actions against any notice and/or order.
- Entry/verification and generation of notices/orders is work-flow and role-based.
- The assessment case transfer process during cases disposal, has been taken into consideration during automation.
- E-Assessment is integrated with other subsystems under VYAS like E-Registration, E-amendment, E-return filing, and Enforcement (SIB, Mobile Squads and Panji5) OCS, appeal and E-services portal for dealers, in order to file assessment case as per the tax deposited by dealers.
- Total elapsed time in manual system for notice/order serving was observed as 10 days and it is online, i.e. notice/order is served at the same time via SMS/e-mail when it is generated, in automated system.
- XML format used to save various notices and orders, having different formats. It was a first time innovation during development of E-Assessment system.
- User found it difficult to prepare some 40–50 pages lengthy notices/Orders online. For this issue, Microsoft Word Template was used as offline tool to write lengthy notices/Orders and then on uploading the same to the E-Assessment system, it is combined as running text in HTML during Notices/Orders generation on the fly using ASP.NET Programming. It was a new innovation used for the first time in any web application. This solution was then widely accepted with the success of E-assessment.
- Assessment Process information, Additional Demand Booked and its collection are digitally captured.
- Fifteen notices, Twenty two Orders, R5A, R5B registers, Recovery Challan Register-R3, Refund Register-R27, etc. have been computerized and integrated with each other.

The internal and external sub systems of E-Assessment are shown in Fig. 7.2. The working model of the system is presented in Fig. 7.3.

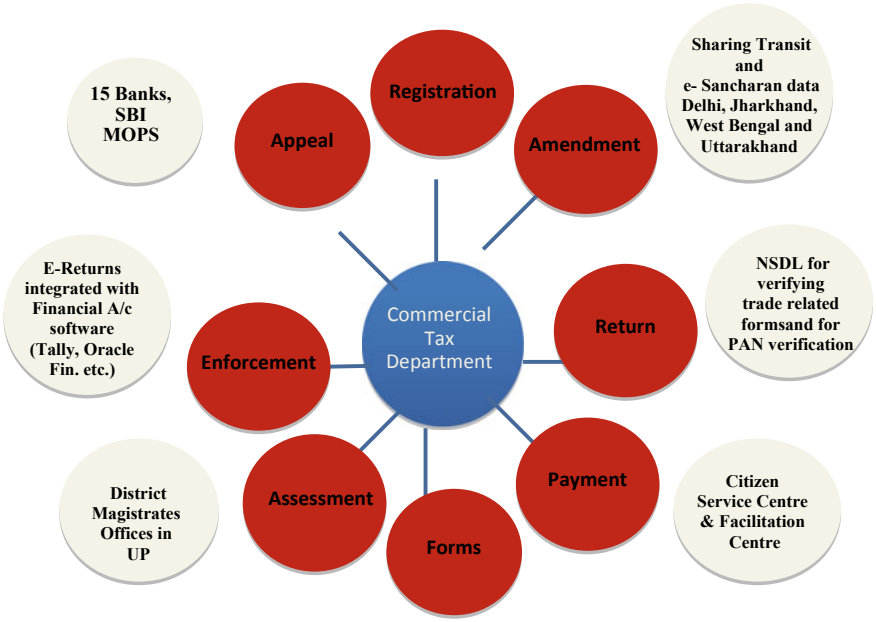
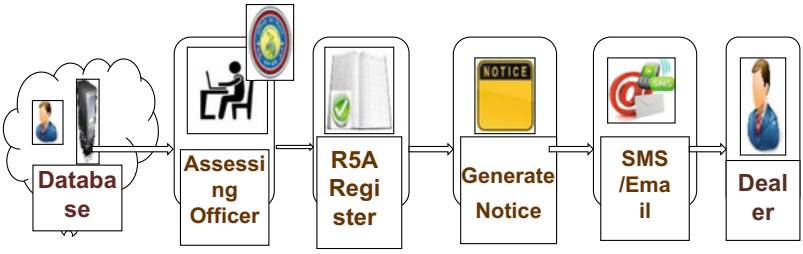
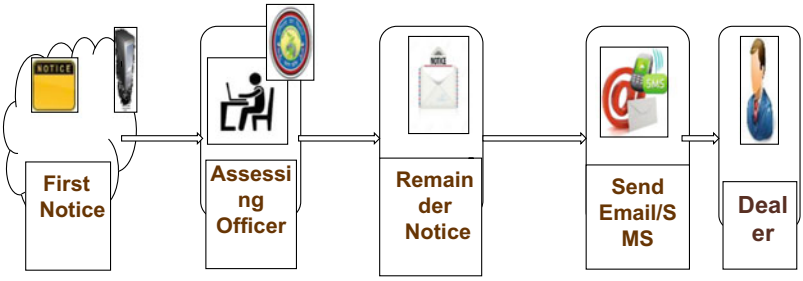


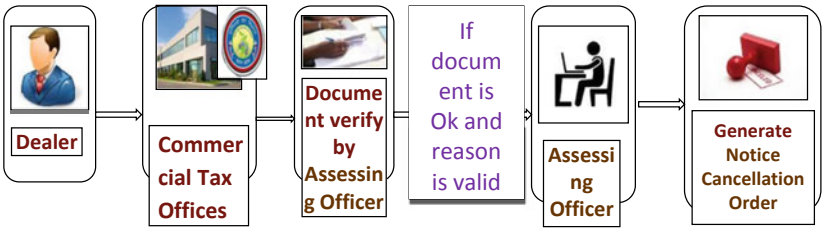
Fig. 7.2 Internal/external interactive systems of e-assessment



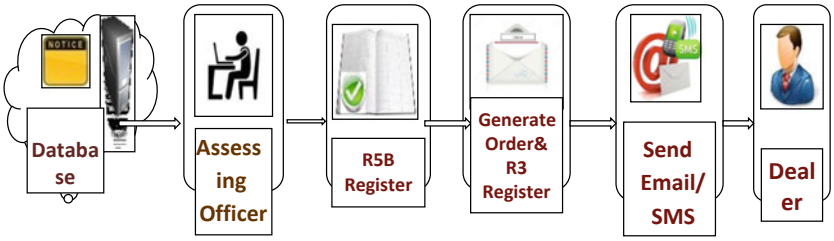
If Dealer does not appear on Enquiry date, the assessing authority can generate reminder notice for dealer to present with valid proof; otherwise entry will be made in R5B register for Demand Generation.

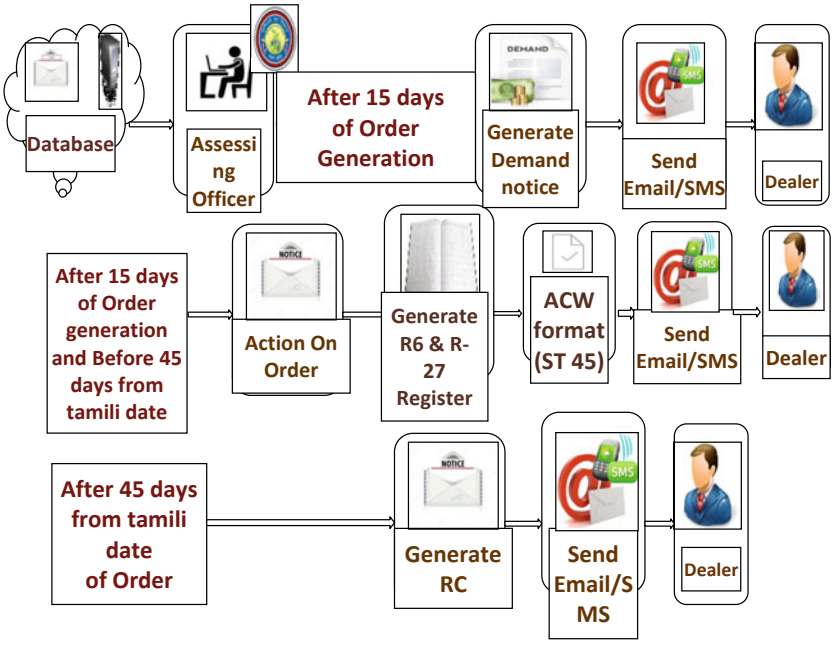


If dealer appears on enquiry date and satisfies document, the assessing authority can generate notice cancellation order



If at the time of Dealer document verification something goes wrong or not present after remainder notices the dealer not appear on hearing date the assessing authority can be generate R5B register for Order generation with demand amount and tamili date.





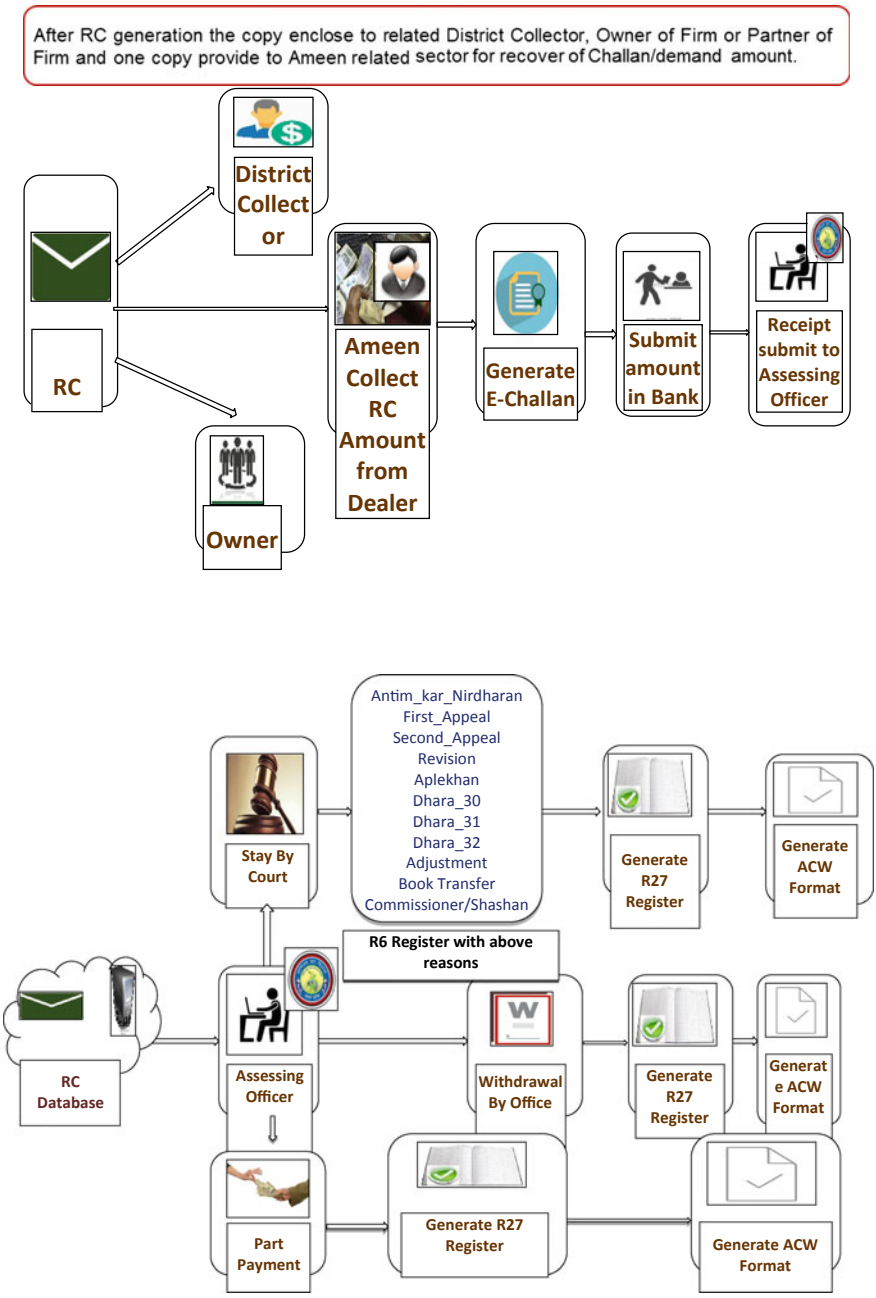


Fig. 7.3 Working model of e-assessment

7.3.2 Technology Used

The technology used in E-Assessment comprises of:

- Web, email, and SMS used as Service delivery channels
- Visual Studio 2010 used for software development.
- ASP DOT NET Framework 4.0
- SQL SERVER 2008 R2 data server
- IIS 7.0 web server
- Operating system—Windows Server 2008 R2,
- Virtual Private Network for web application being operated on from 1349 sector offices of the commercial tax department at 95 locations in the State of Uttar Pradesh.
- SDC (State Data Centre), Uttar Pradesh as data centre for project.

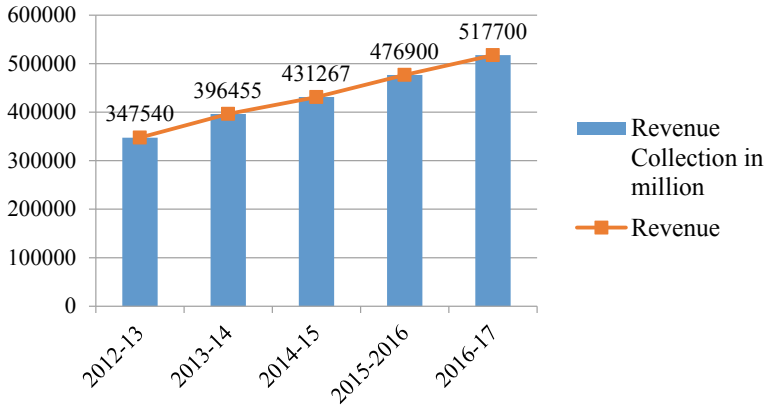
7.3.3 Process Improvement

The following processes have been improved or introduced to overcome the challenges faced in the conventional system:

- Department portal has been developed which includes the automated services of the Department.
- Department Portal has information about its different policies, circulars, notifications and trade-related downloadable forms.
- Government Process Re-engineering has been considered to design user-friendly application forms such that it is easy for the dealer to apply online for various applications.
- Regular updating of contents on web applications has been ensured.
- Feedback monitoring system developed so as to receive constant feedback and take proper actions accordingly.
- The repetitive tasks avoided like typing of same language of notice and orders for different dealers.
- Digital Certificate Registration system developed for registering Digital Signature.
- Service roles managed for authorization for each automated service like contents entry by steno, its verification and final notices/orders generation with digitally signature of officials.
- Regular meetings/trainings/workshops conducted for capacities building for the dealers, departmental officers and staff.
- Online transaction mechanisms take care of Data privacy and protection laws by implementing software security audit standards.
- Automated services in offices are available from 10 a.m. to 5 p.m. under virtual private network environment and online services are available anytime, anywhere.
- Status of filled online application can be traced on department portal.

Table 7.1 Key project statistics

	Financial year	2014–15	2015–16	2016–17	2017–2018
i.	No. of dealers	11,72,848	12,81,167	14,62,806	15,05,157
ii.	No. of notices	4,33,949	7,48,161	10,89,789	17,20,369
iii.	No. of orders	2,25,099	4,68,462	6,55,132	9,67,931
iv.	No. of RCs	1,90,402	1,32,093	1,29,648	3,83,870



- ***% Revenue growth in the year 2013-2014 since inception ~ 14.08%***
- ***% Revenue growth in the year 2014-2015 since inception ~ 24.09%***
- ***% Revenue growth in the year 2015-2016since inception ~ 37.30%***
- ***% Revenue growth in the year 2016-2017since inception ~ 48.96%***

Fig. 7.4 Growth in revenue

- Software Security audit has been conducted for all web applications by Third Party.
- E-Assessment system increased the efficiency and transparency in the Assessment Process.
- The automated system resulted in reduction of paper usage and realization of the objective of a paperless office.

The key project statistics and growth in revenue are shown in Table 7.1 and Fig. 7.4 respectively.

7.3.4 Challenges Faced in Implementation

Being one of the State Mission Mode Projects, NIC and IT team of the department has put joint efforts in design and development of this automated system. Challenges during the changes in any e-governance project are unavoidable as such projects involve multiple stakeholders due to which often there are gaps in planning and implementation. It is, therefore, important to keep interacting with stakeholders to understand their emerging requirements (Suri and Sushil 2012, 2017) and simultaneously manage continuity and change forces (Nasim and Sushil 2010).

The following challenges were faced during the computerization of the department. These could be overcome by ensuring active involvement of various stakeholders during planning, strategy formulation (Suri 2016a) and strategy implementation phases:

- Lack of computer training to the field level officials, was a big implementation level challenge as has been the case with e-governance projects involving multiple actors (Suri 2016b).
- One of the biggest challenges during automation process was to develop and train the departmental nodal officials and sensitize them about the benefits of the computerization of department's functionality.
- The automation procedure had to make a number of iterations before reaching to final workable model as there was lack of clear understanding about the procedures involved in the manual system.
- Understanding the domain knowledge from department officials for automation of the various services.
- Security and privacy of different data was a huge concern to make officials understand so that they should not share login/password credentials with operators
- Initial non-cooperation from dealer community because of lack of basic knowledge of computer operations.
- There was need of regular meetings, dealer workshops, trainings and dealers/officials suggestions/feedback received in such a programme.
- One IT committee of departmental officials used to evaluate the suggestions given by representatives from the field offices and possible amendments in Acts and rules. Application forms, etc. are made accordingly in a way that automation of various trades related services do not cause any problems to dealers/tax payers.

Table 7.2 Expenses incurred on paper usage, postage and fuel

Cost	Per month	Per year
Paper @ 1 Rs	36,73,714/=	4,40,84,568/=
Postage @Rs 25 per speed post	24,23,050/=	2,90,76,600/=
Fuel @Rs 60 per trip document	58,15,320/=	6,97,83,840/=
Total (in Rupees)	1,19,12,084/=	14,29,45,008/=

Table 7.3 Contribution to green-governance

Contribution to green governance	Every month	In a year
Papers saved (in number)	36,73,714	4,40,84,568
Poplar trees saved (in number) (8,333.3 sheets made from 1 tree)	441	5290
Water saving (one A4 size page requires 10 L water)	3,67,37,140 L of water	44,08,45,680 L of water

7.3.5 Toward Green Governance

Department decided for digitally signing of all the trading documents, required by dealer. This was a huge digital transformation in department working and also a step toward Green Governance.

With various automated systems like E-Receipt, E-Registration, E-amendments, E-Assessment, the direct cost saving has been observed in terms of paper, postage and fuel during a month.

The expenses incurred on paper usage, postage and fuel in a year and contribution toward green governance are shown in Tables 7.2 and 7.3.

Basis of the Calculations

(I) Paper used in Dealer Registration Application : 32 pages * 2 (2 copies)

a. Application–10 pages, attached documents–10 pages, enquiry, survey process–10 pages and Registration Certificate–2 pages
b. On an average 7645 dealer registration processed every month, therefore paper used: 32*7645*2= 4,89,280 & in year 489280*12 = 58,71,360
c. Toner/paper @ Rs 1 costing 4,89,280 /= per month & 58,71,360/= per year
d. Postage @25 Rscosting in one month = 7645*25=19,11,25 & in a year 191125 *12=22,93,500/=
e. Fuel cost @Rs 60 per certificate costing in one month = 7645* 60 = 4,58,700/= & in a year = 458700*12 = 55,04,400/=

(II) Paper used in dealer registration amendment: 20*2 pages (2 Copies)

a. Application –8 pages, documents enclosure –10 pages, amended registration certificat e – 2 pages
b. As per 2014-2015 data, 3819 registration amendments granted in a month. Hence paper used in a month : 20*3819 *2= 1,52,760 &
in a year 152760* 12 = 18,33,120
c. Toner/paper @ Rs 1 costing in one month = 1,52,760 /=

And costing in a year = 18,33,120/=

d. Postage @25 Rs costing in one month = 3819*25 = 95,475 &
in a year 95475*12 = 11,45,700 /=
e. Fuel @Rs 60 per certificate costing in one month = 3819*60 = 2,29,140/= & in a year = 229140*12 = 27,49,680/=

(III) Paper used for dealer assessment (notices) : 2 *2 pages (2 Copies)

a. No. of pages in one notice: 2
b. No. of notices per month in financial year 2014-15,: 53743, hence pages used in a month: 53743*2*2 = 2,14,972 &
in a year: 214972 * 12 = 25,79,664
c. Toner/paper @ Rs 1 costing in a month = 2,14,972/= &
in a year = 25,79,664/=
d. Postage @25 Rs costing in one month = 53743* 25 = 13,43,575/= &
in a year 1343575* 12 = 1,61,22,900/=
e. Fuel @Rs 60 per certificate costing in one month = 53743* 60 = 32,24,580 & in a year= 3224580 *12 = 3,86,94,960/=

(IV) Paper Usage for Dealer Assessment (Orders) : 25 *2 pages (2 Copies)

a. No. of pages used in one order on an average : 25
b. No. of orders per month during financial year 2014-15: 31715, hence pages used in a month: 31715*50 = 15,85,750 &
In a year: 1585750* 12 = 1,90,29,000
c. Toner/paper @ Rs 1 costing in a month = 15,85,750/= &
in a year = 1,90,29,000/=
d. Postage @25 Rs costing in one month = 31715* 25 = 7,92,875/= &
in a year 792875* 12 = 95,14,500/=
e. Fuel @Rs 60 per certificate costing in one month = 31715* 60 = 19,02,900 & in a year = 1902900*12 = 2,28,34,800/=

(V) Paper usage for receipt acknowledgement : 1*2 (2 copies)

a. No. of pages used in one acknowledgement: 1 page
b. No. of receipt acknowledgements per month: 6,15,476
c. No. of pages used in a month: 6,15,476*2 = 12,30,952 pages
d. No. of pages used in a year: 1230952 * 12 = 1,47,71,424 pages
e. Toner/paper @ Rs 1 costing in a month = 12,30,952 / &
in a year = 1,47,71,424 /=

7.4 Awards and Accolades

'VYAS' has received the following awards:

- Digital India Award 2016 highest 'Platinum' award in 'Exemplary Online Services'. The award was facilitated by Shri Ravi Shankar Prasad, Hon'ble Minister of Electronics & Information Technology, Law and Justice, on December 19, 2016 at Planeray Hall, VigyanBhawan, New Delhi.
- 'Award of Excellence' at CSI NIHILENT AWARDS ceremony on 24th January' 2016 at Coimbatore, Tamil Nadu.
- 'eIndia Award' at eIndia Innovation Submit at Jaipur, Rajasthan on 3rd March 2017
- 'Outstanding Integrated E-Governance Project' category award to Commercial Tax Department, Government of U.P. by Technology Sabha Express Computer award during 16–19th February, 2017 at Novatel, Visakhapatnam.

7.5 Conclusion

Uttar Pradesh State stands first in the country for the implementation of online issuance of digitally signed notices and/or orders and ensured delivery of the same via email and SMS that enable dealers to take timely Act ions to save from penalty from the department. The repetitive task of typing the similar contents in notices and orders, serving time and possibility of loss of notices/orders has got eliminated and this resulted in reduction in tax evasion and increase in collection of revenue. The computerization of Commercial Tax Department has provided the trade-related services to citizens in a convenient, efficient, and transparent manner and also promoted green governance by saving papers and so the trees.

This digital transformation of department services management has been applauded among officials and dealer community, as secure and assured delivery system and a step toward Green e-Governance.

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Chapter 8
Giving off a Rosy Glow: Exploring the Link Between Self-efficacy Optimism, Personal Optimism and Career Planning in Indian Sub-continent

Teena Bharti and Santosh Rangnekar

Abstract In the era of career transition, to have a positive orientation and knowledge about the factors that support a successful career planning is vital. The current article analysis the association between self-efficacy optimism, personal optimism and career planning. The study analyzed a sample of 283 managers working in the public and private manufacturing sector. The current chapter applied correlation and regression techniques to analyze the optimism-career planning relationship. The results specified that there is a significant relationship among optimism (measured by self-efficacy optimism, personal optimism) and career planning. The findings and results were discussed, and future research recommendations were also addressed.

Keywords Career planning · Indian study · Personal optimism · Positive psychology · Self-efficacy optimism

8.1 Introduction

The dynamic business environment has changed the socio-economic environment and poses a greater challenge which needs to be dealt with in a positive manner. Researchers suggest that positive psychology at workplace plays an important role and unfolds a downward spiral that leads to unemployment, stress, anxiety, absenteeism and job loss (Youssef and Luthans 2007; Froman 2010). Also, Martin (2005) and Salovey et al. (2000) suggested that positive psychology and emotions are linked together reflecting that the former can enhance motivation, satisfaction, productivity and impacts the physical and mental health of individuals. In 1976, Eysenck et al. stated that personality traits constitute numerous sub-traits that including impulsivity, sociability, and optimism. Various authors supported that an optimistic explanatory style (Seligman et al. 1979; Peterson and Seligman 1984) is related with performance, health, job satisfaction and other variables (Nolen-Hoeksema et al. 1986; Peterson

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and Barrett 1987; Peterson et al. 1988). According to Krueger and Killham (2005) of Gallup Management, managers significantly impact the employee engagement and well-being at the workplace, which at the hind side acts as an important predictor of individual performance working in an organization (Arakawa and Greenberg 2007). Further, in 1998, Fredrickson emphasized that the broaden-and-build theory sheds light on how managerial individuals might help in creating more engaged employees as the theory primarily revolves around positive emotions. Additionally, Seligman et al. (1984) suggested that the explanatory style of optimism is significantly associated with performance outcomes, productivity, innovation, and healthy workplace relations and outcome. Further, researchers (Howell et al. 2016; Valentino et al. 2016; Shauman et al. 2018) suggested that individuals who use flexible schedules, prefer work at home, takes a family leave, or uses technology for distance work contributes to the organizational citizenship and are more committed and engaged to their career.

Continuing with the discussion, various studies (Arnold et al. 1991; Luthans 2002) have tried to measure the association of psychological capital (optimism; hope, resilience, etc.) and performance/productivity variables. There is a scarcity of scholarships in analyzing the sub-dimensions of optimism with the career variables (career planning) especially under the current situation when the concept of career has transitioned to boundaryless from traditional ones (Arthur and Rousseau 1996).

The current study tries to examine the predictive nature of optimism in career planning. Another feature of originality of the present research is the adoption of the concept of career based on Luthans et al. (1981). The concept highlights that career is a set of separate but related work events that delivers continuity, order, and meaning in an individual's life. The current research embraces the concepts of career planning from the lenses of positive psychology to comprehend the effects of optimism dimensions on career planning in an emerging economy like India.

The present research chose the Indian context to measure the relationship between dimensions of optimism and career planning owing to its cultural diversity which influences the organizational practices that are being followed by the management (Arora and Rangnekar 2015). India, being a strong believer in collectivism, display a lot of affection and dependence on one another and all the decisions are taken keeping in mind the prevailing societal norms (Hui and Triandis 1985). As gathered from the epic of Ramayana, Indians have a positive outlook in general, which is reflected in the work they perform. Also, the survey done by India Today in 2005 revealed that Indians are more focussed and dedicate toward their career keeping in mind that the present generation is a balance-seeker. Considering these particular aspects of culture in Indian sub-continent, the current research analyses the role of dimensions of optimism in career behaviors among the managers working in the Indian Manufacturing sector.

8.2 Literature Review

8.2.1 Optimism

The concept of optimism has different connotations and can be expressed as a general expectation that individuals might experience good outlooks in life (Gillham 2000). Srivastava and Angelo (2009) defined optimism as a propensity to anticipate favorable outcomes or results. Further, optimism is defined in a comprehensive way as "a cognitive and a self-serving tendency to expect the positive outcomes and believe that setbacks are only temporary" (Bharti and Rangnekar 2019, in press). Various studies have shown that optimism strongly predicts behavior which leads to the attainment of the goals. Also, when there is an anticipation of unfavorable outcomes, optimism makes an individual to expect for a favorable outcome. Further, researchers (Gillham et al. 1995; Chemers et al. 2000) established that optimistic people are likely to have coping behavior in stressful situations. Also, it enhances the adaptability of an individual to face a change in more assorted manner.

Additionally, optimism plays a vital role in academics, professional life, and psychological adjustments. Lent and Heckett (1987) revealed that a positive attitude is associated with increased levels of career exploration, planning, career goals, and life goals. As per Carver and Scheier (2002), individuals that are optimistic tend to put their best foot upfront that ensures their well-being and engage in productive patterns. Lockhart et al. (2002) established that optimism enables the process of learning and significantly predicts perseverance and productivity in individuals. On the other hand, Schneider et al. (1998) contended that it is associated with a degree of naivety/innocence that makes the picture hazy and distant an individual from reality.

Carver et al. (1989) highlighted that importance of self and agentic traits at the workplace. Also, the expectations of individuals strongly influence goal-directed behavior (Rotter 1954; Seligman 1975; Bandura 1977, 1986; Armor and Taylor 1998). Armor and Taylor (1998) reflected that the behavior of an individual would be initiated or discontinued depending on the prospects of success. Additionally, positive expectancies tend to motivate an individual in a contingent situation and effects the performance. Conversely, research suggests that less favorable expectancies are associated with task detachment outcome failures (Gillham et al. 1995).

Optimism (Carver et al. 2010) may be related to the development and performance of an individual owing to his persistence. It deals with the avenues of how an individual, group or organization flourish. Objectives are activities, qualities or end-states that individuals perceive as being either alluring or undesirable. Many studies support that Optimistic employees tend to achieve objectives qualities or end-states that individuals perceive as being either alluring or undesirable more effectively and efficiently (Scheier and Carver 1985). Researchers have characterized the populace as generally optimistic by their estimations i.e. Nes and Segerstrom (2006) asserted that almost 80% of individuals are named hopeful. In 1985, Scheier and Carver identified Optimism as the cognitive or rational disposition to expect favorable output. Researchers argued that there are differences at an individual level in optimism i.e.

some individuals are more motivated than others to assume that good thing would occur across different realms of life. Also, Gavrilov-Jerkovic et al. (2014) defined "optimism as the general expectation of positive outcome without emphasizing on the agent who controls the outcome." Also, Personal optimism is the tendency to see the bright side of any circumstance/situation and expect the ideal result from any arrangement of occasions irrespective of the environment. Further, Self-efficacy optimism is defined as the positive expectations that one is competent enough to solve their problems (Bandura's 1977).

Also, Wrosch et al. (2003) and Carver et al. (2010) recognized positive thinking as a variable that can be both particular and general: both an evaluation of life when all is said and done and an appraisal of a specific territory or occasion in one's life. Within this framework, optimism has been defined in a more inclusive way and operationalized to incorporate two parts: Personal optimism and Self-efficacy. Personal Optimism is the tendency or penchant to take a look at the brilliant side of any circumstance (Gavrilov-Jerkovic et al. 2014) and expect the ideal result from any arrangement of occasions (Srivastava and Angelo 2009). Also, Personal optimism (Carver and Scheier 2014), which has been studied with positive effects on motivation, well-being and career satisfaction (Lounsbury et al. 2003; Williamson et al. 2005; Nes and Segerstrom 2006; Rasmussen et al. 2009; Lee et al. 2013), and comparatively a new construct, self-efficacy optimism (Rottinghaus et al. 2005; Rottinghaus and Miller 2013), which is apprehended as a distinctive adaptation and defined as an element of a bigger set of optimistic anticipations, encompassing prospects of individual capability as a distinctive characteristic (Gavrilov-Jerkovic et al. 2014). Further, Carver et al. (2010) have emphasized that optimistic people expect positive outcomes and events throughout life.

The impression of optimism (Weinstein 1982; Granberg and Brent 1983) is expressed in terms of constructive upcoming life transitions that are more likely to happen, and negative forthcoming transitions of life are more outlandish for themselves than for other individuals like them. Further, Drake in 2002 contended that state of mind and the individual's optimism impacts the cortical regions and in-turn the performance of an individual. Optimism may be related to the development and performance of an individual owing to his persistence. It deals with the avenues of how an individual, group or organization flourishes revolving around the objectives wherein objectives are the activities, qualities or end-states that individuals perceive as being either alluring or undesirable (Seligman et al. 1984). Additionally, the roots of the construct lie in the theoretical and empirical studies on motivation and how they are expressed in human behavior expectancy model of motivation.

While Bandura (1994) accepted that conduct is fundamentally more controlled by self-efficacy beliefs than by result outcomes. Additionally, that outcomes are altogether impacted by possibility convictions, whereas expectancy-value philosophers express uncertainty in this relationship. Further, Karademas (2006) supported that self-efficacy envisages satisfaction of life and despair through optimism. All the ideas illuminated above have added to our current understanding of the concept of optimism theoretically. Many theorists have discussed optimism in human nature in positive terms. The contemporary branch of psychology namely positive psychology

tends to deal with the virtues and strengths that support communities and individuals to prosper.

Through various studies, it has been established by researchers that the linkages between optimistic explanatory style in correlation with efficacious job performance (Seligman and Schulman 1986). Kouzes and Posner (1999) that if employees are optimistic, they perform at a higher level and are highly engaged with the organization.

8.2.2 Career Planning (CP)

The concept of career, which has an essential place in present world scenario, has been dealt with its different correlates since the 70s era because of the new organizational structures and changes in the business life. Hall (2002, 2004) propounded that career is a set of separate but interrelated work activities that provide direction, meaning and permanence in the life of an individual. The concept further consists of a sequence of role experiences and not merely the job experience. This leads to an increase in compensation, professional responsibility in the organization, power, and rise in the status of an individual. Therefore, the career can be perceived as one of life's expeditions that individual can either take the flattened path or choose to traverse.

In 2002, Hall added that due to alterations in the nature of careers over time, people feel accountable for career management. Further, this change has amplified the requisite to proactively plan and engage in career behaviors (Thomas et al. 2010). Various methods for diverse career behaviors such as career planning programs (Walker 1978), career planning (Gould 1979) and networking/social support (Wolff et al. 2011) exist. Previous studies (Hall 1976, 2004; Bolles 2009) have pointed to the need for individual career planning for a successful career. Several private and public organizations are looking into different aspects of formal career planning programs (Walker 1978). The aim of these programs is to enhance the extent of personal career planning, which could lead to more prompt and effective careers and career choices.

"Career planning is the deliberate process through which someone becomes aware of his or her interests, personal skills, motivations, knowledge, and other characteristics; acquires information about choices and opportunities available; identifies specific career-related goals; and establishes an action plan to attain the goals" (Dessler 2008). Also, Career planning gives the confidence to take greater responsibility for one's self-development. This development also entrenches the shaping of skills measured as significant in the present scenario (Doyle 1997). Results of the empirical research, which was conducted at the student and employee levels, demonstrated that career planning is of higher importance to win a job and for long term achievement of career—goals (Folsom and Reardon 2003; Broscio and Scherer 2003).

CP attitudes are considered as predispositions which tries to analyze the engagement of an individual in career planning (NOICC 1992). Redman and Wilkinson (2001) emphasized that career establishes the strong framework of capacities and learning of the working people to emphasize in their callings, work experience, and try to improve the professional ties over a period of time. As of late, a few studies

have perceived the pertinence of planning careers, intending to comprehend and foresee the vocation related practices, for example, word related decision, commitment, engagement, and satisfaction. Additionally, the concept revolves around exploring the abilities and interests and planning according to the goals/aim. This further develops the insights into what is needed by an individual from his/her career currently and in the near future. The whole idea is to assess the strength, abilities, competency, and skills of an individual. Therefore, there is a need to develop attitudes, interests, and skills of career planning which are required for effective and efficient career choices.

8.2.3 Optimism and Career Planning

Optimism is considered to be a self-regulating mechanism to determine whether an individual will start or continue to work toward the desired goals, which is in sync with the control theory (Carver and Scheier 1981, 1982). According to the theory, if individuals' expectations of eventual success are adequately constructive then they tend to remain engaged in efforts to reach anticipated aims and objectives despite all the roadblocks.

According to a study, career issues are especially notable for youthful populaces where youngsters should be educated, gifted, and sure to set future objectives and settle on profession related choices. Imperative to the changes in life, i.e., from education to work contribute to different levels of career development, their profession, and basic leadership capacities, along with the precision of their future work-related objectives. Further, Geers (2000) established the link among the positive emotions and academics, health and other outcomes.

In 2000, Sullivan and Mahalik evaluated the relationship of Self Efficacy and career planning—vocational exploration among 60 women in New England. The authors conducted an experimental study wherein women (30) received six weeks of career training that focused on increasing their self-efficacy. Also, Lent and Hackett (1987) investigated the relation among self-esteem, optimism, career anticipations, career objectives, and career exploration, considering that gender would also impact the career planning, which depicted that male and female both plan for their career. Further, Creed et al. (2006) evaluated the relation between self-efficacy of individuals and career decision-making. Also, Bertoch (2010) added to the literature of relationships among goals, career decision-making, career planning, and performance in the course of career development (CD).

In 2010, Gunkel et al. assessed the relationship among career planning; personality considered moderator and career decision-making. The research established that culture has a substantial influence on career planning. As per a research conducted by Murphy et al. (2010) career transitions and other general themes, comprising of the role of anticipations, optimism, and resilience in the college-to-industry shifts. The results highlighted that well-informed and realistic expectations play a vital role in the individual perception of the personal as well as professional life. In 2011,

Duffy et al. established that optimism or higher the positive outlook in life the more an individual plans the course of his career. Also, the adolescents in schools who have a positive outlook in life tend to adopt the career and have higher career optimism. In 2013, Atta et al. studied the effects of self-efficacy on career planning as measured by negative career thoughts. Based on the above literature, the dimensionality of the (Personal optimism and self-efficacy optimism scale-Extended (POSO-E) remains unclear, and the scale has not been tested on Indian sample. Also, the concept of optimism has not been studied in relationship with CP, where a futuristic orientation is of primary concern.

Consequently, the current research empirically examines the relationship of optimism in terms of subscales, i.e., personal optimism and self-efficacy optimism along with career planning. Therefore, within this framework following hypotheses have been formulated (Fig. 8.1):

H1: Personal optimism significantly affects the career planning in employees of Indian organizations.
H2: Self-efficacy optimism significantly affects the career planning in employees of Indian organizations.
H3: Optimism significantly affects the career planning in employees of Indian organizations.

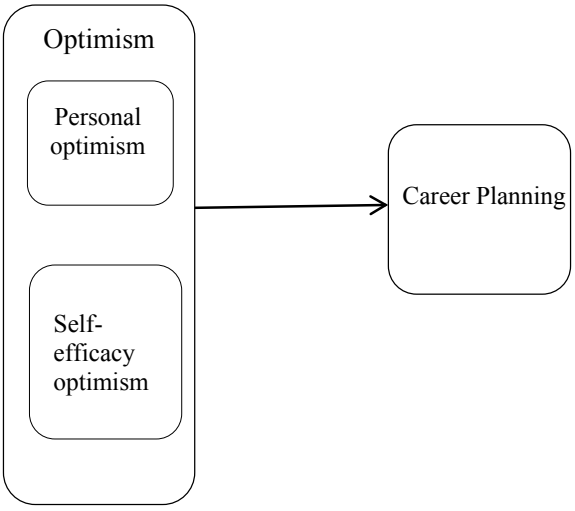

Fig. 8.1 Hypothesized model

8.3 Methods

8.3.1 Data Collection and Participants

The current study utilized a cross-sectional survey based research design wherein the sample comprised of the employees working in the Indian organizations. The study used random sampling to collect the responses from respondents (Suen and Ary 2014). Further, the data were collected with the help of face to face interactions and through training programs from the public and private sector organizations. Furthermore, the relevant information was provided to the participants to make them aware of the questionnaire first hand only. Nearly, 301 self-administered questionnaires were distributed out of which overall 283 usable responses were analyzed based on the preliminary screening and processing.

The respondents consisted of 71.03% males and 28.97% female middle-level employees from public and private manufacturing sector organizations in North India. Further, the middle-level employees were selected for the present study as they serve as the strategic link or play a crucial role between the higher-level and junior-level employees. In other words, the middle-level employees act as a bridge between the top management and junior–level employees. The sample indicated a gender inequality wherein the majority was male employees. The respondents were in four age groups: 21–30 years (63.02%), 31–40 years (21.90%), 41–50 (8.83%) years and above 50 years (6.02%) for the current study. Also, 52.65 percent of employees were working in the public sector organizations while 47.35 percent were working in private sector organizations in North India. The employees' demographic characteristics are shown in Table 8.4 (Appendix) which includes their tenure in total as well as with the present organization along with their education profile, and they are mainly junior level, middle and higher-level employees working in public and private Indian manufacturing select organizations in India.

8.3.2 Measures

Optimism

Optimism was assessed by using a 9 item scale where the subscales of personal optimism contain four items and self-efficacy optimism consists of 5 items adapted from POSO (Gavrilov-Jerković et al. 2014). The study used a seven-point Likert scale ranging from 7 (strongly agree) to 1 (strongly disagree) to collect the responses from the sample. The coefficient of reliability (alpha-α) for personal optimism was 0.81 and self-efficacy optimism was 0.79. And, the reliability coefficient of the scale compositely was 0.83.

Career Planning (CP)
CP was analyzed by using a 3 item scale adopted from the scale developed by Hirschi et al. (2014). Further, a pilot study was conducted to check the usefulness of the scale of career planning in the Indian context (n = 35). The reliability coefficient was 0.87 (Cronbach's $\alpha > 0.7$) (Nunnally 1978). The responses were tapped using the 7-point Likert Scale ranging from 1 (Usually) to 7 (Never).

8.4 Results and Discussion

The data collected were tabulated, and essential inferential statistical measures were applied. To perform quantitative analysis, SPSS statistical software (Version 23.0) was used. Also, exploratory factor analysis has been applied to check the validity of the items as represented in Table 8.5 (Appendix). The factor loadings depicted that the items stand valid in the Indian context.

Further, to inspect the association among the independent and the dependent variable, the coefficient of correlation and regression were calculated and the outcomes were as follows. It can be seen that both the categories of optimism, i.e., Personal Optimism and Self-efficacy optimism had positive correlations with Career Planning. The reliability coefficients of the variables fall in line with the recommendations of Nunnally (1978), i.e., above 0.70.

Hypothesis 1 The study resulted in a standardized coefficient β equivalent to 0.719, and the value is highly substantial ($p < 0.05$). The highly significant and big positive value signifies that Career Planning and Personal optimism are highly related as depicted in Table 8.1. Thus, H1 stands valid and is accepted. Especially, the result suggested that 51.6% of the employees accepted that individuals with high personal optimism tend to form plans for future on a personal as well as career level (Wille et al. 2013). The reason for this may be that in the manufacturing sector the individuals need to be optimistic about the situations which need to be inculcated through a positive outlook to achieve organizational goals. Further, Optimism can predict the mental health along with the physical (Robinson-Whelen et al. 1997). Also, optimism is associated with CP, career decision making, and correlates of career (Creed et al. 2006).

Hypothesis 2 The study resulted in a standardized coefficient β equivalent to 0.701, and the value is largely positive that implies self-efficacy optimism is positively

Table 8.1 Model summary personal optimism and career planning

Model	R (standardized β coeff.)	R^2	Adj. R^2	Std. error of the estimate
1	0.719[a]	0.516	0.518	3.46105

Source Authors' own
[a]Predictor: (Constant), Personal Optimism

Table 8.2 Model summary of self-efficacy optimism and career Planning

Model	R (standardized β coeff.)	R^2	Adj. R^2	Std. error of estimate
1	0.701[a]	0.491	0.490	2.49112

Source Authors' own
[a]Predictor: (Constant), Self efficacy Optimism

Table 8.3 Inter-correlation among optimism and career planning

Model	R^2	Adj. R^2	Std. error of the estimate
1	0.581	0.337	1.65262

Source Authors' own

related to career planning as highlighted in Table 8.2. Thus, the second hypothesis stands accepted. This signifies that optimistic people desire to be involved, say finding out job possibilities may be by collecting information from others or by themselves, taking part in activities which could broaden the horizon and help in understanding what kind of work an individual wants to do. The positive association between self-efficacy and performance have been reported extensively in the earlier research studies (Sadri and Robertson 1993; Pajares 1996; Vrugt et al. 1997; Newby-Fraser and Schlebusch 1997; Wolters and Pintrich 1998; Manstead and Eekelen 1998; Stajkovic and Luthans 1998). Thus, planning for a career and exploring the potential areas is required to implement one's goals to develop one's career or progress vocational development. This further, increases the ability to rely upon self and deal with a contingent situation in the future times.

Hypothesis 3 Table 8.3 depicts that if all the dimensions of optimism are applied together, then R2 is equivalent to 0.581, and the value relatively significant ($p < 0.05$). This positive value implies that optimism and career planning are related to a significant level but the degree of relationship is not very strong owing to the other factors (networking, career satisfaction, interpersonal relationship, resilience, hope, positive affect, life satisfaction, and negative affect) that contribute and affects the relationship between the variables (Manstead and Eekelen 1998). Thus, the third hypothesis is accepted. Specifically, the result ($R2 = 0.581$; $p < 0.05$) depict that if the two dimensions of Optimism are applied together, career planning, i.e., tendency to plan to achieve a goal in life is amplified by 33.7%. Employees advocated that individuals having belief in themselves tend to perform better and that too for a long period indicating that there is a need to attain the goals they have set for themselves (see Table 8.3). Under such circumstances, they will work with more passion and enthusiasm, resulting in better productivity. The result substantiated that having confidence in oneself would lead to better career plans keeping the aim and objective in mind.

These findings highlighted the need to have a positive thought process and the need to cultivate agentic traits like optimism that plays a vital role in an individual's career orientation (Creed et al. 2006; Taylor et al. 1998). If positive anticipations of the forthcoming times for an individual can be nurtured when they are likely to

exhibit an increased level of career planning along with exploration that would make them more confident about the career choices they make keeping in mind the career goals, thus, while developing the orientation programs, career behavior of individual or employees should be focussed keeping their agentic traits like optimism levels in mind and promoting flexible career goals (Scheier and Carver 1992; Aspinwall and Taylor 1992; Creed et al. 2006; Gorod et al. 2008; Rastogi et al. 2016).

8.5 Implications

The study has various implications for academicians and managers.

8.5.1 Implications for Academicians

A bibliographic record of the literature would be helpful in gaining insights in the various constructs. Secondly, the importance of and need for career behaviors and positive psychology would be useful for adolescents and budding managers. Further, it would be helpful in making the teaching notes and developing case studies.

8.5.2 Implications for Managers

The study results have huge implications for manufacturing organizations in the Indian context. For example, organizations should motivate employees to build a positive outlook (Hu et al. 2014). Further, to ensure better productivity and effectiveness in an organization, training activities should be promoted to enhance the personal optimism and self-efficacy optimism of the employees. This would lead to competency building and improved skill sets in the individuals. The employer plays a key role in providing such training as an employer and employee go hand in hand and work for the organization. The above is based on the premise of optimism transfer that takes place between the employer and employee that is susceptible to sensitivity and the career plans of an individual. Also, the employees should understand the importance of positive thinking and to what level it affects the course of a career, which should be demonstrated by the employer as well. The study supported that the personality traits or agentic traits like optimism should be considered to have a person-environment fit and the development practices/training should be incorporated to increase the performance and effectiveness of employees in the organization. This would further lead to a deeper understanding of the behavioral constructs and management. Finally, the study might help in preparing the guidelines for positive thinking which can be executed in the manufacturing organizations.

8.6 Limitations of the Current Study

The present study is not untouched by the limitations. Firstly, the results cannot be generalized owing to the sample that is collected from the organizations of the north region of India. Second, the data was collected via a self-reported questionnaire and therefore can be biased owing to the social factors. Thirdly, the constructs can be analyzed with other variables like happiness, work-life balance, mindfulness, effectiveness, resilience, and others. Lastly, techniques like SEM, DEMATLE, and AHP can be used to prioritize the ranking of different variables.

8.7 Conclusion

Owing to a lot of competition due to globalization, the business environment puts a lot of pressure on how well the organizations' structure and what practices they follow to motivate and retain their employees. The findings revealed that a higher level of optimism is positively and largely demonstrate a higher level of career planning. Further, the implication integral in the current findings indicates the prominence of examining optimism and pessimism independently. The concept of optimism is well recognized with pessimism as it helps in understanding the positives and negatives of an individual and help in achieving a clear picture of the professional life of an entity (Seligman et al. 1984). The above notion is based on the conception that optimism and pessimism are two sides of the coin. Additionally, the sample of the study can be expanded to different sectors and a comparative study would contribute to the future endeavors. Future research studies should explore the models that would impact the career behaviors of individuals and suggest/examining the.outcomes of career behaviors at a larger level.

As per the current findings, a number of capacities need to be further examined. The study needs to inspect the developmental course of optimism and pessimism in specific and general about the development of career variables for individuals. Further, the importance of a positive outlook in defining an individual's career-related activities and career course of action needs to be studied. For example, how do positive expectancies impact the job performance or productivity, and the role of mediating and moderating variables? It is likely that optimism research scholarship will substantiate a productive prospect to facilitate a better understanding of the career behaviors. Thus, the study concludes that having a positive outlook in life can lead to better career plans and ultimately the career behaviors that play a vital role in an individual's life.

Appendix

See Tables 8.4 and 8.5.

Table 8.4 Demographic details of the respondents

Variables	Number	%	Variables	Number	%
Age, Yrs			**Tenure, yrs**		
<30	179	63.25	<10	143	50.54
31–40	62	21.90	10–15	53	18.72
41–50	25	8.83	16–20	46	16.26
>50	17	6.02	>20	41	14.48
Gender			**Education**		
Male	201	71.03	Diploma	38	13.42
Female	82	28.97	Graduate	139	49.12s
Ownership			Post-graduate	58	20.50
			Above post-graduate	48	16.96
Public sector	149	52.65	**Experience (present organization)**		
Private sector	134	47.35			
Job-Hierarchy			<10	135	47.71
Junior level	149	52.66	10–15	68	24.02
Middle level	88	31.09	16–20	41	14.49
Senior level	46	16.25	> 20	39	13.78

Table 8.5 Factor loadings of optimism and career planning

Optimism		
1	Facing future in optimistic way	0.79
2	Something positive in future	0.81
3	Don't worry about Future	0.75
4	Seems everything is bright around me	0.76
5	For each problem I will find a solution	0.82
6	I will find a way	0.85
7	I master difficulties	0.91
8	I can master difficulty	0.89
9	I always find a solution	0.78
Career planning		
CP1	Design my future	0.83
CP2	Took things to achieve career goals	0.78
CP3	Planned goals or my future career	0.87

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Chapter 9
Technology-Driven Workplace Transformation

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Abstract Advancements in the Information and Communication Technologies (ICT) has transformed the traditional workplaces into digital workplaces. Human resource is regarded as a significant asset in terms of skills and abilities. Flexibility in managing human resources is an important aspect of organizational productivity. With new technologies and digitization, organizations require a flexible system in its portfolio which will encourage employees with multiple job skills and abilities to prove themselves in a result driven environment. In this paper, we present a framework that facilitates interrelationship between human resource flexibility and organizational effectiveness. Further, we establish the possible role of organizational citizenship behavior and employee interest to stay with the organization.

Keywords Flexible managers · Flexibility in skill · Human resource · Human resource flexibility · Organizational citizenship behavior · Organizational effectiveness

9.1 Introduction

Advancements in the Information and Communication Technologies (ICT) has transformed the traditional workplaces into digital workplaces. Human resource is regarded as a significant asset in terms of skills and abilities. Flexibility in managing human resources is an important aspect of organizational productivity. With the advent of new technologies and digitization of work spaces, there is a demand of employees with multiple job skills and abilities which make their job more secure

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and enable them to prove themselves in a result driven environment. In this chapter, a framework is proposed which aims to increase organizational output effectively by implementing human resource flexibility. This also brings into organizational citizenship behavior putting the organization first and plays a major role in increasing employee interest to stay with the organization.

Human resource (HR) is regarded as a significant asset in terms of skills and abilities. There is a strong relation between productivity and employee-employer relationship. So, the flexibility of human resource is an important aspect of organizational productivity.

In many organizations, profits define employees incentives where as in government organizations and academics incoming and outgoing time is very important where a punctual employee is treated as a best employee in varied of his contribution to the organization. Staff with small kids, elderly parents and single parent should be handled with care as they have to balance family and professional life. Company's productivity will also depend on the satisfaction toward the family responsibility of the employee. Flexible human resource management is an art to deal with such situation and utilize the skills of employees in a cost-effective way. Organizations with a flexible environment and strategies are favorites for employees with a personal touch. So it is the time to change the workspace with the changing realities of the society. With a lot of technology in this digital world, Flexible management can become a reality.

In the fast-changing era of Information Technology, new technologies and digitization of work spaces, there is a demand of employees with multiple job skills and abilities which make their job more secure and enable them to prove themselves in a result driven environment.

In this chapter, we work out with a framework that aims to increase organizational output effectively by relating it with human resource flexibility. We study the different type of Indian organizations that possess the possibility of flexibility and its influence on organizational effectiveness. This study shows that implementation of flexibility in an organization, establishes organizational citizenship behavior putting the organization first and plays a major role in increasing employee interest to stay with the organization.

9.2 Literature Review

Flexibility at workplace deals with making flexible environment; as to when, where and how a person will work to meet his employers or organization needs. Flexibility at the workplace relates to flexibility in time, location and flexibility to choose an area of interest provided skill set is there. Flexibility is proposed by the employer and adopted by the employee with an aim to increase employer-employee relationship and thereby increase the overall productivity. The organization may adopt two types of flexibility, one in which there is a predefined policy of the organization and one

which is given out of concern for the employee. Note that formal flexibilities can be measured whereas informal cannot be.

One of the most famous models of human Resource flexibility is the '*Model of the flexible firm*,' developed at the Institute of Manpower Studies (Atkinson 1984; Martín 2012; Sarah White); where the 'flexible firm' is defined as workplace management and organization technique which optimizes HR through flexibility based on segmenting the workers into peripheral and core groups. The core group of employees is highly skilled and experienced. They are generally senior level employees who are also involved in decision making of the organization and are difficult to replace. The Peripheral group also consists of skilled employees, but the skill set is easily available in the market and sometimes only required for specific jobs. This group is prone to replacement. The 'core group' of employees with different skill set shift from one role to another as per the requirement of the organization. They work full time, and their flexibility is not only required for different roles but different timings, managing a different group of people with a different skill set. These employees are usually managers, technicians, and designers. Thus employees in the core group are subjected to functional *flexibility, timing flexibility and behavioral flexibility. S*o it is prevalent that employees with this flexibility join the core group and have more job security. On the other hand, Wright and Snell (1998) described human resource flexibility being composed by three sub-dimensions: *employee skill flexibility*, *employee behavioral flexibility*, and *HR practice flexibility*.

9.3 Framework for Technology-Driven Flexibility

Information and Communication Technologies (ICT) has made a significant impact on various businesses and transformed the traditional workplaces into digital workplaces. The three main characteristics of a digital workplace are 3Cs: (i) Communication, (ii) Connectivity and (iii) Collaboration. These 3Cs help users/employees to work in unprecedented ways. We introduce 'Culture' as an additional dimension that creates adaptive workplace and allows flexibility toward organizational empowerment. That is, the digital workplace brings 'cultural change' in a working environment. The benefits of digital workplace include work-life balance, work from anywhere, work at any time, knowledge sharing, etc.

Figure 9.1 shows a high-level overview of the framework that enhances flexibility at the workplace. The major aspects that influence the workplace are (i) Business with respect to their policies, (ii) Information and Communication Technologies (ICT), (iii) Human resources and (iv) Culture. Figure 9.2 shows an architecture framework toward achieving *Better Employee Engagement and Employee Inclusive workplace*. Major infrastructure requirement includes cloud, data center, and networking.

Technologies like e-mails, Virtual Conferences, Virtual Meeting rooms, Chat bots, Video calls (e.g., Skype), Artificial Intelligence (AI), etc. are driving digital workplaces. AI transforms the workplace into the way manager performs his or her work and interacts with their peers and team members. For instance, AI helps managers

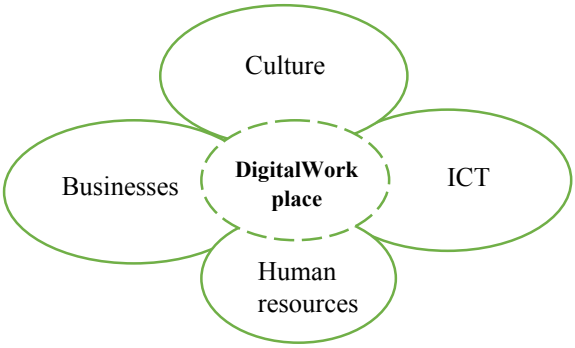

Fig. 9.1 The framework for enhancing flexibility at workplace

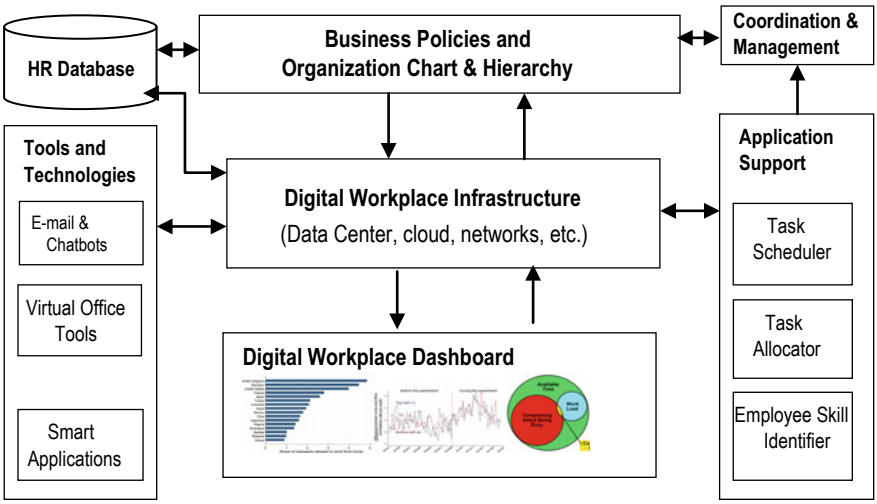

Fig. 9.2 Architectural framework for digital workplace

in mining the vast amount of data related to workers, like skills, experience, performance, past works carried out, etc. The patterns from these data are useful to allocate works based on the skills, portfolio management (placing employees in the appropriate units/departments), etc. Further, AI-driven Digital Workplaces allow creating/configuring bots (virtual agents) so that the bots can estimate the time taken by each task (based on the historical data), assign tasks to appropriate workers, schedule meetings, etc. The technologies create digital workplace innovation that continuously improves the organizational effectiveness and employer-employee relationship in a more informed manner. Finally, technology and culture change along with 3Cs makes a better workplace . Further, digital workplaces that facilitate flexible management

improve the efficiency, productivity, and overall workplace practices. Some limitations of these changes in the workplace are security and privacy; working in different time zone, spoofing, etc.

9.4 Flexibility in Work Culture

In this section, we discuss three dimensions, namely work from home, working in shifts and Flexibility in skills, which results in changes in culture at workplaces.

9.4.1 Flexibility in Place of Working (Work from Home)

There are two sides to this aspect, if we look closely to the option of working from home; one side of the aspect is, no work will be done as there is no monitoring; whereas another side is, workers will be happier and more productive, as an when required they have balance between work from home. While a few workers feel that there is more productivity at home and more distraction in the office with wastage of travel time and friends chitchat and unnecessary meeting with tea and snacks, whereas others feel there is a lot of distraction at home with TV and family around. It all depends on the personality of the worker and the kind of work in hand.

When work from home is opted by employees who are committed and disciplined, it is seen that the productivity increases as they can utilize the time in a better way and also stress levels are found to be less with a lot many reasons like decreased travel time and need not be located at the work place. Supporting work from home is added bonus supported by employees and also saves money for the company in terms of the hiring of space, distributed working and traveling allowance.

The IT industry has already adopted shift schedules and work from home option. With networking going stronger and with the rise in facilities such as VPN chats, Video calling facility and wireless internet, people across the globe are always connected as if they are all at one place. Technology experts across the globe can be shared by more than one company instead of permanently hiring them for a short schedule as a package, which adds advantage to the company and the skilled person has more opportunities than a bond.

9.4.2 Employer Benefits

(a) **Better Utilization of Space**

Employees as the study showed benefit from work from home; the organization also benefit just as greatly by utilizing the same office space for double the number of employees, increase productivity, and save money. This is very easy to implement where companies generally take projects of remote users. Similarly, the companies can get the work done using remote employees with added SVN facility to monitor the work.

(b) **Better Utilization of Skills**

Simon Slade, CEO, and co-founder of Affilorama has experienced firsthand the benefits of having remote workers at his company (Simon and Oakes 2006), According to him, "By allowing employees to work remotely, you can hire the best of the best while not limiting yourself to geographical restrictions. And sometimes we need not hire them completely but take work and pay them". The study shows that work from home gives the same work satisfaction and performance. Instead, organizations need not invest in electricity and resources like computers as while working from home, employees use their resources. Opening the talent pool with freelance workers can become a big benefit with research and open source departments which allow the research to happen around the globe giving wonderful products. Linux and other open source software are examples of this kind of products.

Companies with work from home benefit tend to retain more employees and complete the assignment in time. Nick Bloom, a Stanford professor, conducted a study to evaluate the benefits of working from home. He found workers were more productive, with more work done, worked longer hours, took fewer breaks, and used less sick time than their in-office counterparts. These employees were also happier and tend to quit less than those who went into the office regularly. He estimated that, on average, the company saved around $2,000 per employee who worked from home (www.monster.com, Sarah White).

(c) **Health Benefits**

Employees working from home travel less hence less stress in traffic. Travel cost is also saved by the employee and employer. They eat healthy and hot food while working. If an employee or his family member is sick instead of taking leave, they can take rest or attend to sick people while working. This gives more satisfaction as by having a balance between work and life, adjustment at the workplace allows them to spend more time with their family taking care of kids and elder's health and well-being. Less traveling and more of your own space reduce stress, which leads to a happier and more productive output.

9.4.3 Managing Work from Home Through Technology

Not only IT Companies but other organizations are also adopting work from home. This option may not be given at all times or the employee may not be hired with an option of work from home but at least when needed. Definitely, in the fast-growing market, technology and even banking facility on mobile has increased productivity and technology, enables the organization to measure the work done from home. With a virtual environment and virtual team working, employees need not work at the same place and still connect with one another. They may be in different time zones, and still, they work together. A number of such options are available:

- **Different time, different place**—employees working from distant places keep in touch with the organization and each other via email.
- **Same time, different place**—employees can communicate with each other in 'real time' through call conferences, video-conferencing or using instant messaging.
- **Different time, the same place**—employees can access their business network or servers by connecting to an intranet or extranet. A virtual private network (VPN) is a more secure, but sometimes, expensive way of connectivity.
- **Same time, same place**—even working from home, your employees will still need to meet face-to-face occasionally. Email and electronic diaries allow an organization to arrange meetings and transfer documents, while wireless technology allows you to meet anywhere.
- **Any time, any place**—mobile phones and laptop computers with wireless internet access mean that employees are always accessible and can work from wherever they are.

9.4.4 Security

When data flows from Remote area and is not confined within the office, security and privacy of the data become the major concern. Antivirus, firewall and secured VPN connections would be an option. But employees should be properly trained to understand IT and security policies and their responsibilities toward it.

Employees with work from home option dealing with sensitive information should be careful about:

- Safety of equipment and data
- Safely carrying equipment from one place to another and be aware of theft and misplacement due to negligence
- Working using public internet access may not always be secure
- Printout and other paper document related to work should not be thrown at public places without shredding them.

9.5 Flexibility in Timings (Working in Shifts)

Nearly all of the private organizations work in shifts round the clock. Employees are not always given with an option to choose the shift of their choice, but sometimes requests are considered. There will be continuity to work in shifts, as the same work is handled in the relay by consecutive shifts getting 24 hours coverage and thus production is not hampered and gives accurate results. For certain time-sensitive tasks, especially in mass production, such practices are beneficial from the employer's perspectives. For employees in some company, there is a change in shift in the round robin, to see that everybody is working in every shift. Whereas in others it is project or task-based. Flexibility in timings means liberty and convenience. However, it always has a bad impact on an employee's health. The main advantages of working in shifts are reduced amount of working hours, multitasking, avoiding peak hours in traffic, pushing works to weekends and flexibility of leave.

9.5.1 Convenience

In some organizations, employees have an option to choose the shift of their choice. In families with both husband and wife working, the husband can opt for night shift and wife with morning shift to the care of little ones and old members of the family. At the same time, it is beneficial as instead of taking leave to complete a task or a family function, it is just to opt for an evening or a night shift. The common morning shift seems to be convenient for everyone. However, the young generation, choose for night or evening shifts because they get the liberty of time with their family in such shifts. Employees with babies and elderly parents can opt for night shifts where one of them can work in day shift and the other at night and provide full support to their families.

9.5.2 Optimized Working Hours

The total working duration is well organized with the shift system. Organizations with only one shift system generally tend to make the employees wait after the scheduled time for completion of the task in hand and deadlines approaching. However, in shift system employees with the next shift are ready to take over the pending tasks in a relay manner and thus there is no need to extend working hours. This gives enough relaxation time and breaks, putting less stress on employees.

9.5.3 Training Prospects

This could be the best utilization of working in shift. While working in shift employee gets the opportunity to enhance his or her skills and upgrade the career. Opting for flexibility in timing and enrolling for training to learn new technology and trend, gives the scope of new career prospective.

9.5.4 Avoid Peak Hours

Morning shifts take most of the traveling time. Traveling to work at peak hours or rush lead to stress, frustration, and less concentration. A slight change in timing can make traveling flexible.

9.5.5 Pushing Works to Weekends

Working in shifts allows completing important family chores during weak as they are not pending for the weekend. This leads to relaxed weekends which can be spent with family and friends leading to a balanced life.

9.5.6 Flexibility of Leave

Instead of keeping the option of leave only at weekend organizations can allow requests in the midweek. His allows seven days work without putting pressure. As it is self-opted and compensate for it later, or one can swap shifts with coworkers as per the requirements. This is an advantage in real time tasks where round the clock monitoring can be enabled.

9.6 Disadvantages of Working in Shifts

Abnormal routine, shift inequality and safety.

9.6.1 Abnormal Routine

Shift workers have a change of shift every weak which disturbs their time of sleep, wake up time and eating time. Adjusting from day shifts to night shift and vice versa affects their sleep and eating habits, and they always feel tired and lazy. Employees in shift have a regular change in routine which is difficult for the body to adjust and sometimes they get disconnected with social life. There is a deep impact on their health, and they tend to be less attentive at work affecting productivity and even may lead to major accidents.

9.6.2 Shift Inequality

In some of the organizations, the distribution of employees in shifts is based on seniority. Senior or manager level employees have an option to choose their slot and others are left with evening and night shifts. This may result in an imbalanced team with respect to experience and juniors do not get the advantage to work with seniors and learn from their experience.

9.6.3 Safety

This is the major concern of organizations especially with women workers, as either, they have to employ women workers in morning shift or carefully handle their safety in night shifts. Night shifts are a matter of concern at the workplace within the premises and also for them to travel to and from the workplace.

9.7 Flexibility in Skills

Employees with adjusting mentality and flexible nature are in high demand by employers. Flexibility at job includes adjusting to managerial decisions, positively and readily responding and adapting to new changes and needs. They never say “I don’t know” or “I will not” they find opportunities to take new assignments and understand demands and situations.

In general, organizations appoint people based on qualification and experience but sometimes working in an organization, the employee learns new skills as per his area of interest and would like to work in the area. Organizations should be flexible to allow him and utilize his skill set as they are ready to take more responsibilities and ready to do more work. A step forward, the organization may provide them with training to increase their skill set.

The organization should make it a point that every employee is an individual and flexible managers put an effort to accommodate different working styles and provide them with a comfort zone. Force to change the style of working may sometimes affect performance. Flexible managers help them suggest ways to achieve their goals and create a kind of relationship with the employee. They regularly motivate them and give recognition of their hard work.

9.8 Optimize Performance

Employees with work satisfaction and family well-being give better performance [S. C. Clark 2001]. When organizations invest a lot of time and money to train their staff in the required skill they should adopt flexible policies to retain such manpower as they become an asset to the organization. Such a flexible policy attracts skilled manpower and results in good name and business.

Employees who are interested in organizational citizenship behavior are bold and committed, they work hard to meet organizational goal effectively, and need developing innovative ideas in achieving organizational innovation (Yang and Konrad 2011). Hence organizational creativity and innovation adapting to new technology related to organizational citizenship behavior that is instrumental in achieving competitive advantage. Organizational citizenship behavior is the outcome of an organization's human resource system. Thus, the association between human resource flexibility and organizational citizenship has a positive influence on an organization.

A strong bond between employee and the organization is seen through job satisfaction which comes through human resource flexibility. This may lead to different situations like (a) Skilled Employees with part-time contracts by employers where the level of work satisfaction between the employee and the employer will vary and general study shows that employees with part-time contracts have lower levels of job satisfaction than employees with full-time contracts, (b) As higher is the flexibility in the working schedule, higher will be the level of job satisfaction, and (c) Workers on shift contracts have a lower level of job satisfaction than those who do not work on shifts.

9.9 Insights from Survey

It is found that in an organization where flexibility was already introduced:

- 75% of Employees were positive toward flexibility which had resulted in a better work-life balance in their life.
- 25% of employees felt flexibility in skill resulted in more work as more work was assigned as they never said no to any work.

- Female employees were more favorable toward flexible work place environment who themselves have greater parental responsibility.
- Flexibility positively resulted in their contribution to efficiency and quality outcomes.
- Employees felt that flexible working policies mean the employers value them and have a personal relationship with them which make them more connected to the organization.

Managers supported flexibility in skill as this allows the organization to take new innovative activity and other members easily learn the skill. Management can rely on these employees where an employee of a critical project goes on long leave or resigns. Flexibility in place of working had no issues, but flexibility in timings was not supported by managers as timings are to be fixed as per the client requirements and sometimes it leads to a complex situation were more employees opt for change in timing simultaneously.

In an organization where flexibility was not introduced:

- 80% felt that flexibility reduces discipline and regular practice leads to unorganized organization
- 20% felt that flexibility should be at least provided need-based.
- 70% felt that office timing and fixed place of working is must as Human relation at work place increase bonding and work in collaboration gives higher outputs. They felt that work from home disturbs relationship as we are at work but always doing office work which has no time limit.

Managers allowed occasional work from home to reliable workers and high performers. But other employees who always need supervision in their work were never given with such an option.

It was felt that higher grades should have full-time jobs and flexibility in timings cannot lead to satisfactory results.

There was a perception that works can be completed only when taken as full time.

Overall, the study showed that flexible working environment improved work-life balance. Support from the organization creates organization citizenship which results in improved job satisfaction and job performance. Organizations with shift systems and no option to choose the shift mainly affect women workers with family responsibilities. Senior level managers find it difficult to manage flexibility when there are tight guidelines. Trust becomes the main component in all these options, and this trust can be built only after a long duration of stay in the same organization with a lot of experience. Employee flexible mentality looks for organizations with flexibility.

Employees with citizenship behavior prefer work satisfaction and many a time stay back after office hours to complete their task. They don't depend on the organizations to provide them flexibility but would be happy if it is considered as they would like to take it as a token of appreciation. Flexible workers have more job satisfaction than fixed time workers.

9.10 Conclusion

The flexibility provided at work place has a direct impact on the human relationship, work satisfaction, and productivity. HR policies in an organization should be framed taking into consideration human resource flexibility. Workspace flexibility, human resource flexibility, and work-time flexibility are the need of the hour for both men and women. With the advent of new technologies, organizations have to develop new policies and strategies to hold their skilled man powers, develop multi-skilled professionals and provide them an environment of work satisfaction where output can be enhanced with all possible flexibilities. Employees with family responsibilities, with other commitments, like sports and other social activities can have work-life balance with flexible options delivering the required and making the organization proud. Flexibility will be a significant advantage for employees at the verge of retirement and for all gender and ages.

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Chapter 10
Supportive Culture: A Transformational Strategy

Monica Verma

Abstract The volatile, uncertain and challenging global business environment has resulted in organizations adopting innovative strategies to enhance their performance and sustain their competitive advantage. Organizations are trying to develop and sustain a culture which is flexible and can provide them with a strong foundation. This chapter tries to examine the relationship between supportive culture and job satisfaction mediated by stress and career advancement by using the data collected from women employees of call centres located in Delhi and NCR. Multiple regression is used both for analyzing the data and testing the hypotheses. The findings indicate the significance of supportive culture in enhancing the satisfaction of women employees in call centres in India.

Keywords Call centres · Career advancement · Culture · Job satisfaction · Stress · Women

10.1 Introduction

The presence of an agile environment has forced organizations to design, develop and adopt flexible management systems to have sustainable solutions. These flexible management systems comprise of various types of flexibilities related to organizations, operations, people, information, marketing, etc. (Sushil 2016) and nowadays form a part of the overall culture of any organization.

The culture of an organization is widely known to have a strong impact on the success of organizations. It is considered as a vital parameter of achieving competitive advantage which is sustainable (Schein 1990; Zheng et al. 2010). The effectiveness of strategies and systems implemented in the organizations are explained by the

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culture adopted (Prajogo and Sohal 2001). A culture consisting of values, beliefs, norms, communication, relationships, and practices, etc., lays the foundation of any organization. The culture of an organization can be supportive or strong or weak. Supportive and strong culture leads to the development of good systems and right structures which acts as a transformational strategy to achieve organizational effectiveness.

This chapter is written with the objective of providing insights on the impact of supportive culture on the satisfaction level of women employees concerning their jobs in call centres in India with stress and career advancement acting as mediating variables. The scheme of the chapter is as follows. The next section describes the theoretical structure to gain a more detailed overview of existing research on the topic. Section 10.3 talks about the methodology employed in collecting and analyzing the data. Then, Sect. 10.4 reports the results of the study. Results are discussed in Sect. 10.5. Finally, the chapter concludes with an overall outlook which is included in the last section.

10.2 Theoretical Framework and Hypotheses

10.2.1 Supportive Culture

Culture can be defined as a set of values and beliefs and acts as a strong foundation for the existence of an organization (Pettigrew 1979; Schein 1985; Sackmann 1991; Hatch 1993). It consists of different proportions of attitudes, values, and assumptions (Moran and Volkwein 1992) and is influenced by both internal and external environment (Alvesson 1991). There are innumerable studies discussing the importance of culture in organizations (Alvesson and Berg 1992; Brown 1995). It is said that human resource strategies and work environment of an organization are influenced by its culture (Kerr and Slocum 1987; Kopelman et al. 1990).

When talking about supportive culture, work of Litwin and Stringer (1968) finds relevance. They have established a link between attitudes and behaviors of employees and the work environment of an organization. Out of the nine sub-scales of a 50 item questionnaire developed by them, two sub-scales, i.e., 'support' and 'warmth' explain supportive culture. By support, they mean to state that mutual support and help extended by superiors to subordinates and by peers and colleagues have a positive influence on employees. They feel happy and satisfied, and hence, are motivated to perform effectively and be more committed to the organization. Similarly, warmth refers to good interpersonal relationships among employees developing a congenial work environment. Such a warm work environment results in happy, satisfied and stress-free employees who are motivated to work more efficiently and effectively in the organization.

A number of studies (Flowers and Hughes 1978; Huo and Randall 1991) have developed several important value dimensions relevant for the organizations. Taking a clue from the work of Flowers and Hughes (1978) who have identified a comprehensive set of 12 discrete organizational values, one value of 'teamwork' supports our concept of a supportive culture. Teamwork implies the culture of working in teams and positive work teams have a positive influence on its members.

Similarly, Jones and James (1979) identified six dimensions of climate, out of which, support by the leader, cooperation and friendliness among group members at the workplace, professional and organizational esprit, and mutual trust can be related to supportive culture. These dimensions have a profound influence on the way employees behave and their motivation levels (Litwin and Stringer 1968; Bowers 1976) and on organizational effectiveness (Likert 1961; Mudrack 1989). The supportive work culture of team spirit, mutual trust and support, friendliness, and warmth, and caring attitude helps in developing positive perception and attitudes of employees and relieve them of stress. Employees are motivated to work harder in the organization and improve their performance, indirectly affecting their growth avenues which find support from literature. Employees are likely to be motivated to stay in the organization when they find the work environment friendly and supportive with strong cohesion among peers (Hong and Kaur 2008). Employees who enjoy and have a positive attitude towards work are less likely to leave their jobs (Sherman 1989; Connolly and Viswesvaran 2000). On the other hand, unsupportive or negative organizational culture may trigger negative reactions among employees and may result in adverse consequences for the organization.

Researches in the past have linked employee job satisfaction with a number of cultural factors like rewarding employees for good performance, providing growth opportunities, involving employees in decision-making, support of supervisors, etc. (Mckinnon 2003; Arnold and Spell 2006; Rad 2006; Chang and Lee 2007). Employees in a supportive culture understand the values, norms, and requirements of their organizations and perform accordingly. On the other hand, organizations having weak organizational cultures do not have values, systems, norms, structures, etc. in synchronization with each other and thus might lead to chaos and confusion and dissatisfaction of employees.

With reference to call centres, the interviews with women employees revealed that call centres work in teams. Employees are allocated in different teams, headed by a team leader. Team leader gives directions to his or her team members and is entirely responsible for the performance of the team and its members. Building upon the above-mentioned literature, it can be inferred that if the team is positive and has good relationships among members and the leader, then it might have a positive influence on its members who will be motivated to work more efficiently and effectively in their teams. Moreover, a number of call centres understand the family-related issues of women and thus, have taken initiatives, such as, career break schemes, flexible work arrangements, crèche facilities, etc. to motivate and encourage women to stay in the organization and focus on organizational activities (Scholarios

and Taylor 2010). In fact, in the last few years, organizations have designed and implemented a large number of flexible work practices such as flexi-time, flexible compensation (Sushil 2016), work from home and many others with the objective of motivating their workforce. Research suggests that flexible working arrangement help in reduction of occupational stress and demonstrate a greater commitment to the organization (Ivanauskaite 2015; Clarke and Holdsworth 2017). Flexible work schedules give a signal to the potential employees that the organization takes care about the well-being of employees and hence, are attracted towards the organization (Onken-Menke et al. 2018). Thus, taking reference from the above-mentioned review of the literature, it can be conjectured that:

H1: Supportive culture is positively related to job satisfaction.

H2: Supportive culture is negatively related to stress.

H3: Supportive culture is positively related to career advancement.

10.2.2 Stress

Lazarus and Folkman (1984, p. 19) define stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being." Parker and DeCotiis (1983) emphasize "psychological and physiological reactions to uncomfortable or undesirable conditions" as leading to stress. Stress also refers to the emotional and situational perception of people (Pearlin 1989). Also, it may be understood as any situation or condition that has a negative impact on the well-being of the individuals (Crank 1991). There are myriad factors such as environmental, organizational and individual which can stimulate stress (Robbins and Judge 2007). For instance, the work stress increases due to (a) lack of support from seniors and/or subordinates, (b) less challenging job, (c) prevalence of biases by giving preferences to male peers (d) favouritism, (e) lack of recognition/appreciation of a job well done, (f) office politics or (g) high competition (Shikari 2010). The climate of the organization also plays a major role in creating job stress (Hemingway and Smith 1999; Zeffane and McLoughlin 2006). Employees experience lower stress if they perceive the work environment favourable and vice versa. However, call centres are generally described as stressful and hence, we hypothesize that:

H4: Stress acts as a mediating variable between supportive culture and job satisfaction.

10.2.3 Career Advancement

Career advancement is an important feature that employees look for in all organizations. Its significance in an organization cannot be underestimated. Various researchers have explained career progression or advancement in different ways,

but the underlying meaning remains the same. Kaine (2010) defined career progression as a systematic approach which helps in ringing out a match between the goals of employees and the organization. According to him, organization undertakes initiatives for the development of its employees, enabling them to look for future job opportunities, who in turn benefit the organization with their dynamism and effectiveness. Such initiatives of the organization tend to enhance job satisfaction of employees. Similarly, Fanimehin and Popoola (2013) were of the view that lack of new challenges brings job dissatisfaction. He further added that people leave jobs because of lack of career progression in their organizations. Any employee who joins an organization wants advancement in his career and would like to achieve success in his profession (Mayo 2008). This research is further supported by Linghan (2008) who highlighted the role of career progression in developing and preparing people for taking up higher responsibilities in the organization. He further stated that career advancement provides a certain level of autonomy to employees, which in turn provides a sense of professional satisfaction and security to them. On the other hand, lack of career progression leads to frustration and job dissatisfaction among employees. Thus, the above-mentioned literature helps us to hypothesize that:

H5: Career advancement acts as a mediating variable between supportive culture and job satisfaction.

10.3 Mediator Model

Baron and Kenny (1986) gave the following conditions for the variable to act as a mediating variable:

Condition 1	Independent variable leads to dependent variable Drawing analogy to our proposed model, supportive culture leads to job satisfaction.
Condition 2	Independent variable leads to mediating variable In our model, supportive culture leads to stress and career advancement.
Condition 3	Mediating variable leads to dependent variable rendering the previously significant relationship between independent and dependent variables no longer significant In our model, stress and career advancement lead to job satisfaction, rendering the previously significant relationship between supportive culture and job satisfaction as non-significant.

The conceptual model based on Baron and Kenny (1986) model is given as under (Fig. 10.1).

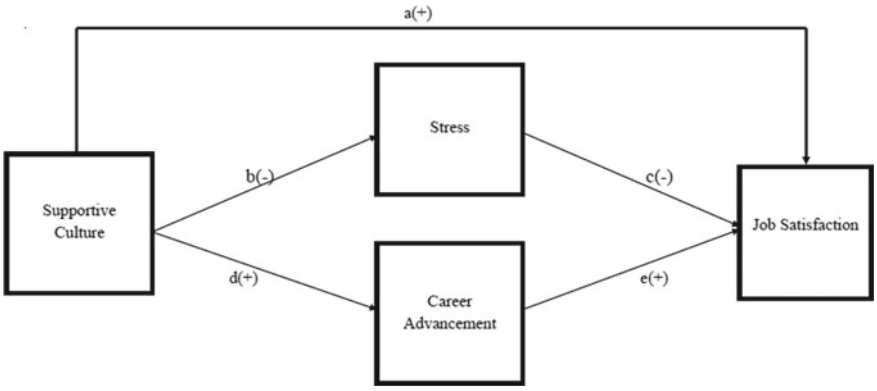

Fig. 10.1 Model of supportive culture and job satisfaction with stress and career advancement as mediators (**a** Indicates the direct path, **b**–**c**, and **d**–**e** indicate mediated paths)

10.4 Methodology

10.4.1 Participants

A total of 302 employees from 8 different call centres took part in the study. The participants of the study were female executives serving both international and domestic clients. International clients included clients from the US, UK, and Australia. For data collection, HR managers of the call centres were contacted. Managers from only two call centres agreed to conduct a survey in their organizations. A total of 117 questionnaires were collected through these two call centres. The remaining data was collected through the method of snowball sampling, wherein contacts were used to identify respondents. Nearly 400 questionnaires were distributed through acquaintances/contacts out of which 261 were returned, and 179 were found fit for analysis. Six questionnaires (fit for analysis) were obtained from the online portal surveymonkey.com.

The respondents were in the age group of 18–53 years with an average age of 21.7 years. The educational qualification ranged from graduation to technical, professional and post-graduation. A total of 299 respondents reported their qualification and most of the respondents (47.8%) were post graduates. Most of the employees were in the lower levels as is evident from their reported work experiences. Demographic data shows that 72.2 % of women had 0–3 years of experience. A total of 301 respondents reported their marital status and the majority of the respondents (77.4%) were unmarried. Majority of the respondents (75.6%) lived in a nuclear family.

10.5 Scales Used

Both standardized and self-developed scales were used which are as given below:

10.5.1 Supportive Culture

The scale for supportive culture was developed by adapting items from the questionnaire used by NASSCOM-IIM (A) study (2009) on 'Crossing the Digital Barriers'. The scale consisted of five items with one item as a reverse coded item. The sample items are: my organization has a frank and open environment, all employees work with a team spirit in my organization, etc. The items were rated on a five-point rating scale (1 = strongly disagree to 5 = strongly agree).

10.5.2 Stress

Four items related to anxiety and burnout were used to measure stress (e.g., I feel emotionally drained by my job, I feel tense at my job) adapted from the scale developed by Tate et al. (1997). Participants marked their experience with each of these symptoms on a six-point scale.

10.5.3 Career Advancement

The scale for career advancement was developed for this study consisting of four items. One, out of the four items was reverse coded. The construct validity was established by taking the views of a group of people. Five-point rating scale was used to rate the items (1 = strongly disagree and 5 = strongly agree). A sample item is "I have got substantial growth in my career during my stay in this organization."

10.5.4 Job Satisfaction

A scale developed by Brayfield and Rothe (1951) was used to assess job satisfaction. It consisted of six items with three items as reverse coded. The respondents rated the items on a five-point scale (1 = strongly disagree to 5 = strongly agree). A sample item is "I feel fairly well satisfied with my job".

10.6 Analysis and Result

Multiple regression analysis was conducted to test hypotheses. A significant model emerged: $F = 7.883$, $p < 0.001$(Condition 1 in both Tables 10.1 and 10.2) after using the enter method. Thus, results offer support for hypotheses H1. Supportive culture is found to be significantly impacting stress ($\beta = -0.260$, $p < 0.001$) (Table 10.1), thus offering support to H2. Similarly, there is a strong positive relationship between supportive culture and career advancement ($\beta = 0.453$, $p < 0.001$) (Table 10.2). Hence, our third hypothesis (H3) is also accepted.

We used regression-based mediation analysis (Baron and Kenny 1986) to test hypothesis 4 and hypothesis 5. Hypothesis 4 suggests that stress mediates the relationship between supportive culture and job satisfaction. A significant model emerged ($F = 25.784$, $p < 0.001$) depicted in Table 10.1 (condition 3). Stress was found to be significantly related to job satisfaction ($\beta = -0.450$, $p < 0.001$) rendering partial mediation between supportive culture and job satisfaction ($\beta = 0.143$, $p = 0.007$). Thus, the results partially support H4. In all the cases, age and marital status had no relationship with job satisfaction. The partially mediated values are shown in Table 10.1

Table 10.2 shows the partially mediated relationship between supportive culture and job satisfaction ($\beta = 0.141$, $p < 0.05$) by career advancement. This implies that results partially support H5. However, before partial mediation, the relationships between supportive culture and job satisfaction ($\beta = 0.260$, $p < 0.001$) and between supportive culture and career advancement ($\beta = 0.263$, $p < 0.001$) are significant. None of the control variables is found to be significant to job satisfaction.

Table 10.1 Partial mediation between supportive culture and job satisfaction (stress as a mediator)

Baron and Kenny's (1986) conditions	Variables	Beta values	F change	R^2	*p* value
Condition 1	Age	0.077	7.883	0.075	0.277
	Marital status	0.059			0.105
	SC	0.260			0.000
Condition 2	Age	0.094	8.365	0.080	0.182
	Marital status	−0.090			0.204
	SC	−0.260			0.000
Condition 3	Age	−0.034	25.784	0.263	0.588
	Marital status	0.018			0.772
	ST	−0.451			0.000
	SC	**0.143**			**0.007**

Note Independent Variable: Supportive Culture (SC), Dependent Variable: Job Satisfaction (JS), Mediating Variable: Stress (ST)

Table 10.2 Partial mediation between supportive culture and job satisfaction (career advancement as a mediator)

Baron and Kenny's (1986) conditions	Variables	Beta values	F change	R^2	*p* value
Condition 1	Age	−0.077	7.883	0.075	0.277
	Marital status	0.059			0.405
	SC	0.260			0.000
Condition 2	Age	0.041	7.853	0.075	0.565
	Marital status	0.045			0.528
	SC	0.263			0.000
Condition 3	Age	−0.095	26.100	0.265	0.132
	Marital status	0.039			0.540
	CA	0.453			0.000
	SC	**0.141**			**0.008**

Note Independent Variable: Supportive Culture (SC), Dependent Variable: Job Satisfaction (JS), Mediating Variable: Career Advancement (CA)

10.7 Discussions

The study partially supports our research model which shows stress and career advancement as mediating variables between supportive culture and job satisfaction. Our findings suggest several conclusions. Firstly, a positive relationship exists between supportive culture and job satisfaction. Supportive culture comprises of interpersonal relationships between employees and the warmth and support extended by employees to each other (Litwin and Stringer 1968) and the flexible work arrangements such as flexi-time, work schedule, etc. All these have a profound effect on the attitude and reactions of employees towards their organizations. If the culture and climate of the organization are favourable to the employees, they will be happy and satisfied in the organization, and if the same is adverse to them, they may develop a negative attitude towards the organization. Similarly, if the value system of an organization matches with the values of an individual, he/she feels satisfied and may result in positive work outcomes. Secondly, there is a strong negative relationship between supportive culture and stress. An organizational culture where superiors take care of their subordinates, and there is mutual trust and support between employees, is positively accepted by employees and motivates them to develop a positive attitude towards the organization. A perceived friendly and supportive work environment is more likely to influence employees to stay in the organization (Hong and Kaur 2008). Such a supportive work environment is likely to reduce stress levels and provide satisfaction to employees which may help them to concentrate on their performance in the organization, which might result into the growth of their careers providing support to our third finding where supportive culture is positively related to career advancement.

Other significant results that emerge out of the study are partial mediation between supportive culture and job satisfaction through stress and career advancement. Results clearly indicate the strong significance of supportive culture in call centres for women employees. There is a perception that women in call centres feel stressed, as the call centre work is stressful (Mitter et al. 2004; Sharma 2005). But, our results indicate that stressful environment of call centres only partially mitigates the strong relationship between supportive culture and job satisfaction. Similarly, career advancement also only partially mediates the relationship between supportive culture and job satisfaction which otherwise is considered a strong mediator. This implies that in a call centre women consider supportive culture more important and seem to have a more profound impact on job satisfaction.

10.8 Conclusion

The study contributes significantly to the literature of call centres by developing a theory about how supportive culture has a strong impact on the job satisfaction of women employees and stress, and career advancement only partially mediate their relationship. The results of the research work have useful implications for practitioners also. The findings clearly indicate that women in call centres feel that even career growth cannot provide that much job satisfaction to them, as the supportive culture can give, a culture that is flexible and positive. Similarly, stress caused by other factors cannot disrupt the strong cohesion between supportive culture and job satisfaction. This implies that the flexible and positive culture of an organization which is favourable to its employees plays an important role in determining their satisfaction and can be utilized by policy makers and practitioners in bringing about transformation in the organization in the form of increasing the motivation levels and lowering the attrition rate of employees. Zairi (1997) very rightly stated that having good structures and systems only will not help organizations to achieve effectiveness and efficiency rather they should focus on their cultural aspects.

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Chapter 11
Framework for Sustainable Healthcare Waste Management in India

Ankur Chauhan

Abstract Healthcare sector has witnessed a significant development in the past few decades, which led to relieve people from epidemics, diminished mortality rate, and enhanced patient care across the world. With this improved patient care, the generation of huge waste with hazardous, infectious, and toxic elements has shown tremendous growth. The management and disposal of this huge waste could be suitably carried out if the entire system of healthcare waste disposal would have been designed in a flexible scenario. The flexibility in healthcare waste disposal system has a vital place as it helps in meeting the exponential and uncertain need for waste disposal. Today, healthcare waste management is a major concern for governments across the world. Reports have been released regularly by various international and local bodies for creating awareness about the hazardous impact of healthcare waste on humans and animals. World Health Organization (WHO) has been actively playing a role in improving the situation of healthcare waste management by seamlessly emphasizing on the significance of creating awareness, technological and managerial solutions. The technological innovations are majorly unaffordable for adoption for the management of healthcare waste in developing countries whereas the effective managerial solutions are not available to the key decision makers, that is, hospitals and healthcare waste disposal firms, for implementation. Hence, in the present chapter, the flexible framework for effective healthcare waste disposal has been developed and presented.

Keywords Healthcare waste disposal firms · Healthcare waste management framework · Multi-criteria decision-making methods · Optimization and statistical modeling · Sustainability

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11.1 Introduction

The waste that comes out of different healthcare facilities such as clinics, nursing homes, hospitals, pathology labs, and medical research centres, has been categorized as healthcare waste (WHO 2013). This waste consists of bloodied cotton, bandages, infected syringes, scalpels, body parts, chemicals, cytotoxics, and radioactive materials (Pruss et al. 1999). The presence of the mentioned infectious and hazardous components converts healthcare waste into life taking object for humans as well as animals (Chauhan and Singh 2016). The improper disposal of infectious syringes and scalpels plays a major role in increasing the number of HIV infection in rag-pickers (Ananth et al. 2010). In 2010, 33 800 new HIV infections, 1.7 million hepatitis B infections, and 315 000 hepatitis C cases of infections had been reported across the world (WHO 2013). In spite of this, the hospitals pay the least attention for the proper disposal of their waste. According to practitioners, the cause of paying limited attention is the realization of its investments into costs. The US agency, OSTP (2014) revealed that despite the heavy generation of CO_2 and harmful emissions, i.e., 380 kg and 80 kg carbon equivalents per patient per day, respectively, the investment of government in healthcare waste disposal activities is extremely low.

It has been observed from the literature that the healthcare waste management, in developing countries, has been paid very limited attention in comparison to other wastes such as municipal solid waste, e-waste, etc. (Coker et al. 2009; Adedigba et al. 2010). In India, the healthcare waste management rules had been introduced by the Ministry of Environment and Forest (MoEF), first time, in 1998 and revised in 2011 and 2015, respectively. However, in spite of the strict rules and regulations of environmental bodies, a remarkable improvement from the perspective of methods of disposal and management procedure could not be traced in reality. Hence, to overcome this deficiency a complete solution for managing healthcare waste has been proposed in this chapter.

11.2 Evidence from Literature

The research work on healthcare waste management has its roots in the seminal work of Pruss et al. (1999). The definition of healthcare waste management was introduced and amended regularly by the World Health Organization with the help of academicians, practitioners, and researchers across the world. In spite of this, there has been a continuous demand from the researchers to amend the definition according to their region or country to better define the categories of infectious HCW and hazardous HCW and for an easier understanding of legislation (Ferreira and Teixeira 2010; Askarian et al. 2012; Caniato et al. 2015).

In the reported literature, it has been found that studies on HCWM have been conducted to understand the composition and quantities of HCW generation (Patil and Shekdar 2001; Moreira and Gunther 2013), to explore the best practices for

enhancing HCWM (Sharma and Chauhan 2008; Ananth et al. 2010; Kumar et al. 2014), to select the method of treatment and disposal of HCW (Huang and Lin 2008; Liu et al. 2013, 2014), and to reveal the potential of recycling and reuse in HCW (Lee et al. 2002; Campion et al. 2015).

11.2.1 Review of the Studies Conducted Focusing on the Composition of Healthcare Waste

In the reported literature, a long list of studies is available that deal with topics related to the estimation of the generation of HCW per bed, per day, per department, etc. Additionally, a large number of studies have been conducted to find the composition of healthcare waste coming from a particular healthcare facility/facilities. Therefore, in this section, the reported studies have been reviewed to identify the major contribution from researchers on revealing the composition and estimation of the quantities of HCW generation.

Patil and Shekdar (2001) estimated that the HCW generation rate in India was 0.5–2 kg bed^{-1} day^{-1}. They estimated the total quantity of waste as 0.33 million tons of waste per year with a composition of 40–45% general waste, 7–10% plastics, 3–5% glass, and 30–35% infectious HCW. Altin et al. (2003) revealed information about the composition of HCW in four hospitals in Turkey. They found that 92% of healthcare waste was combustible; whereas, 8% was noncombustible. They estimated the waste generation rate as 1.25–2.6 kg bed^{-1} day^{-1}. Reza Sabour et al. (2007) formulated a regression model, using the number of hospitals and active bed, to predict the generation and composition of HCW in each province of Iran. Graikos et al. (2010) conducted a study to determine the production rate and the composition of HCW in the Social Insurance Institute, Xanthi, Greece. Voudrias et al. (2012) carried out a study to estimate the composition and production rate of pharmaceutical and chemical waste in Greece. Nabizadeh et al. (2012) conducted a study to estimate the composition and production rate of HCW in Hamadan, Iran. They found that 71.15, 21.40, 7.26, and 0.18% denoted the general, infectious, chemical and pharmaceutical, and toxic waste, respectively, in the composition of dental waste. Zhang et al. (2013) investigated healthcare facilities to reveal their HCW generation quantities and composition in Gansu Province, China. They found that the quantities of the generation of HCW in the primary, secondary, and tertiary HCFs were 0.61, 0.59, and 0.79 kg bed^{-1} day^{-1}, respectively. Maamari et al. (2015) analyzed the generation rates and patterns of HCW collected from 57 hospitals in Lebanon. The results of the study showed that the small private hospitals ($\leq$100 beds) and large private hospitals ($\geq$200 beds) generated the infectious HCW as 1.14 kg bed^{-1} day^{-1} and 2.45 kg bed^{-1} day^{-1}, respectively. Moreira and Gunther (2013) assessed the HCWM plan on the basis of composition and quantities of generated HCW at primary healthcare facilities (PHFs) in Sao Paulo, Brazil.

11.2.2 Review of the Studies Conducted to Explore Best Practices in Healthcare Waste Management

In the reported literature, a large number of studies have been found that focus on the identification of best practices (drivers) for improving HCWM at different healthcare facilities. This information helps in understanding, identifying, and providing an exhaustive list of the best practices from the reported literature. Along with this, it also helps to identify related research issues based on reported best practices.

Caniato et al. (2015) reported a review of the literature on HCWM considering the low, middle, and high-income countries across the globe. They mentioned the best practices and key definitions for the most significant factor for better HCWM. They stated that the development of a sustainable HCWM plan and its execution with the help of best practices, such as proper segregation, regular training, and awareness programs for healthcare personnel, educating patients and the public, administrative monitoring and control, implementation of legislation, etc., at the level of healthcare facility, province, and waste disposal facility, is required at the present time in developing countries. Patil and Shekdar (2001) attributed the poor management of HCW in different healthcare facilities to technological inefficiency, lack of funding, and lack of trained professionals for healthcare waste management. Askarian et al. (2004) noted that the lack of segregation between hazardous and nonhazardous waste, lack of implementation of the laws related to collection of waste from patient wards and temporary storage sites, disposal of HCW with MSW, lack of training of personnel, lack of personnel-protective equipment, and insufficient knowledge of the proper use of these equipment were the significant issues that existed in the healthcare facilities.

Gupta and Boojh (2006) reported the lack of segregation of infectious and non-infectious waste and a 2–3 days holding of the waste in the hospital, the lack of a treatment facility for infectious waste on hospital premises, the open dumping of the waste coming from research laboratories, and health hazards to rag-pickers due to infected syringes, etc., in Balrampur hospital. Bdour et al. (2007) noticed the lack of implementation of biomedical waste management rules that lead to poor segregation and high quantities of HCW. Alagoz and Kocasoy (2008) noticed the lack of appropriate laws and effective control, lack of awareness, and financial constraints leading to poor management of this waste. Arab et al. (2008) reported that the lack of warning signs at temporary storage sites, poor segregation of waste, and the absence of waste treatment and disposal equipment in hospitals led to poor healthcare waste management in Tehran. Sharma and Chauhan (2008) carried out a study to assess the biomedical waste management of three large hospitals in Agra, India. They found that the lack of knowledge, lack of awareness, and old technology for disposal leads to poor HCWM.

Birpinar et al. (2009) conducted a study in the hospitals of Turkey and found a lack of appropriate waste containers, a lack of temporary waste storage sites in hospital premises, and a lack of personnel-protective equipment for safe handling of HCW. Hanumantha Rao (2009) noted issues, such as budget constraints,

training, and awareness programs for healthcare workers, lack of a waste management officer in many hospitals, irregular monitoring and control, and the lack of use of proper color-coded bags for source segregation at the micro level. Omar et al. (2012) found poor waste segregation practices, improper usage of color-coded bags, poor usage of waste containers, improper record keeping of waste generation quantities, the absence of temporary waste storage sites, and lack of training and awareness programs. Longe (2012) conducted a study in 20 healthcare facilities containing 20–600 beds in Ikorodu and Lagos state of Nigeria. They found that the healthcare facilities have a lack of waste treatment systems, lack of funds, and lack of professionally trained waste management officers.

Shiferaw et al. (2012) carried out a study to understand the causes of diseases occurring from sharps, blood, and bloodied body fluids to healthcare personnel. They found that less than 50% of workers wore gloves or boots, workers lacked knowledge of HIV and hepatitis B and that a lack of personnel-protective equipment led to the diseases. Kumari et al. (2013) discussed a report of the Civic Action Group (CAG), which pointed to the lack of awareness and lack of commitment of senior officials at the hospital and government level leading to poor HCWM in hospitals. Therefore, it has been argued by the researchers that there is an urgent need for a HCWM plan that could include the sound arrangement of a healthcare facility, using appropriate technology, operational plans, financial management, and timely training programs for staff, highlighting the importance of risk management within and outside of a hospital, the health and safety of healthcare workers, training programs, and an emphasis on segregation for recycling and better disposal of HCW.

Mostafa et al. (2009) carried out a study assessing the knowledge and awareness of doctors, nurses, ward boys, and housekeeping staff at Al-Mansoura University Hospital, Egypt. They revealed that the healthcare personnel, including doctors and housekeeping staff, did not have adequate knowledge and awareness about HCW. However, the results showed that training of nurses was positively related to the knowledge they carry about HCW. On the basis of the findings, they formulated and implemented protocols to enhance HCWM. Al-Khatib and Sato (2009) conducted a study to assess the implemented HCWM practices in the Palestinian Territory. They found that the practices were not implemented properly according to WHO standards; therefore, the policies, along with a comprehensive plan, should be implemented to provide a technologically sound and environmentally sustainable HCWM plan. Khammaneechan et al. (2011) conducted a study to assess the implementation of practices related to HCWM. Lakbala and Lakbala (2013) carried out a study to assess the knowledge and attitude of healthcare workers towards HCWM in Shiraz, Iran. Gavrancic et al. (2012) conducted a study to assess the implementation of a national strategy for HCWM at the Oncology Institute, Serbia. They evaluated the collection, segregation, storage, handling, transportation, and disposal of HCWs at this healthcare facility.

Ratkovic et al. (2012) assessed the efficiency of 35 healthcare facilities on the basis of technology implementation in the collection and disposal of HCW using a data envelopment analysis method in Serbia. They found that 60% (21) of the healthcare facilities were inefficient with an average level of inefficiency of 13%.

They stated that the findings of the study could be useful in providing insights for better planning and management of HCW. Chaerul et al. (2008) studied the interaction among the factors of HCWM using a system dynamics approach. They concluded that the implementation of an effective segregation plan would help in minimizing the risk as well as harmful emissions associated with the handling and disposal of this waste. Ali et al. (2016) conducted a study identifying the motivating factors for HCWM in developing countries. The indicators including cleanliness, implementation of legislation, training and awareness programs, and availability of funds, etc., for a healthcare facility were clubbed to form three motivating factors, i.e., reputation, liability, and expenses. They concluded that the concerns of the healthcare facilities vary considerably for liability and financial burden from one facility to another; however, it did not deflect much for the reputation of a healthcare facility in the implementation of a sound HCWM plan. Furthermore, they recommended analyzing the social, economic, environmental, and organizational factors using multi-criteria decision-making methods. Moreira and Gunther (2013) argued proposing a method for evaluation of an HCWM plan including quantitative and qualitative parameters for better monitoring. These parameters could be legislation, training and awareness programs, inspection of safety equipment provided to workers, and reduction in the volume of waste reaching sanitary landfilling sites with the help of enhanced segregation of waste. Lee et al. (2002) studied the potential of recycling plastic waste generated in hospitals. The advancement of technology such as the development of chlorine-free blood bags as an alternative to PVC, diminishes the harmful emissions associated with the incineration of waste (Altin et al. 2003; Ratkovic et al. 2012).

11.2.3 Review of the Studies Conducted on Disposal of Healthcare Waste

The disposal of HCW has been considered an important issue to be researched due to its social and environmental implications. In the reported studies, most of the research work has been conducted for estimating harmful emissions and poisonous gasses generated from the burning of this waste. This section reviews the reported studies for disposal-related issues and paves the way for management research of HCW.

Alvim-Ferraz and Afonso (2005) carried out a study for assessing the percentage of harmful emissions, which occur in the disposal of HCW. They found that the incineration of this results into the 80% harmful emissions, which could be curbed with the help of an effective segregation and disposal strategy of HCWM. Mbongwe et al. (2008) explored the need for an organized HCWM system so that the risk associated with the generation of harmful emissions in incineration could be computed and compiled. Cheng et al. (2009) stated that heavy quantities of infectious HCW were incinerated in hospitals that led to the production of large quantities of harmful emissions. Liu et al. (2013) stated that the incineration, steam sterilization,

microwaving, and landfilling could be the methods of disposal for HCW at a central waste disposal facility. The selection of a method of disposal depends on economic, social, and environmental factors (Dursun et al. 2011; Liu et al. 2014). Aghapour et al. (2013) recommended providing training and awareness programs for conducting the correct biological tests for the HCW for sterilizing and appropriate autoclaving of the infectious and hazardous HCW.

Bdour et al. (2007) studied the procedures, techniques, and methods of handling and disposal of HCW along with the qualitative and quantitative properties of HCW to assess the weight and physical properties, respectively. They noticed the lack of implementation of biomedical waste management rules that lead to poor segregation and high quantities of generation of HCW. Therefore, they recommended the urgent need to address the issues related to the collection, segregation, handling, storage, and disposal of HCW. Coker et al. (2009) stated that the formulation of policies and implementation of legislation regarding the collection, segregation, handling, transportation, and disposal for the safe management of HCW is needed in a country. Additionally, they suggested conducting regular training programs for the safe handling of this waste. Ratkovic et al. (2012) assessed the efficiency of 35 healthcare facilities on the basis of technology implementation in the collection and disposal of HCW using the data envelopment analysis method in Serbia. Gavrancic et al. (2012) evaluated the collection, segregation, storage, handling, transportation, and disposal of this healthcare facility. Sartaj and Arabgol (2014) carried out a study for the assessment of HCWM practices such as collection, segregation, handling, storage, transportation, treatment, and disposal in Isfahan Province (Iran).

Di Bella et al. (2012) concluded that onsite incineration is an effective solution for developing countries such as Somaliland. Lee et al. (2004) stated that the combination of onsite incineration with microwave technologies for the treatment and disposal was the most sustainable approach in terms of economic and environmental sustainability. However, Taghipour et al. (2014) assessed and compared onsite treatment and disposal with off-site treatment and disposal of HCW. They noted that onsite treatment and disposal of HCW lack plans, finances, the determination of the capacity of the installations, proper operations, and maintenance. Therefore, they suggested the centralized off-site treatment and disposal of HCW. Karagiannidis et al. (2010) argued that a central HCW treatment and disposal firm assists the hospitals in reducing the environmental impact and cost of disposal of HCW.

Nema et al. (2011) highlighted the importance of private players, such as common HCW disposal firms or outsourcing firms. Therefore, it was suggested that hospitals use services from these centralized HCWM treatments and disposal firms for safe disposal of this waste (Abdulla et al. 2008; Verma et al. 2008; Bendjoudi et al. 2009). Graikos et al. (2010) suggested the disposal of infectious HCW with the help of an outsourcing firm for safe and cost-effective disposal. Ho (2011) conducted a study for the selection of an appropriate HCW disposal firm for the hospitals of Taiwan using fuzzy analytic hierarchy process. Hsu et al. (2008) addressed the problem of selection of an HCW disposal firm for the hospitals of Taiwan. They recommended that the selection of a sustainable HCW disposal firm by a hospital depends on the contractor's qualification, contractor's service capability, contractor's equipment, etc.

Liu et al. (2014) conducted a study for the selection of an HCW treatment and disposal technology using a multi-criteria method (interval 2-tuple MULTIMOORA). They recommended dealing with the issue of HCW disposal/outsourcing firm selection using multiple criteria.

Ciplak and Barton (2012) carried out a study for selecting and planning the treatment capacity of an HCW disposal firm with the help of a system dynamics approach. They recommended the application of multi-criteria decision-making methods for selecting an appropriate HCW disposal firm. They also suggested the consideration of environmental, social, and economic criteria for the waste disposal firm's facility location. Ruoyan et al. (2010) pointed out that a sufficient budget and attentive administrative monitoring is required for the establishment and function of an off-site common HCW treatment and disposal facility. The future capacity planning of a disposal firm for the disposal of HCW was another major issue highlighted by authors.

The studies reveal that healthcare facilities produce a high content of waste materials that could be recycled with the help of competent technology and infrastructure (Lee et al. 2002; Altin et al. 2003; Jang et al. 2006; Coker et al. 2009; Sawalem et al. 2009). Additionally, some researchers criticized the process of waste disposal through incineration, dumping, or landfilling (Alvim-Ferraz and Afonso 2005; Tamplin et al. 2005; Nemathaga et al. 2008; Adedigba et al. 2010). Some researchers emphasized the benefits of HCW recycling that could outweigh the other treatment and disposal methods (Jang et al. 2006; Bdour et al. 2007; Campion et al. 2015). HCW recycling is a more sustainable approach because it adds weight and covers the shortfall and weaknesses of other disposal methods.

Countries like India and China account for almost 38% of the world's population and generate a large amount of waste: therefore, there is a need for research in HCWM in these countries. Although we have found that many of the HCWM studies from these countries have focused on the computational aspects of generated waste and its composition. Many of them have suggested improving segregation practices by waste separation at the source, leading to minimum waste for incineration and landfilling, thereby increasing the scope of recycling. Although past studies highlighted the seriousness of the issue in the future, a study of the development of a comprehensive and sustainable plan for HCWM to deal with the large quantities of HCW in these countries is missing in the literature. Therefore, it can be concluded from our review of literature that there is an evident need for better HCW disposal alternatives, such as recycling, to address issues with the environment, human health, and resource conservation.

Based on a review of literature in the abovementioned three sections, it can be stated that the previous studies have attempted to work upon a specific issue instead of providing a complete managerial solution model to hospitals and waste disposal firms. Majorly, the work included the understanding of waste generation rates, assessing the impact of training and awareness programs on healthcare waste management, the disposal of healthcare waste and the impact of toxic emissions on the environment. A few behavioral studies have focused on establishing the relationship between the attitude of a healthcare worker and the quantity of waste generated. However, the

studies such as identifying and analyzing the drivers for effectively managing healthcare waste at hospitals, comparatively assessing the waste management of different hospitals, selection of healthcare waste disposal (outsourcing) firms, the identification of an appropriate location for establishing a plant for waste disposal, the capacity planning of a healthcare waste disposal plant, the optimization of resources in collecting healthcare waste from hospitals for disposal at plant, and the plant layout design, has not been paid adequate attention in the literature.

11.3 Research Gap and Research Problem

In a nutshell, it can be stated that the development of this multi-criteria decision support framework would help in addressing the following issues/gaps:

- To select and model the drivers of HCMW to understand their interrelationships.
- To evaluate the selected drivers and develop a comparative assessment model on the basis of these drivers.
- To assist the hospitals in selecting an appropriate HCW disposal firm with the help of a hybrid model.
- To assist the HCW disposal firms in the selection of healthcare waste disposal facility locations.
- To develop a forecasting model of HCW generation for assisting HCW disposal firm in its capacity planning.
- To formulate a reverse logistics model for optimizing the resources used for collecting healthcare waste from hospitals.

Hence, to address this void in the literature, the development of a theoretical decision support framework would assist the key decision makers in making effective decisions for enhancing healthcare waste management in developing countries.

11.4 Research Methodology

The objectives highlighted in the previous section can be handled effectively using multi-criteria decision-making methods such as interpretive structural modeling method (ISM) (Warfield 1973), total interpretive structural modeling (TISM) (Sushil 2012, 2017; Khatwani et al. 2015), decision-making trial and evaluation laboratory method (DEMATEL) (Fontela and Gabus 1976), analytic hierarchy process method (AHP) (Saaty 1990), analytic network process method (ANP) (Saaty 2004), technique for order preference by similarity to ideal solution method (TOPSIS) (Hwang and Yoon 1981). The optimization models such as integer linear programming, deterministic, dynamic, stochastic, and goal programming can be used for reverse logistics

model development for waste collection (Ware et al. 2014). The statistical methods such as regression and ARIMA modeling help in understanding the co-relation and planning of healthcare waste disposal (Chauhan and Singh 2017).

11.5 Proposed Multi-criteria Decision Support Framework for HCWM

Healthcare waste management of a country highly depends upon the positive participation of key decision makers toward this issue. The key decision makers include the hospital for managing the waste within its premises and the healthcare waste disposal firms, which collect and dispose of the waste at a safe place. In hospitals, the key participants of the waste management team consist of a waste management officer, medical superintendent, head nurse, and other members. The waste management team has the responsibility to continuously monitor the management of waste with the given economic and environmental constraints. The decisions within the premises of hospital are most likely related to the hygiene, separation, temporary storage, and treatment of waste. Hence, to assist hospitals in decision-making, there are four key decision points, i.e., D1, D2, D3, and D4 that have been mentioned in the developed theoretical decision support framework (Fig. 11.1). Similarly, the four key decision-making points for healthcare waste disposal firms, i.e., D5, D6, D7, and D8, which include selecting a location for establishing a waste disposal plant, network design for waste collection, its capacity planning, and process selection for disposal, have been mentioned in Fig. 11.1.

In practice, the eight vital decisions which have been highlighted in Fig. 11.1 is most likely taken in a dynamic multi-criteria scenario of decision-making. The decisions D1, D2, D4, D5, and D7 are completely taken based on multi-criteria focused analytical modeling. The Decisions D3, D6, and D8 would be best achieved using the hybrid of statistical, multi-criteria, and mathematical modeling.

Apart from hospitals and waste disposal firms, the third party which is held responsible for the management of healthcare waste is the pollution control board. The pollution control board monitors the situation of waste management in hospitals on the basis of the guidelines provided by the government. As discussed, the ministry of environment and forest in India formulates the rules and policies related to healthcare waste management. The pollution control board of India helps in implementing the policies for better healthcare waste management. The decision support framework developed in this chapter vividly helps the ministry and pollution control board for making and implementing policies in a more effective manner. The comparative assessment model developed for taking decision D2 would immensely help the pollution control board in overcoming its manpower deficiency problem and correct assessment of waste disposal of hospitals. Similarly, the model developed for

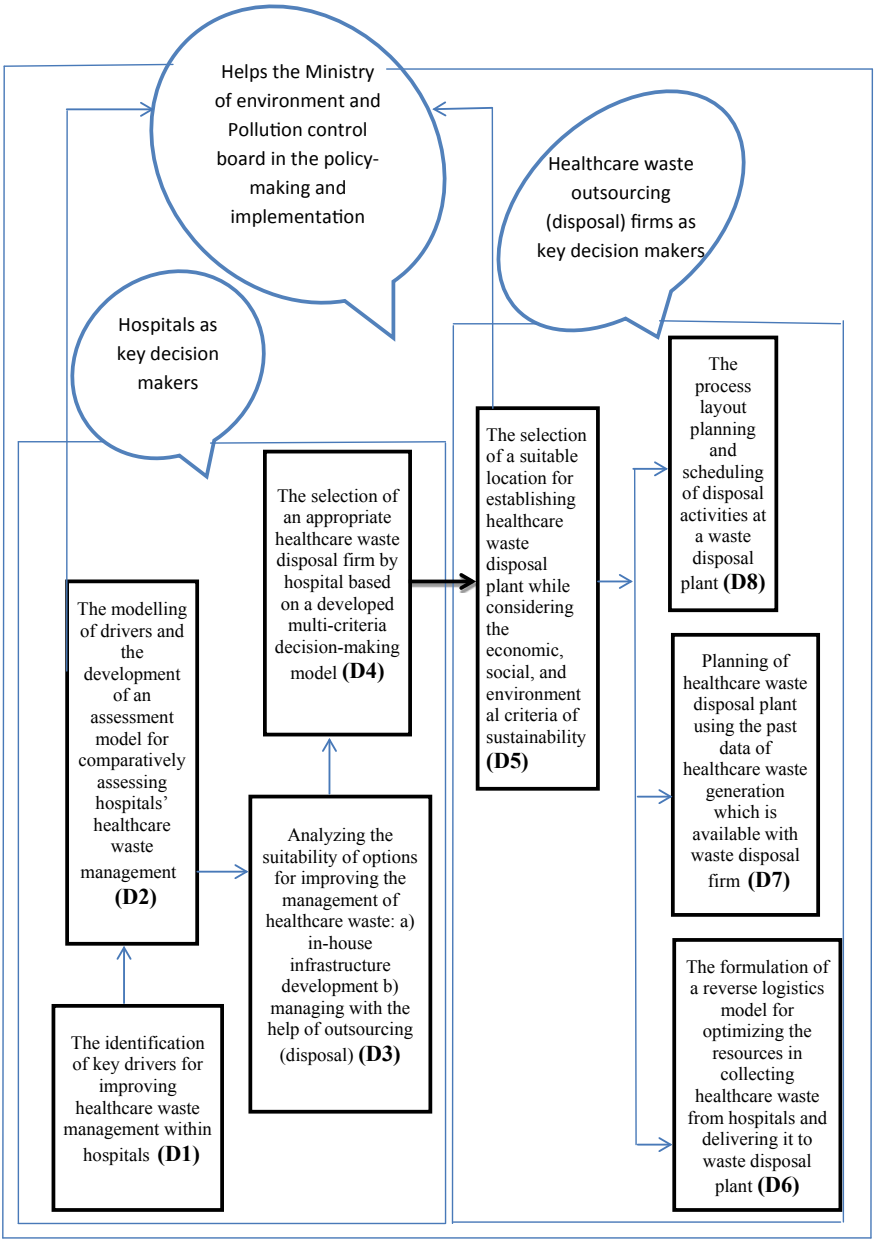

Fig. 11.1 A theoretical decision support framework for addressing healthcare waste management issues in developing countries

taking decision D5, i.e., the selection of an appropriate healthcare waste disposal plant location, would help the ministry in formulating the policy related to location requirements for establishing a waste disposal plant.

11.6 Implications: Contribution to Theory and Practice

The research objectives identified and discussed for addressal with the help of different multi-criteria, optimization, and statistical modeling would be very beneficial from the perspective of society, environmental bodies, hospitals, and other stakeholders. The proposed decision support framework is a complete solution for the typical issue of healthcare waste management in India. On one side this decision support framework is complete and capable in terms of protecting the environment and society; whereas, on the other side it shows the path for the development of a successful business model from this type of neglected and loss-making businesses. With this, not only the hospitals and healthcare waste disposal firms' business strategies would become profitable, but also their operations would become proficient and lucrative to attract positive public attention.

11.7 Conclusion

The proposed decision support framework, which is based on multiple criteria provides a line of action for hospitals and waste disposal firms for effective management of healthcare waste in an economically, environmentally, and socially sustainable manner in developing countries. Since the eight key decision points which have been highlighted in Fig. 11.1 are majorly based on multiple criteria; therefore, the implementation of the proposed framework would be very effective and sustainable for practitioners. With this proposed framework, the key decision makers would be benefited in terms of saving on financial resources and time, overcoming manpower inadequacy, creating positive word of mouth, and improved social acceptability. The implementation of the proposed framework by hospitals and waste disposal firms could be proved as a self-acting algorithm in diminishing the complaints of the public regarding environmental issues generated from the activities related to healthcare waste disposal. The increased level of public satisfaction, especially in terms of environmental matters, inevitably shows a win–win situation for the public as well as administration.

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Chapter 12
Sentiment Analysis: An Effective Way of Interpreting Consumer's Inclinations Towards a Brand

Anurag Tiruwa, Rajan Yadav and P. K. Suri

Abstract Sentiment analysis is an analytical technique, which classifies textual data and collates it into clusters of text that contains opinions on a certain topic, post,/news, etc. It has been used to find consumer or user sentiments on various platforms, but very few studies have done any such analysis in the context of Facebook Brand Pages (FBPs). This chapter aims to shed light on the usage and applicability of the said technique to understand consumers sentiments through analysis of their comments on Facebook Brand Pages (FBPs) owned and moderated by Pepsi®. The data collected was further analyzed to understand the inclination of the consumer sentiments from two perspectives, i.e., negative and positive. It further discusses the analyses and presents the inference concerning the comments and the sentiments of consumers/users toward the social media engagement of the FBP moderated by Pepsi®. This chapter will help the marketers to understand the customer's emotional engagement and their inclinations toward the promotion/brand.

Keywords Facebook brand page · Online customer engagement · Sentiment analysis · Social media

12.1 Introduction

The role of the social media platform has increased during the past few years as the buying behavior of the consumer has been influenced by online brand communities, reviews about the product on social media platform and word of mouth (Eisenberg and Eisenberg 2007; Cheung and Thadani 2012; Munir et al. 2018). Trust in a company or brand is influenced by a user's peer group or the community with which he/she interacts regularly through various social media platforms. It is no longer

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dependent on the traditional channels of marketing and promotion used by organizations. Therefore, to reach and market products to these customers, brands have to allocate a significant budget to social media marketing promotions and creating digital media strategy for marketing.

Brands and marketers now have access to heaps of data generated by the consumer on a social media platform. This data can be processed to learn and understand deeper insights into consumers psychography. The comments that are posted by consumers on social media platforms generally contains information, which can be processed through qualitative analysis. Sentiment analysis has become a strong device for brands and marketers to assess the inclination of the consumers while they engage with them on social platforms like Facebook. Natural language processing software is available—both open source as well as licensed—which are being used by the marketers to find the sentiment of consumers for the social media engagements posted by them on the social media.

This chapter aims to study the effectiveness of a social media campaign run by companies; it involves the study of various customer engagement practices followed by the company. The chapter focuses on the attitude and behavior of the consumer for evaluating the success and effectiveness of the campaign. The same was measured by using sentiment analysis to assess the opinion of the consumer toward a particular post or the brand. For the purpose of discussing the usage of sentiment analysis, social media activities of the leading beverage player Pepsi® were explored and analyzed.

12.2 Digital Media Landscape

Digital Media is defined as audiovisual media contents and applications that are distributed directly over the Internet. This includes digital video contents (e.g., movies, series, and TV shows), digital music provided as download or Internet stream as well as digital games for different devices and electronically published content such as e-Books, e-Magazines, or e-Paper (Statista 2016). The Indian media and entertainment sector is expected to reach US$100 billion by 2025, from its estimated size of US$17.85 billion in 2015, due to its large capacity to consume new products and businesses. ScoopWhoop, an Indian digital media and content start-up, has raised US$4 million from Kalaari Capital and plans to use the funds for expansion of its video production unit called ScoopWhoop Talkies (Ibef 2016). Revenue in the "Digital Media" market amounted to 2,306.7 million USD in 2016 (Statista 2017).

In India, the Internet is penetrating the masses and is available to the majority of the population through mobile Internet usage (Tiruwa et al. 2016). With the advancement in the high-speed internet connectivity, it is expected that soon the majority of the population will be enabled by this Internet Revolution to enable more and more people to actively participate in the social media and e-commerce platforms and to create a positive network effect for further growth (mmaglobal 2017). Therefore, the expenditure on digital ads, which comprises of social media strategies that range from search and display ads to mobile, email and multimedia ads, sponsored content, etc.,

will increase. Mobile advertisement spends, and social media aided digital video advertisement spends are expected to grow at 50.9% and 40% annually between 2016 and 2021, respectively (Brand Equity 2017). Therefore, marketers need a way to measure the repercussions of these digital ad campaigns on various digital media platforms or to assess the need of deploying any such ad campaign by listening in on what consumers are saying about them they need to make flexible changes in their marketing plans to accommodate any future needs that might arise. Thus, making the strategic management of the marketing plan flexible (Sushil 2016).

12.3 Marketers at Social Media

A few years back, brands were more interested in creating and managing their communities rather than focusing on customer engagement. But currently the marketers and brand have shifted their focus to Building Brand Awareness, Building a Community and Customer Engagement on social media platforms (Anderson 2006; EY 2014). About 81% of the brands considered Facebook to be the most important platform, while almost 48% of surveyed brands think that Twitter is the second-most important platform to be on, closely followed by YouTube (43% surveyed brands considered it to be the third–most important channel) (EY 2014). Marketers also created their own YouTube streaming channels to produce and stream video content to promote, market and showcase any development for the brand. Most of the marketers prefer creating a 360° integrated campaign and then extending the mainline campaign on social media. To add to this change in thinking, media-savvy social brands also prefer campaigns exclusively designed for social media. Designing a campaign just for Facebook and Twitter is on a major decline at just 10.53% (EY 2014).

The popularity of social media as a platform to engage customers is rising, leading to new business models that integrate SNS platforms with a focus to interact and connect with the customer. The prime goal is to influence the potential consumer and keep the current customers engaged through the various capabilities of the social media platforms (Kietzmann et al. 2011; Yadav 2015; Tiruwa et al. 2016). Marketers are now aware of the benefits of integrating social media into their businesses and are currently using social media strategies to reach the masses. Marketers have now understood the role of the brand communities and have started to keep a watch over the user-created Communities. Also, the integration of brand communities owned by marketers on various SNSs has become an integral part of the marketing strategy (Constantinides et al. 2008; Tiruwa et al. 2016). These SNSs provide a number of opportunities to the marketers to collect data and analyze it further to understand the customers' perception and attitudes toward the brand. The inferences from their perceptions can be used by the brand to make plans and promotions to keep the customers engaged with the band and its products.

12.4 Sentiment Analysis

Including Social media platforms as part of the integrative promotional business strategy is not enough, measuring its effects is important too. Social media like Facebook comprises of user data in the forms of comments, likes, and shares. This big data can be utilized to understand whether social media marketing or engagement is having some effect on engaging users or not. Sentiment analysis is one such field that analyses people's opinions, sentiments, evaluations, appraisals, attitudes, and emotions toward entities such as products, services, organizations, individuals, issues, events, topics, and their attributes (Tiruwa and Yadav 2015; Lexlative 2017). It refers to the general method to extract subjectivity and polarity from the text. Sentiment analysis is also known as opinion mining, and it refers to the use of natural language processing, text analysis, and computational linguistics to identify and extract subjective information in source materials. It also encompasses the extraction, identification, or characterization of the sentiment content of a text unit. It is widely applied to reviews and social media for a variety of applications, ranging from marketing to customer service (Mozetič et al. 2016). Opinion mining can be useful in several ways. It provides companies with a means to estimate the extent of product acceptance and to determine strategies to improve product quality. The sentiment found within comments, feedback, or critiques provides useful indicators for many different purposes (Condliffe 2010). It facilitates policy-makers to analyze public sentiments concerning policies or public services (Cambria et al. 2013).

It can be beneficial for marketers to assess the successfulness of a digital media campaign or the launch of a new product. Also, it can be determined, which product or service is most identified by the consumer and more popular among them. For example, a review about a newly launched digital camera might be positive, but if the review focuses on its being heavy, it might weigh on the consumers' perception and decision to purchase. If the marketers can identify such information from the interactions, discussions, and comments on the social media platforms, it would give them an edge to foresee such negative effects. They can get a better understanding of the public opinions as compared to a survey or a focus group as the data is user generated in the form of comments (Ramarjun et al. 2016). Sentiment analysis evaluates statements found across various social platforms to determine whether they are positive or negative with respect to a particular brand. A firm might track sentiment analysis over time to (1) determine whether their actions improve or damage sentiment; (2) track brand reputation; (3) test how marketing efforts affect attitudes toward the brand; (4) attitudes toward new products (Hausman 2013).

12.5 Research Methodology

12.5.1 Significance and Scope

The chapter is to examine the importance of brand sentiment analysis. The focus is to analyze various posts and campaigns initiated by Pepsi® on Social Media Platform Facebook. This chapter aims to understand the sentiment of the population engaging on these posts from the lexicon-based sentiments analysis on the user comments on the different types of posts on the Pepsi® Facebook Brand Page (FBP).

12.5.2 Research Design

Research design specifies a framework for conducting the research work. This study follows a descriptive research design, where secondary data was collected from online posts to analyze the sentiments of the users active on the social media platform (Kozinets and Kedzior 2009). For identifying customer sentiment about the campaign of Pepsi®, a food and beverage company, publicly shared Facebook posts and users comment on the same were collected and processed.

12.5.3 Research Technique

Sentiment analysis was conducted by analyzing the different type of content posted by companies on their Facebook page, and a set of a commonly used set of positive, negative, and neutral words was identified. Collected data is cleaned in excel using Sementria®, a plugin for Microsoft Excel®. Visualization and the analysis of the comment sentiments were done on Tableau®. Further, Word dictionary is created which depicts the words or the phrases used frequently and are categorized as positive and negative words.

12.5.4 Population and Sample Size

The population under study includes all the males and females, who follow the Pepsi® FBP and the entire friend list or followers of these users. The sample size includes the active users who posted content on the various posts of the brands.

12.5.5 Data Collection

Online posts were collected using the online tool provided at www.84code.com and is exported into .csv format. The unstructured data content was cleaned and processed for further analytical purpose. The comments of users who have liked the FBP were captured. Data were collected from September to October 2017. During this period, Pepsi® posted content relating to India Australia Cricket Tournament and encouraged users to post pictures with Pepsi® to win a chance to meet the Indian Cricket Team Captain Virat Kohli. Since the duration of this tournament was overlapping with the festive season of Diwali, the brand page also posted content relating to the festive season.

12.5.6 Research Tools

The Research Tools used for conducting the study include Facepager®, Microsoft Excel®, Sementria® for Excel®, and Tableau®.

a. **Facepager®**—Facepager® was made for fetching publically available data from Facebook, Twitter, and other JSON-based APIs. All data is stored in an SQLite database and may be exported to .csv format. The data was extracted from Pepsi® by providing the username provided in the URL, which acts as an object for Facepager®.
b. **Microsoft Excel®**—Microsoft Excel® is a spreadsheet developed by Microsoft for Windows, Mac OS X, Android, and iOS. It features calculation, graphing tools, pivot tables, and a macro programming language called Visual Basic for applications. The data exported to CSV format is cleaned using Microsoft Excel®.
c. **Semantria® for Excel®**—Sementria® for Excel is developed by Lexalytics®. It provides a fast and accurate categorization of data into the positive, negative, or neutral tones embedded in the content. It attaches sentiment score to each theme, phrase, and entity. Sementria® plugin was installed to analyze the sentiment of consumer towards the social media campaign and the brand.
d. **Tableau®—**Tableau®, developed by Tableau® Software, is software used for business intelligence and analytics. It produces a family of interactive data visualization based on data. The structured result produced after processing data using Sementria® was analyzed in Tableau®.

12.6 Data Analysis and Findings

Sentiment analysis was incorporated by analyzing posts of various kinds posted by companies on their Facebook page. Content posted by the company on their respective pages can be classified as of type—photo, video, status, link, and event.

Post of each category was selected, and analysis was performed by capturing the comments by the users who have liked the Pepsi® FBP. Pepsi® was able to grab the attention of its targeted audience by posting the content frequently, and most of the content posted used hashtag and was related to contests. The analysis of various posts shows that customer engagement was done very well and can also gain no of followers and likes in the future.

12.6.1 Post 1

The post analyzed was of the type—photo; it received 73 K no. of likes and was shared by 154 users. Table 12.1 shows the calculated value of sentiment for each comment. Document sentiment indicates the value of the sentiment and document sentiment ± indicates the polarity.

Table 12.1 Sentiment score and polarity for users comment—Pepsi®—Post 1

Document sentiment	Document sentiment ±	User comments
0.51	Positive	#IndVsAusi hope to win. I love Pepsi
0.60	Positive	#WithPepsii I love Pepsi
0.52	Positive	Don't worry be happy, drink Pepsi® and feel good
0.47	Positive	Drink Pepsi feeling happy ndwin d match virat
0.47	Positive	#IndVsAus I HOPE ME WIN AND MEET VIRAT
0.44	Positive	won with Pepsi..hahahaaha
0.60	Positive	#WithPepsi…i love Pepsi
0.44	Positive	won with Pepsi
0.65	Positive	excellent..outstanding…lovely Pepsi
0.60	Positive	love virat
0.51	Positive	best of luck to u and ur team for next match against Aussies
0.49	Positive	Best wishes to one and all #Pepsi
−0.05	Negative	bad for health
0.52	Positive	nice nicely
0.5	Positive	#WithPepsi. feeling happy
0.5	Positive	Nice pic viratkohlisuperrrrrrr
0.5	Positive	Good
0.44	Positive	won with Pepsi

(continued)

Table 12.1 (continued)

Document sentiment	Document sentiment ±	User comments
−0.60	Negative	Nonsense
−0.60	Negative	Pepsi is bad

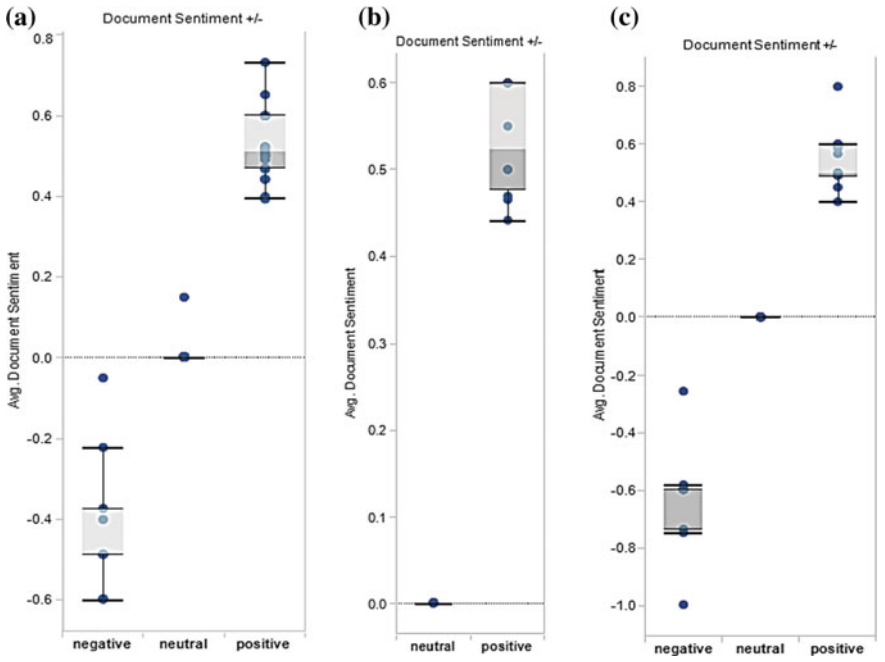

Fig. 12.1 **a**, **b** and **c** Box plot for the analyzed posts—post 1, 2, and 3

Table 12.2 Classification of keywords as positive and negative sentiment

Sentiment	Keywords
Positive	love, win, hope, win, won, best, good, happy, awesome
Negative	Bad, unhealthy, nonsense, damages

Figure 12.1a depicts the average value of the positive and negative value of comments. Tableau® was used to plot the box plot. The plot represents that consumers have a neutral opinion but with alignment toward positivity for the post. The post has an average sentiment value of 0.095.

Frequently used phrases and keywords used in comments were identified and classified as positive and negative based on the opinion of the consumer on the post. Table 12.2 represents the keywords as per the sentiment category.

The consumers had a slightly positive opinion about the campaign and posted their selfies with Pepsi® bottle in the comments. #IndVsAus was used with along with the photos posted. Although few consumers did not find it good, the overall sentiment was positive.

12.6.2 Post 2

The post analyzed was of the type—status; it received only 93 no. of likes and was shared by only three users. Table 12.3 shows the calculated value of sentiment for each comment. Document sentiment indicates the value of the sentiment and document sentiment ± indicates the polarity.

The box plot represented in Fig. 12.1b indicates that consumers had a positive opinion for the post. The sentiment value for the post analyzed was 0.54. No negative keywords were identified. Frequently used phrases and keywords used in comments were identified and classified as positive based on the opinion of the consumer on the post. Table 12.4 represents the keywords as per the sentiment category.

The consumers had a positive opinion about the campaign and posted their selfies with Pepsi® bottle in the comments. Comments showed excitement toward the campaign. It can be inferred that the contest would be able to attract and engage customers.

Table 12.3 Sentiment score and polarity for users comment—Pepsi®—Post 2

Document sentiment	Document sentiment ±	Comments
0.50	Positive	feeling happy with Pepsi
0.60	Positive	#SayItWith #Pepsi love #Pepsi #WithPepsi..
0.55	Positive	Pepsi mojo what a nice game i hope i win a chance and have fun with Virat Kohli
0.60	Positive	#Pepsi I love it #WithPespi. my first selfie
0.60	Positive	#Pepsi love
0.50	Positive	YoPepsi is #feeling_happy
0.44	Positive	#WithPepsi drink Pepsi and win

Table 12.4 Classification of keywords as positive and negative sentiment

Sentiment	Keywords
Positive	love, win, hope, win, won, best, good, happy, awesome

12.6.3 Post 3

The post analyzed was of the type—video; it received 1.9 M likes and was shared by 800 users. It received 439 K views. Table 12.5 shows the calculated value of sentiment for each comment. Document sentiment indicates the value of the sentiment and document sentiment ± indicates the polarity.

Figure 12.1c depicts the average value of the sentiment of comments. Even though positive comments were more as compared to negative in number, the presence of an almost equal number of neutral comments diluted the positive comments. Also, the phrases and the words used in negative comments were more negative as compared to the positive comments. Therefore, consumers have a slightly negative sentiment toward the post as also depicted by box plot. The post has a sentiment value of −0.09.

Table 12.6 represents keywords categorized as per the sentiment category. Frequently used phrases and keywords used in comments were identified and classified as positive and negative based on the opinion of the consumer on the post. The consumers had a slightly negative opinion about the campaign.

Table 12.5 Sentiment score and polarity for users comment—Pepsi®—Post 3

Document sentiment	Document sentiment ±	Comments
0.58	Positive	creative advertisement
0.49	Positive	This always make me smile
0.60	Positive	#HappyPepsi #Pepsi
−0.60	Negative	Nonsense
0.56	Positive	loved it
0.80	Positive	#HappyPepsiToYou #HappyDiwali
−0.75	Negative	Poison is out
0.58	Positive	I liked cool can
−0.60	Negative	Nonsense
0.60	Positive	Nice ad
0.56	Positive	loved it
0.50	Positive	nice song

Table 12.6 Classification of keywords as positive and negative sentiment

Sentiment	Keywords
Positive	love, enjoy, nice, super
Negative	Nonsense, poison, bad, not good, confusing

12.6.4 Overall Analysis

Pepsi® had been able to manage the promotions and campaigns very well; the reason for the same being its association with Indian Cricket team during the India-Australia Series and the number of contests and customer engagement activities(Pepsi® India, 2016). Pepsi® keeps the campaign alive by posting content about the same campaign for a few days continuously in various forms. Introduction of anew product like a mini can, or pet bottle with emoji label was done through various activities and contests. This promotes the sales of the new product; the target audience increases as friends of the followers see the activity in their respective Facebook feeds.

On analysis of 3 posts of Pepsi®, posted during the month of September–October, the overall performance in engaging followers of Pepsi® appears to be good. The attitude of consumer remained positive in maximum cases and negative only in two cases. The comprehensive sentiment calculated comes out to be slightly positive with a value of 0.022. Entities that occurred frequently includes—Pepsi, PepsiCo, #WithPepsi, #IndVsAus, #HappyPepsiToYou (Table 12.7).

Table 12.7 Summary of the analysis of the posts

S. no.	Measure	Pepsi®
1	Polarity	Positive
2	Sentiment	0.022
3	Max liked post	Photo
4	No of likes	73 K
5	Max shared post	Video
6	No of share	800
7	Most positive post	Status
8	Value	0.54
9	Max commented post	Photo
10	No of comments	198
11	Video	−0.09
12	Photo	0.095
13	Status	0.054
14	Link	0.15
15	Frequency of positive keywords	76
16	Frequency of negative keywords	27
17	Top positive keywords	Love, win, hope, nice, loved, awesome, enjoy, happy, best, super
18	Negative keywords	Bad, hate, nonsense, mad, poison, confusing, damages, not good, irritating, unhealthy

(continued)

Table 12.7 (continued)

S. no.	Measure	Pepsi®
19	Entity identified	Pepsi, #Pepsi #WithPepsi, #IndVsAus, #HappyPepsiToYou
20	Entity sentiment	−0.52

Fig. 12.2 Word cloud for the most frequently used words in the Facebook posts

Figure 12.2 represents Word Cloud; the size indicates the average value of phrase sentiment based on the frequency with which it has been used to represent a sentiment in the comments for the selected posts discussed in the previous sections.

As per the analysis of the posts, an observation made indicates that user does not comment on the content related to posts; instead, in most of the cases express an opinion about the product or the theme. Indian Cricket Team or player or a Bollywood actor featuring in the advertisement could be an object for discussion. The attitude toward the post holds valid only in the case where marketers promote the post as a contest. Some people relate the product as an unhealthy drink, which should not be consumed. While some consumers find it as a source of happiness and fun. In the case of Pepsi®, the average value of sentiment for the post is positive. On analyzing, entity sentiment which depicts the true opinion of consumer toward the product, the value comes out to be negative for Pepsi®.

12.7 Discussion

The study indicates the opinion of consumers for the FMCG sector with Facebook Brand Page of Pepsi® as the subject of study. The analysis of the posts indicates that followers' comment on the content is not directly related to the topic of the content in most of the time, the comments relate to the celebrity featuring in the post or old jingles of the brand were used. Negative attitude mostly concerns with ill-effect of the

product on health and based on that users show displeasure. Similarly, the consumers who find the product tasty indicates the love for the brand. Hence, a positive opinion was observed. Only a few users post content related to the post. The opinion about posts mostly reflected in the case of contests and videos followed by events. Out of all types of post—status, photo, video, link, and event; sentiment related to the content was observed in the case of video. Finally, the majority of the negative comments were related to Pepsi® being unhealthy and not fit for consumption. The brand needs to address the same with better campaigns to restraint customers perceiving their product and brand as harmful to health. Pepsi® could post some content related to the product in the form of infographic educating people about the product and brand. Also, with that, some campaign showing social responsibility toward society.

Social media has made it easy for consumers to directly communicate with brands and marketers. The communication capabilities of the social media platforms have given the brands an opportunity to closely monitor and understand the consumer's attitude toward their brands/products. Consumers attitude and their sentiments toward a brand are important to marketers, and it gives them perspective and understanding to strategize better. Social media provides a plethora of consumer data, and Sentiment Analysis is one of the ways through which marketers get information about the consumers' inclinations toward a brand. As seen from the study, it was concluded that sentiment analysis could be used to understand the consumer's attitude and inclinations through the text analysis of the communication on the social media platforms.

12.8 Managerial Implications and Limitations

The information from sentiment analysis helps to gain useful insights about the product like the product seems to be unhealthy. Therefore, the company should position itself accordingly. The marketers should build content to encourage users to engage and participate. The focus should be on the content and videos, as they attract the audience and the comments made relates to the topic of content. Different types of content for the same campaign should be updated on the page more frequently, as it increases the follower engagement with the brand. Another important understanding from the study is that consumers should be encouraged to use hashtags to be eligible for the contest. This would motivate followers to comment related to the post and not their random thoughts and also create buzz for the brand as a trending topic on the internet.

The study was focused solely on FMCG sector, and only one FMCG brand was considered for data collection and analysis. There are a plethora of social media platforms, where both people and brands are actively participating; this study was limited to SNS Facebook. Software tool Facepager® has a limitation that it cannot retrieve 500+ comments at a time for a given post; thus we can say that analysis was based on the limited data. The software which analyzed the comments was restricted to analyze only English language so there might have been instances where comments

written other than English were not considered fit for analysis. The demographics of the users cannot be established and taken into consideration while analyzing the data. There is future scope for the study regarding a comparative study between two similar brands in different social media platforms.

12.9 Conclusion

Brands and marketers need to understand the costumer's inclination or attitude toward them to strategize accordingly. Social media has provided a platform from where they can get a huge amount of data which can be processed to develop the said understanding. Quantitative methods are undoubtedly useful in finding more about customer's attitude and behavior, but organizations now are moving toward the qualitative analysis of the data in order to understand customers' inclinations. Social Media platforms like Facebook gather data in the forms of comments from the users, which can be processed through language processing tools to find meaningful information. Sentiment analysis can be utilized by the marketers to assess the implied inclinations of the customers about their product/services from their engagements (comments) on FBPs moderated by the marketers. As the study discussed in this chapter depicted, it is quite useful to understand and measure the online engagements from the perspective of customer sentiments. The results of the study indicate the sentiment toward each post and company as an overall entity. It was observed that the Pepsi® received positive sentiment in most of the cases. The study was also useful in finding out the keywords, which might give an insight into understanding the reasons for customers' positive/negative sentiments. It was noted that Pepsi® posted interrelated content frequently, which continuously engaged the customers. Pepsi® also received negative sentiment at the entity level, therefore, as per the recommendations. Pepsi® can work on customer interaction more, converting the negative sentiment into a positive one.

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Part III
Supply Chain Flexibility

Chapter 13
Channel Collaboration in E-commerce: A Study on Channel Relationship from the Perspective of Vendors Selling on Online Platforms, the E-retailers

Rajan Yadav and Swati Bhatnagar

Abstract Businesses today are getting agile with the infusion of new age information and communication technologies. In order to achieve business excellence, firms must possess strategic flexibility. They should focus not just on launching innovative products and services but also focus on how to deliver it or how to make it available to the market. In order to ride the uncertainty of the business environment and the risk associated with the same, firms must have strategic flexibility in marketing, finance, operations, information technology, and supply chain. Marketing flexibility can be realized by having channel collaboration in the value chain so that the value chain become more adaptive, responsive and sustainable. Marketers, therefore, today are exploring all possibilities of inter or intra-firm collaborations and coming up with business solutions with the sole objective of creating customer value. One such collaboration which has transcended all business boundaries and is transforming the landscape of the business in the twenty-first century is e-commerce. Fuelled by the meteoric growth in the advancement of communication and information technology, e-commerce has come about as an important marketing channel, which firms can no longer ignore. Indian e-commerce is pegged to reach the staggering US $35 bn by 2020. These online exchanges through the Internet are bringing together buyers and sellers in an interesting manner, which has not been witnessed earlier. Amazon Flipkart, Snapdeal, and many others in their marketplace model have collaborated with a huge set of vendors across the country for supplying goods and services to the end consumer. Amazon and Flipkart had more than 1,00,000 registered vendors in January 2017!! In this context, this chapter attempts to investigate the nature of collaboration between the vendors and the e-retailers and identify important elements of their trade relationship which contributes to general satisfaction in this electronic channel relationship.

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Keywords Channel collaboration · Channel relationship · Distribution · Electronic distribution channel · E-retailers · Marketing channel · Marketplace model · Vendors

13.1 Introduction

13.1.1 Overview of Indian E-commerce Industry

Information technology today is the backbone of any firm's strategic infrastructure. Managers are exploring all possible ways in which information technology can be used to link firms with their suppliers and channel partners. Electronic commerce or e-commerce is one such arrangement, where vendors or suppliers register with the e-retailer and get their products sold to end customers. E-commerce in India is witnessing an unparalleled growth rate, particularly in the past five years. Consider this; Amazon had pumped in Rs. 2,900 crores into Amazon Vendor Services, its single-biggest infusion into its Indian marketplace in 2017 when rival Flipkart garnered nearly $4 bn (about Rs. 26,180 crore) in funding. The third capital infusion of Amazon into its Indian arm—the Amazon Vendor Services took its total investment to Rs. 17,840 crore ($2.6 bn) more than double of Flipkart's Rs. 8,349 crore investment in its marketplace. Such size of investments confirms the serious interest the Seattle-based online retail giant has for the Indian market. In May 2018, there was yet another development in the Indian e-commerce space when Walmart acquired Flipkart for a staggering amount of $16 bn making it the world's largest e-commerce deal!

India is catching up and becoming one of the largest bases of Internet users in the world. It is expected to touch 500 mn by June 2018. According to Internet and Mobile Association of India (IMAI), Indian e-commerce industry is adding six mn new customers every month, and by the end of 2020, Indian e-commerce industry will generate $100 bn online retail revenue. As of now, Indian e-commerce is the fastest growing in the Asia-Pacific region with a CAGR of over 57% majorly driven by mobile penetration and the high-speed Internet, now available at affordable prices.

13.1.2 The Marketplace Model

E-commerce is bringing about a revolution and a fundamental change in channel relationships. While these online exchanges were infiltrating distribution channels at an alarming rate, the vendors did start feeling threatened of being cut out from the distribution channel. The e-retailers initially started with the inventory-based model, wherein they would stock the inventory and then deliver. But, with the legal as well as physical infrastructure constraints they were compelled to transform to

the marketplace model. In the marketplace model, the e-retailers got registered with numerous vendors selling a variety of goods, for instance, electronic goods, fashion and apparels, household products, etc. All of these vendors provide a certain amount of stock to the e-retailer, but since the business model is a marketplace, the e-retailer does not store any of these products with itself rather that stock is with the registered vendor only near the destination pin code. However, that stock will be sold online via the e-retailer because they have agreed on doing so. Once a customer selects a particular product that is being sold by the vendor the e-retailer records that request and that request is initiated to the vendor. The vendor then sends the exact product to the e-retailer. Once the product reaches the e-retailer, it is then handed over to the logistics department of the e-retailer, most of the retailers have their own logistics firms while others have outsourced it to a professional logistics firm. The logistic department then packs the product and makes it transit ready and then the product moves out and reaches the customer. The customer may choose to pay once he/she receives the product, i.e., cash on delivery or the payment can be made online. Once the payment has been received, the e-retailer keeps its part of the commission and gives the rest to the vendor. The commission is obviously as per the agreed terms of the contract that's between the retailer and the vendor. The e-retailers are wooing their vendors by sharing their facilities (warehouses) for a fee, handling packaging, and delivery through its third-party logistics partners which enables them to deliver the shipment, the very next day.

An area of contention is reverse logistics or when a customer returns a particular product. The e-retailer charges commission on the return of sale resulting in a loss to the vendor. At times, the product which is returned is often counterfeit for which the vendor has already paid the commission. Due to the absence of quality checks on the product at the end of the e-retailer, such lapses end up escalating the cost for the vendor. So technically the vendors are more vulnerable, but they dust this off by saying that they get much greater demand through e-retailer's digital platform instead of just regional sales in offline mode. Vendors do not have much say in the profit sharing decision; price setting is based on mutual consent most of the time, but with so many vendors registered on the e-retailer, it is a case of perfect competition. The marketplace model is turning out to be a scalable model providing a win–win situation for brick and mortar and online retailers. The vendors have been logging rapid growth in their sales since their collaboration with e-retailer. In such a scenario, it will be interesting to go behind the scenes and study the perception of vendors for this set up and their general level of satisfaction with this collaboration. Are the vendors able to secure their position in this new distribution channel? This chapter will unveil the important drivers of the channel relationship and the possible areas of improvement in the e-retailer and vendors relationship.

13.2 Literature Review

13.2.1 Enablers for E-commerce

E-commerce has profoundly affected trade relationships and has created a paradigm shift in channel power as information technology continues to change the competitive landscape of the business. Palacios (2003) discussed that in a developing country there are many factors that can inhibit and drive the development of e-commerce and all of them should be analyzed with diligence as some of the factors manifest in the long run. Some of the basic factors affecting e-commerce are the creation of the legal framework that regulates the e-commerce industry, followed by improvement in the country's telecom infrastructure and the emergence of e-banking and e-governance that makes it more efficient. Once multinationals observe this kind of infrastructure is getting built and the serious intent of the government in developing a feasible environment, they feel secure and invest in e-commerce, and the industry unfurls. These trends were seen in Mexico, and similar trends were seen in India as well, back in the 2000s. In Mexico, the banking and finance industry was the most advanced sectors to adopt e-commerce to discharge their businesses, and the least advanced was the manufacturing sector. But the picture in the Indian context is quite different. The sector that adopted e-commerce in India very aggressively was the retail sector, and it is still growing at a rapid pace. Now almost all the sectors of the Indian economy are embracing e-commerce. Five propositions which were traced in literature include (i) Global forces are more powerful for the diffusion of e-commerce when compared to domestic forces, (ii) MSMEs or Micro, Small and Medium enterprises are least likely to use e-commerce, (iii) B2C e-commerce spreads rapidly than B2B e-commerce, (iv) the policies of the government are indispensable for the development of e-commerce as it promotes the level of technology provides the required infrastructure for mobile telephony and other communication services and also aids various telecommunication service providers, and (v) Lastly, a legal framework should exist so that the progress and shortcomings are continuously monitored thereby reducing the incidents of malpractices and securing all the stakeholders of the industry from any type of harm.

El Gawady (2005) found that the major factors which push the development of e-commerce in a country whether developed or developing are taxation, security of assets, profitability, content, privacy, and the level of contribution in developing international benchmarks. E-commerce is used by businesses and customers because it drastically reduces costs in terms of hours spent and work done to make the products and services reach the end consumer and finally complete the transactions. The e-commerce firms work diligently toward its goals while all the other firms that are not a part of the e-commerce industry will work hard to face competition and thus the productivity of the whole economy will increase.

Javalgi and Ramsey (2001) in their study stated that e-commerce and Internet have linked nations, organizations, and people operating at a local, regional, and national level. Thanks to the enormous rate of technological advancements, global

e-commerce has reached every country of the globe. E-commerce is the exchange of goods, services, and information through seamless connectivity and speed. E-commerce is beneficial as it improves the allocation of resources, augments the relationship between various stakeholders, increases competitiveness, cuts costs, and increases the overall efficiency of the economy. For e-commerce to flourish in a country there are four sets of variables that should be there—(1) Computer and telecommunication infrastructure, (2) Commercial infrastructure, (3) Social/Cultural infrastructure, and (4) Government/legal infrastructure.

13.2.2 Marketing Channels

Luk (1998) discussed that channel structure forms the basis for market entry in the target overseas market. In their study of the Chinese market, they observed that the most common problem that all the MNCs face while they try to tap the Chinese market is the selection of a proper type of distribution channel that is to be used. The most widely present factor in context of size and geography is the diversities that exist between markets. A firm must use permutation and combination to a very large extent to come up with the most efficient distributive network. Once a distribution network is devised that is effective, it will be able to solve the issues that emerge out of a nation's environmental idiosyncrasies. Coelho and Easingwood (2008) discussed that marketing channels seldom change or if put in other words they react very slowly to the changes. Various factors come in play explaining this particular behavior of the distribution channels. The place mix is an integral aspect of a firm's positioning strategy and gives it a competitive edge. For a firm to retain its competitive edge, it should examine the mix of channels continuously so that changing customer needs can be accommodated. Distribution can be regarded as the most lethal weapon of a firm's arsenal. Numerous external factors have resulted in making it all the more significant. These factors are continuous pressures on competitive advantage; the distributor's ever-increasing power, low distribution costs, stress on growth, and new technical advancements. Past literature has emphasized that "channel design should be used as an integral part of a firm's attempts to gain a differential advantage in the market." Companies have made radical changes in their marketing channels and reorganized them by way of investments in new electronic channels, which are a part of their multichannel strategy. The magnitude of channel transformation is based on consumer's needs that are increasingly volatile, level of sophistication of the targeted customer, minimalist nature of the product, rapid changes in the external environment, force of competitors' strategies that might make the firm vulnerable, economies of scale, and the company size. Szopa and Pekala (2012) discussed that the distribution channel performs various functions such as the physical movement of products, transfer of ownership, transfer of information, risk bearing, negotiation, and realization of orders. These functions flow in both the directions that is manufacturer to the customer and from customer to the manufacturer. For instance, the product, its ownership and risk flows to the customer and payments, information of market

flows towards the manufacturer (Mulky 2013). One inimitable source of strategic competitive advantage for a company is an exclusive distribution channel. However, to get a pitch, perfect distribution design is something only a few Indian firms have got the hang of. The same is achieved after years of experience and trying out various combinations to check as to which combinations will suit the best.

13.2.3 E-commerce as a Marketing Channel

Amor (2000) had highlighted that the Internet has indeed become the fourth channel of commerce after direct or face-to-face, mail, and telephone. An Ernst and Young (2016) study analyzed that in the past 40 years or so there has been a humongous change in the patterns of distribution worldwide. In the 70s, the retailers used to obtain their supplies directly from suppliers or wholesalers, then came the 80s the era of stores which were involved in centralized deliveries. Global sourcing and import were on the rise in the early 90s and then came the glorious era of e-commerce and e-fulfillment. E-retailer has to make an intelligent decision and weigh all their options whether to hire a courier company or hire a specialist third-party logistics or develop a completely in-house logistics department. Certain key points that are of immense importance to the e-retailer and should be executed are (1) Delivery that is pitch perfect and involves low cost, (2) Service which is cost-effective, and (3) An advanced enterprise resource planning software or ERP. For an e-retailer who trades goods across border, all these processes are planned by specialized and expert logistics players who are well versed with international rules and regulations. All the functions of procuring the supplies, storing them, generating an invoice and delivering the goods to the end user are determined by four factors—speed, the accuracy of orders, analytics and surge. The amount of transparency in the supply chain is an inimitable resource through which the e-retailer wins the trust of the customer. This study indicated that shoppers give more weight to the delivery time and facilities like free shipping, etc., over anything else when it comes to shopping online.

In the current setting of multiple channels, the choice between traditional distribution channel and e-commerce should be taken in terms of transaction costs. Wigand and Benjamin (1995) analyzed the electronic channel from a transaction cost perspective. They discussed that ultimately transaction cost theory helps to understand how markets and hierarchies are chosen. Generally, the price of a product sold has three elements of costs: production, coordination and profit margin. Thus, in the event of market hierarchies getting bypassed the transaction cost would get reduced (Wigand and Benjamin 1995). A research report brought out that web-based processes can save up to 10–30% of operating costs and reduce cycle times up to 90% and can reduce supply and demand mismatches and improve the efficiency of the overall value chain (Kearney 2000). Wigand and Benjamin (1995) in their study illustrated that retail prices could be brought down by almost 62% if wholesalers and retailers in the traditional distribution channel can be eliminated.

13.2.4 Working Relationship in E-commerce

Electronic trade was initially touted to bring about disruption and a structural change in the market such as disintermediation (Adellar 2000). However, Sarkar et al. (1995) disagreed stating that different outcomes such as re-intermediation or cybermediation are also possible in the case of e-commerce. The cost of creating value in a supply chain depends on how well the activities and function in a value chain are coordinated as well as integrated (Delphi Group 2000). Thus in times to come channel members who are unable to coordinate and integrate functions and activities at a reduced cost will lose out to this new market arrangement—the e-commerce. Pitt et al. (1999) argued that many channel partners would die out as new channels and new intermediaries will replace them due to the onslaught of the Internet and the World Wide Web. This will be the most massive environmental force since the Industrial Revolution.

Schmitz (2000) discussed that the impact of e-commerce on marketing channel will depend upon the characteristics of products involved and that it will be easy to distribute those products which will have high degrees of standardization, easy to describe and have less complexity. Jantan et al. (2003) conducted a study and proposed a framework to evaluate the impact of e-commerce on the roles of distributors in the semiconductor industry for four different types of products. This framework was based on the parameters of the novelty of markets and novelty of the technology; they were: architectural, differentiated, complex, and technological products. They surveyed industrial distributors (multinationals) in the semiconductor sector in Penang, Malaysia. Their study empirically concluded that the probability of functions of traditional distributors being replaced is highest for differentiated products, then by architectural products, technological and complex products in that order. Disintermediation is less likely to occur for undifferentiated products (architectural, technological, and complex products). The reason is that complex distributor roles, and complicated products are difficult to explain on the Internet. Besides the transaction cost attached is also too high for producers in terms of nearness, flexible pricing, digital signatures advance customer support or financial clearing of transactions of a large sum. Also for customers, sourcing data from multiple websites for a nonstandard complicated product shall be cumbersome and not cost-effective.

Robicheaux and Elansary (1977) presented an inclusive model of channel partner behavior which could help channel members to better understand the behavior of firms on other channel levels and help design strategies to achieve personal and organizational goals. The comprehensive model incorporated the following set of variables coming from position role, power leadership control, conflict or cooperation, performance satisfaction or dissatisfaction, communication and finally bargaining variables. The model's principal point was channel performance, which in turn is determined by channel structure and individual channel member behavior. The model did not focus on structural variables (like channel level and a number of channel members) but majorly on behavioral variables. They said channel performance is an end result of efficiency of channel control and satisfaction or dissatisfaction of

intermediaries with channel relationships. Channel control is a function of dependence, power base, and resources, tolerance for control, desire to influence, power and effectiveness of channel leadership. Cooperation and conflict are inherent in the channel due to functional interdependence.

Shipley and Egan (1992) did a study on power, conflict, and cooperation in brewer–tenant distribution channels. They mailed a questionnaire to brewers and tenants, questioned personally through a separate questionnaire containing closed MCQs to uncover perceptions with respect to interdependence, power, conflict, and cooperation. The results were analyzed in terms of frequency percentage and mean. They concluded that the channel relationship between brewer and tenant were not effective due to the excessive use of coercive power and insufficient use of reward power. A partnership approach in channel relationship was not implemented and thus the brewer–tenant distribution channel could not generate much of channel coordination due to the significant absence of trust, equity, and abundant communication with its tenants. The brewers dominated tenants with short contractual agreements with the implicit threat of the same would not be renewed in case of noncompliance. The brewers, instead of offering help to tenants for performance, focused more on nonrenewal of contracts.

Tsay and Agrawal (2004) in their research effort on channel conflict and coordination in the e-commerce age wanted to model a stylized supply chain with independent decision-making at both manufacturer and reseller level for understanding dynamics of channel conflict and investigate mechanism for improving individual and system performance. They analyzed the demand function for direct channel, reseller channel, and both channels keeping in mind profit outcomes. Their study pointed out that the addition of a direct channel is not necessarily detrimental to the reseller as there can be a net system-wide gain as a result of wholesale price reduction. However, their study had limitations in terms of drivers of customer channel preference and evolution of distribution strategy over the product life cycle.

Achrol and Etzel (2003) discussed that distribution channel is important and marketing channel managers today are confronted with the demanding and complex task of achieving channel synergies, resolving channel conflicts, and identifying the optimal channel mix to implement the channel design.

Frazier (1999) identified areas of channel management, which still require a good deal of research. Some of them were intra-channel conflict and its impact on long-term channel relationships, use and management of multiple channels, industry life cycle, resource allocation to different channels, how functions are shared/split between channel members, combination of push and pull strategy, when and how Internet should be used as a sales distribution channel, how coordination is achieved and how goals and plans are set and appraisal is done for a channel system. According to him tracing a crisis through stages of conflict interaction, with special consideration for communication content and flows is essential to understand the development and impact of conflict. As channel members work together, domain and jurisdiction problems are often created. In the absence of conflict or cooperation, any channel relationship will not be able to develop effective operations.

Geyskens and Steenkamp (2000) suggested that satisfaction should not be viewed as overall satisfaction, but one must distinguish economic and social satisfaction. Also, satisfaction can be viewed as a qualitative outcome, whereas performance will be the quantitative outcome of a channel relationship. The results indicated that the dealer's satisfaction is positively related to his performance. The study advocated that the source should try to use perception altered tactics, especially the provision of valuable information to build amicable relations and improve the target's performance.

Golicic et al. (2002) in their study on the impact of e-commerce on supply chain relationships, emphasized that companies who are involved in e-commerce must have a greater focus on relationship management to deal with uncertainty and the dynamic market environment. It will enable channel members to better and efficiently deal with increased visibility and availability of information provided by e-commerce.

Yan (2008) researched on the pricing strategy for companies with mixed online and traditional retailing distribution market. His work was primarily focused on what pricing strategy should a firm adopt if following a multichannel strategy to optimize the profit. He provided a framework to help business marketers with multiple channels to find an optimal pricing strategy and market structure to maximize profits. He used the game theory model of economics by considering Bertrand (both traditional and online channels have equal power), Stackelberg (model of duopoly, one is a market leader and the other is a market follower and they compete with each other) and integrated (decision-making is centralized) market structure. The total profit for the multichannel company is the largest under channel integration of all market structures as it synchronizes pricing strategies of both the channels and manages consumer demand.

Tuominen (2004) in the study on "Efficient Consumer Response" or ECR discussed that the same had changed the competitive landscape in the field of grocery trade. ECR focuses on creating value for the end consumers through a supply chain system that is efficient and provides value to the involved channel members. The results indicate that a strong constructive relationship between channel members and the firm increases overall value. Businesses must carefully design the strategic channel structure and manage collaborative channel relationships. Channel collaboration is managing relationships based on a long-term relational exchange as compared to the traditional transaction-based exchange process.

Harvey and Speier (2000) suggested that channel partnering and supply chain collaboration is a consequence of trust between parties and their relationship commitment. Channel strategy should focus on creating a sustainable competitive advantage that can lead to superior financial performance. According to Mizik and Jacobson (2003), two processes combine and interact, one that involves the creation of customer value by innovating, producing, and delivering products to the market and the other focuses on taking value to the marketplace. Kiran et al. (2012) advocated that relationships in marketing channels tend to be long-term oriented when channel partners rely on each other to jointly achieve mutual goals by serving customers. Despite the overall channel's focus on serving buyers, conflicts arise between channel members because of each member's individual goals and self-interest. When conflicts

arise, the perceptions of channel partners which are based on normative, rational, or emotional reasoning influences relational norms like trust and commitment that characterize the relationship between members.

Iyer and Villas-Boas (2003) found that the intensity of relationships between manufacturers and retailers in a distribution channel depends on the balance of power or the negotiating power of both parties. The authors have developed a comprehensive framework to evaluate negotiating power between channel members. The scholars also uncovered a fact that when a retailer exercises more power in a channel, it automatically promotes channel coordination. Thus, sometimes the presence of a dominant retailer might be beneficial for all the channel members.

Desperate measures undertaken by the e-commerce giant Snapdeal in India, in the past 12 months did not prove very fruitful. Industry experts have been continuously arguing that there never existed any business model at Snapdeal. As a strategic and calculated move to be the most profitable e-retailer of India, it had decided to revamp its business model. However, there was not much scope in that realm as out of the two models that have been working effectively in India, i.e., marketplace and inventory-based model, Snapdeal had tried both the models. However, it was just a perfect illustration of desperate times, desperate measures. Foxconn, Softbank, and Alibaba group firm's chief executives stated that they had pledged not to take the salary for an unspecified period. This was attributed to a large number of losses that got piled up for a long period. Not only this, Snapdeal's top management was not very stable. With a very high turnover rate and increasing competitive pressure from Amazon, the e-commerce giant had streamlined their goals which involved reorganizing the company into a lean, focused structure. They were combining teams, eliminating non-core projects and had a razor-sharp focus on profitable growth by reducing layers. The firm planned to achieve this by laying off 1000 of its employees from all the stages in the hierarchy. This strategic lay off regime was not limited to the firm only but, its logistics partner, "Vulcan Express" was also a part of this move.

After analyzing the secondary data exhaustively, the key research questions have emerged as follows:

(a) In this current arrangement of e-commerce, is there any scope of the relationship between the vendors and e-retailers or is it simply transaction based?
(b) What is the current perception prevailing among vendors for e-commerce as a channel and support provided by e-retailers?

With this, we arrive at the specific objectives for this study as

(i) To study and understand the distribution model of the prominent e-retailers of the Indian e-commerce industry.
(ii) To analyze the general satisfaction of vendors with the e-retailers based on the understanding of the business model.

13.3 Research Methodology

13.3.1 Research Design

This research uses both exploratory and descriptive research. The base of this research comes from an exhaustive study of various research papers on this particular topic. The initial part of the research was exploratory, where expert opinion was sought from the vendors already registered with the e-retailers, and their general areas of satisfaction and grievances in this electronic trade were investigated. The primary data was collected through a structured questionnaire, which was developed after an exhaustive and judicious secondary data study and pilot testing. The questionnaire was also put on Google forms so that few respondents could fill their feedback through the link generated via mail at their convenience and certain others through the offline survey.

The study followed a sequential process, progressing through four major stages, where each stage of the study adopted specific methods as listed below:

1. Identification of all the possible variables that affect the relationship between vendors and e-retailers which was converted into items (Based on past literature of channel relationship and expert opinion).
2. Reduction of these items affecting the relationship between vendors and e-retailers into a meaningful number of factors (through Exploratory Factor Analysis).
3. Convergence and validation of the identified factor into a conceptual model based on the theory.
4. Study the interrelation between the factors of the relationship between e-retailers and E-vendors through regression.

13.3.2 Sampling

The sample elements were the vendors registered with the e-retailers and based all over India. The investigation started by collecting a few references of vendors. After being interviewed, these respondents were asked to identify others who would belong to the target population of interest. Subsequent respondents were selected based on the referrals. Thus, snowball sampling was adopted to ensure the representation of the data for the whole population.

A sample size of 60 vendors was chosen which were registered with the e-retailer (Flipkart, Snapdeal, Amazon, etc.). The questionnaire used a 5-point Likert Scale.

13.3.3 Scale Items

Based on the literature review on the channel relationship, certain factors like satisfaction, information sharing or communication, access to new market, website and technology infrastructure of e-commerce were identified to affect the relationship in this new channel of E-retailers and vendors. After the analysis of the previous findings and expert opinion from vendors, the authors realized that there were certainly more factors which could be applicable in terms of pricing, regulatory framework, biased behavior, and support functions that could also be incorporated in this study. The same was framed into items, and Exploratory Factor Analysis (EFA) was conducted to group the items into relevant factors to define this electronic channel relationship.

13.4 Results

The questionnaire consisted of 25 questions as scale items, whose reliability was tested. The Cronbach Alpha value for the scale with 25 items was calculated and was found to be 0.869 which was very much in the acceptable range, suggesting that there is high inter-item consistency. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0, the greater is the internal consistency of the items in the scale.

13.4.1 Factor Analysis

For EFA, Principal axis factoring with promax rotation was used to analyze how 25 items were clustered in the electronic channel relationship. Kaiser–Meyer–Olkin (KMO) value of ($0.814 > 0.7$) in Table 13.1 indicates a sufficient number of items for each factor. Further, we consider Bartlett's Test of Sphericity to evaluate hypothesis H_o: correlation between the variables are interrelated against the alternative hypothesis H_a. Bartlett's Test of Sphericity was found to be significant ($p < 0.05$) indicating that the correlation matrix between test items is significantly different from an identity matrix, in which correlations between variables are all zero.

Table 13.1 KMO and Bartlett test

KMO and Bartlett's test		
Kaiser–Meyer–Olkin measure of sampling adequacy		0.814
Bartlett's test of sphericity	Approx. chi-square	3112.346
	Df	300
	Sig.	0.000

7 items out of 25 items were eliminated due to low communalities (≤0.495) and high cross-loadings (≥0.5). Finally, 18 items were considered for factor analysis and further evaluation (Refer Table 13.2).

Eigenvalues greater than 1 were considered for factor extraction. It was found that a total of nine factors with (Eigenvalue > 1) accounts for 61.13% variance in all variables considered for channel relationship between e-retailers and vendors (Refer Table 13.3). It was found that the first factor accounts for the highest percentage

Table 13.2 Communalities (principal axis factoring)

Items	Extraction
E-retailers take a good effort to maintain trade relationship	0.522
The e-retailer assists you for delivery and return issues	0.542
E-retailer gives equal attention to all vendors	0.693
E-retailer understand your grievances and try to devise trade friendly strategies	0.838
E-retailers try to dominate business decisions	0.501
E-retailers donot encourage and include in predatory pricing	0.643
The pricing and profit decisions on products are taken mutually	0.688
E-retailers comes with an interesting buyback and cashback offer which help in increasing demand	0.643
E-retailers are not biased in promoting big vendors	0.549
A big e-retailer increases your visibility and customer base	0.584
The e-retailer is also helping you target global markets	0.788
The e-retailer ensures to share information timely and always tries to work closely	0.844
E-retailers provide good website infrastructure which helps in sales	0.707
E-retailers always keep you connected with the business	0.766
E-retailers adhere to the legal framework most of the times	0.549
You are happy with the existing regulatory framework for online vendors	0.557
You would like to continue your association with e-retailer in the future also	0.669
Your focus on online and offline are equal	0.650

Table 13.3 Total variance explained

The relationship between E-retailers and E-vendors	Eigenvalues	% Variance	% Cumulative	Rotation sums of squared loading
Pricing	5.886	15.545	15.545	3.016
Information sharing	3.494	9.978	25.523	2.659
Satisfaction	2.961	8.846	34.369	1.998
Regulatory framework	2.562	7.249	41.618	2.6371
New markets access	2.157	6.627	48.245	2.090
Promotion	2.069	4.274	52.519	1.603
Support functions	1.985	3.940	56.459	1.639
Website infrastructure	1.813	3.254	59.713	1.612
Biasness	1.604	1.416	61.129	1.274

of 15.55% of the variance. Table 13.2 displays the items or factor which shows the relationship between the E-retailer and the vendors in the E-commerce industry. Since the rotations allow for correlation, hence oblique rotations were used to arrive at Rotation sum squared values.

A Principal Axis Factoring with Promax rotation was conducted with the aim to minimize the number of variables. Through Rotated Extraction, the 25 dependent variables (statement 1–25) were reduced to 9 clear factors that were identified (Table 13.4).

13.4.2 Regression Results

After the identification of factors which contribute to the overall satisfaction in this e-retailer and vendor relationship, dependent and independent variables have been identified as:

Dependent variable or DV: Satisfaction

Independent Variable or IDV: Pricing, Information sharing, existing regulatory framework, new market access, promotion, support functions, website infrastructure, and biases.

Based on the basic understanding of theory the regression equation was developed as:

Satisfaction = $\beta 0 + \beta 1$ (Pricing) + $\beta 2$ (Information sharing) + $\beta 3$ (Regulatory framework) + $\beta 4$ (Newmarket) + $\beta 5$ (Promotion) + $\beta 6$ (Support functions) + $\beta 7$ (Website Infrastructure) + $\beta 8$ (Biasness) + e.

The regression results are shown in Table 13.5.

Thus our results indicate that promotion activities of e-retailers have the highest impact in building satisfaction in the relationship of vendors and e-retailers. The

Table 13.4 Factor labels, rotated component factor loading and reliability

Factors	Items	Factor loading	Reliability coefficient (Cronbach α)
1. Pricing	1.1. E-retailer does not encourage and involves in predatory pricing 1.2. The pricing and profit decisions on products are taken mutually	0.584 0.898	0.852
2. Information sharing	2.1. E-retailers always keep you connected with the business 2.2. The e-retailer ensures to share information timely and always tries to work closely	0.986 0.972	0.799
3. Satisfaction	3.1. E-retailer understand your grievances and try to devise trade friendly strategies 3.2. E-retailers try to dominate business decisions	0.857 0.714	0.777
4. Regulatory framework	4.1. E-retailers adhere to the legal framework most of the times 4.2. You are happy with the regulatory framework existing for online vendors 4.3 You would like to continue your association with e-retailer in the future also	0.849 0.651 0.812	0.757
5. New markets access	5.1. The e-retailer is also helping you target global markets	0.510	–
6. Promotion	6.1. E-retailers comes with an interesting buyback and cashback offer which help in increasing demand 6.2. A big e-retailer increases your visibility and customer base	0.779 0.884	0.675

(continued)

Table 13.4 (continued)

Factors	Items	Factor loading	Reliability coefficient (Cronbach α)
7. Support functions	7.1. E-retailers take a good effort to maintain trade relationship 7.2. The e-retailer assists you for delivery and return issues 7.3 E-retailer gives equal attention to all vendor	0.545 0.642 0.618	0.704
8. Website infrastructure	8.1. E-retailers provide good website infrastructure which helps in sales 8.2 Your focus towards online and offline are equal	0.662 0.914	0.674
9. Biasness	9.1. E-retailers are not biased in promoting big vendors	0.549	–

Table 13.5 Regression results

Coefficients[a]								
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Std. error	Beta			Tolerance	VIF
1	(Constant)	0.736	0.232		3.172	0.002		
	PRICING	−0.326	0.077	−0.352	−4.230	0.000	0.495	2.020
	INFORMATION	0.280	0.067	0.298	4.204	0.000	0.683	1.465
	REGULATION	0.217	0.116	0.158	1.871	0.063	0.480	2.085
	NEWMARKET	0.403	0.105	0.303	3.820	0.000	0.544	1.838
	PROMOTION	0.451	0.089	0.432	5.063	0.000	0.471	2.124
	SUPPORT	−0.449	0.139	−0.306	−3.217	0.002	0.379	2.641
	WEB INFR	−0.141	0.074	−0.121	−1.891	0.061	0.831	1.203
	BIASNESS	0.195	0.088	0.168	2.212	0.029	0.593	1.686

[a]*Dependent Variable* Satisfaction

biggest draw or motivation to stay in this electronic channel is promotion and visibility which vendors get through their tie-up with e-retailers as that leads to increased business and economic satisfaction.

13.5 Conclusion

E-commerce is witnessing an unprecedented growth in India. In this regard, this study has thrown light on how electronic channel relationship, i.e., between the e-retailer and the vendor can be further enhanced and what strategies can be used to develop win–win situations for all the stakeholders: e-retailers, vendors as well as customers. This chapter has addressed a research gap as not much work has been done particularly in India in the area of relationship management in e-commerce. This study contributes to the theory of e-commerce channel relationship that what should be the area of focus for enhancing the satisfaction in this channel. The study can be taken up in the future in a more comprehensive manner by increasing the sample size and adding some more antecedents of satisfaction to make the study more enriching.

The balance of power as of now appears to be tilted toward the e-retailer as they gain acceptability in the urban and suburban areas day by day. However, the e-retailer should also be conscious that both of them need each other and should be mindful of their policies so that the partnership continues to add value to all the stakeholders in the supply chain. Vendors also need to understand that they will have to deliver solutions and not just products to survive in this electronic channel. The e-retailer, on the other hand, should invest in capabilities to provide vendors with market intelligence which otherwise is difficult for the vendors to acquire. The good part is that the e-retailer is already working in this direction by investing in data analytics and artificial intelligence. This is one of the methods of value creation in this new business model which e-retailer can incorporate and plan meaningful strategies based on customer's transaction data.

As far as the relationship between the e-retailer and vendors is concerned, we have concluded that in the current set up of e-commerce in India, promotional activities of e-retailers and access to new markets are the main determining factors that can strengthen the relationship between the vendors and the e-retailers. The same is expected and logical as the primary motivation for vendors to add electronic channel is to get a better demand from the market and new customer segments which is in sync with the past literature (Geyskens and Steenkamp 2000) that economic satisfaction is the leading reason for a channel member to be in a trade relationship. Vendors feel that they will sell on a lower margin if their customer base is increasing. Most of the vendors feel content in their relationship, and vendors generally have to let go of their goals to accommodate e-retailer's goal. Vendor and e-retailer relationship should be considered as a collaboration with mutual dependence and care should be taken to treat this collaboration as a symbiotic one in this dynamic era of technology.

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Chapter 14
Examining Adoption of eNAM Platform for Transforming Agricultural Marketing in India

Sanjay Chaudhary and P. K. Suri

Abstract E-commerce is a well-known global success phenomenon, and it is also gaining popularity in Indian Agriculture sector in the form of B2B e-commerce. The electronic National Agricultural Marketing (eNAM) initiative of the Government of India is emerging as a viable solution to the highly fragmented and inefficient supply chain about agricultural marketing in India. This B2B E-commerce platform provides more sale options to farmers, increase direct access to markets, reduce intermediation costs and promote common procedures, scientific storage, and quality grading within a better supply chain. To realize the benefits of eNAM, its high adoption is a prerequisite. In this chapter, the constructs "Performance Expectancy", "Effort Expectancy", "Social Influence", "Facilitating Conditions", "Behavioural Intention", "Trust", and "Cost" of the adoption framework relevant to the Indian agriculture sector are discussed with the support of a pilot study. The relationship between the adoption factors and intention to adopt is analyzed using analysis of data collected through an opinion survey conducted in the Meerut wholesale market in Uttar Pradesh (UP). It is expected that the study helps in understanding the online behavior of adopters and help bring more and more participants to the National Agricultural Marketing B2B platform for its eventual success.

Keywords Adoption · Framework · Agricultural marketing · B2B E-Commerce · B2B E-Commerce adoption · Digital india · National agriculture market · eNAM

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14.1 Introduction

The agriculture sector is important to the economy and society of India. The GDP of agriculture and allied sectors in India was recorded at USD 244.74 billion in FY16, and it was the primary source of income for about 58% of the population (IBEF 2017). According to the latest India census data, the country has more than 270 million persons employed in the agriculture sector—about 50% of its workforce.

In India, agricultural commodities are sold through oral auctions for hundreds of years (Banerji and Meenakshi 2004). As a step toward bringing transparency in market transactions and empowering farmers with the latest market information, the Government of India launched the AGMARKNET project during the year 2000–01. The purpose of AGMARKNET, under which about 3000 agricultural produce wholesale markets have been networked, is limited to collection and dissemination of daily market information (Suri 2005). In an effort to improve efficiency as the next logical step, oral auctions are now progressively being shifted to B2B E-commerce in India. The purpose of this initiative is to disseminate farming know-how, broadcast price information, reduce intermediation, and optimize the agricultural supply chains that support the livelihood of billions of people (Banker et al. 2011).

The B2B e-commerce marketplaces are geography independent and more transparent. These attract more consumers and contribute to increased demand for produce in India (Verma and Chaudhuri 2008). It has also increased the bargaining power of farmers by opening access to a wider range of buyers. Consequently, farmers obtain a better price on the digital platform compared to the farm-field gate sale (Banker et al. 2011).

B2B e-commerce is a relatively new phenomenon in the agricultural industry in India. It is affecting the processes and business culture of this sector. In addition, it is also changing the marketing and distribution of agricultural produce in India.

While the benefits of B2B e-commerce are evident, its related adoption in the Indian agriculture sector still faces technology and collaboration related barriers. An understanding of adoption factors can help draw meaningful and actionable recommendations for government, participants, business owners, and policy-makers.

In this chapter, the adoption is described as a business engagement in an online exchange relationship with producers/sellers on the internet.

An idea (e.g., B2B e-commerce in agriculture) may be a new approach to solving the problems, but testing it in a given geography and value chain for the adoption can save a lot of money and organizational resources (Ganguly et al. 2017). Thus, a better understanding of determining factors of adoption highlighted via adoption framework shall help companies and policymakers make suitable strategies and managerial practices. Doing it early in the life cycle shall result in success and requisite benefits reaching participants. In addition, it helps the service providers take actions/decisions necessary for increased volume required for the very survival of agriculture sector B2B e-marketplace. The National Agriculture Market (NAM) is an e-trading platform started by the Indian government. The NAM Portal is the largest such service in India and provides a single window for all state-regulated Agricultural Produce Marketing

Committee (APMC) related information and e-commerce services. As on December 31, 2018, NAM has 14 million farmers, 121 thousand traders and 67.37 thousand agents registered on its trading platform. In 2017–18, agricultural produce worth INR 283 billion had been transacted, as 10.9 million tonne produce is e-traded in transactions (DACFW 2018).

The chapter is based on a case study of NAM to highlight the determinant factors involved in the adoption of B2B e-commerce in Indian Agriculture sector and use the NAM participants' survey data to validate the adoption framework.

14.2 Objective

The objective of this research is to highlight the adoption framework for the B2B e-commerce in Indian Agriculture sector.

The factors relevant to the Indian agriculture sector are specified via empirical study. The determinant factors are validated using survey data analysis from the case study of Indian Government-sponsored B2B Agriculture e-commerce platform "National Agriculture Market" (NAM).

14.3 The Significance of the Research

B2B e-commerce, in agricultural commodities, is a relatively new activity in developing countries (Schrader 1984). Due to lack of data, there is insignificant research on the agriculture B2B e-commerce in India. In this chapter, it has been attempted to analyze this relatively new phenomenon in India.

The proposed adoption framework shall fill the gap for a theoretical framework required for B2B Agriculture e-commerce adoption. The findings may help improve the adoption of NAM and achieve its intended benefits. These benefits include farmers get access to more buyers, farmers get negotiation power to seek a higher price for higher quality, traders get access to the larger national market, and companies bear reduced intermediation costs, through direct participation in the local trade.

The agribusiness e-commerce also has much in common with other industry e-commerce, e.g., use of the same information technologies, persuasion of individual interests by traders, and an inverse relationship between supply and demand curves (Clasen and Mueller 2006).

14.4 Research Methodology

In order to formulate a research design, a systematic review of the literature was performed. The few keywords used in search were "Technology Adoption", "Adoption Framework", "Agriculture", "Agriculture Sector Trend", "E-commerce", "E-

Commerce Adoption in India", "Agriculture Value Chain", "B2B E-commerce", "B2B E-commerce Adoption", "National Agriculture Market", "eNAM", "Public Service Delivery system", "e-governance Services in India", "India", etc.

A few exclusion criteria used were time period (more than 20 years old), nature (B2C e-commerce, finance), geography (Africa, North Asia, Europe, America) and document type (news article, public presentation), language (other than English), research setting (contrived), research design (experiment), etc.

The validation of determinant factors in the framework is done through a survey of NAM participants using a Likert scale-based questionnaire. The multiple questions cover respondent opinions on the factors related to B2B e-commerce adoption, identified during our secondary research. The Likert scale has options of 1–5, where 1 means "Negligible" and 5 means "To a very large extent".

Data is collected in November 2017 for 4 days. The survey questionnaire results are entered in SPSS version 20 for descriptive statistics. The univariate analysis is used to get better insights into the conceptualized research variables.

The trial questionnaire was pretested on five respondents, which included both experts from academia and domain as well as end users. In the APMC market of Meerut district (UP State, India), the simple random sampling without replacement was used to select the survey respondents. The sampling unit is a participant (farmer, trader, buyer, and agents) trading on NAM or Agriculture Produce Marketing Committee (APMC) regulated agriculture market of Meerut. As of now, there are 6000 farmers and 735 traders listed on the NAM system in Meerut APMC. Out of this list, 50 participants were at random picked from this list and approached for questionnaire (in the Hindi language) response. Being a participant in a market, the respondent is expected to have an opinion.

14.5 Literature Review

14.5.1 B2B E-Commerce and Indian Agriculture Sector

The agriculture supply chain in India is highly fragmented and inefficient. A study of fruits and vegetables supply chain in four India metros reported that, on an average, there are five–six intermediaries in the supply chain (Global AgriSystem Consulting 2010). Due to the high number of intermediaries, the total price increase in the chain is approximately 60–75%. Thus, the farmers receive only 20–25% of the end consumer price. In addition, the wastage is 15–25% of the value (Patnaik 2011; Kaur 2015).

On top of this, the information asymmetry is high, which relates to, information about product availability at the source/market and demand patterns (Suri 2018). The most common reason given is that the agriculture trade markets in India are dispersed across the country with little coordination, full of trader cartels, and functions in offline mode.

Given the above scenario, the B2B e-commerce marketplace is seen as the savior. These B2B e-commerce marketplaces (e.g., NAM) are characterized by relatively low-cost digital trading and enhanced transaction cost efficiency. The improvement is seen in the performance of trade, in terms of the right bid price, quality of produce, direct procurement from a farmer/trader, and in the required time (Harrison and Smart 2003; Shirzad Robaty and Bell 2013).

The Indian government's national policy on ICT in agricultural extension also supports a market-friendly policy to promote marketing across geographies using ICT. But, it has to gel with the practical realities on the ground, e.g., complex interactions between the actors, the role of tacit knowledge, the high impact of social actors, bad power and Internet conditions (in rural India), and low IT literacy level in the agriculture sector (Suri 2009; Suri and Sushil 2012; Kaur 2015).

The earlier studies focused mainly on defining the concept of e-marketing and its use in agriculture markets, including a gain in prices (Henderson 1984; Sporleder 1984). A study of MarketMaker (a USA government-sponsored electronic trade platform for agriculture) estimated that participants had received an average of 2.6 new leads and 1.5 new customers. In addition, registered farmers increased their annual average revenue by $121 (Zapata et al. 2013).

One key insight from the case study of MarketMaker, relevant from India's point of view, is that the e-trading forerunners should encourage other users to become more frequent user to achieve the desired benefits. The reason is that the benefits associated with e-trading marketplace or e-trading increase with the increasing familiarity of the website functions (Zapata et al. 2013). Given this, peer persuasion and media advertisement are desirable features of e-marketplace.

An analysis of e-marketplace "https://www.agriculture.com" with a number of hits per day as success criterion, revealed that low transaction costs, national and local language content, number of product categories, trading in agricultural machinery, and age of the e-marketplace are all positively significantly correlated with success (Clasen and Mueller 2006).

The main reason for the success of the agriculture B2B e-commerce marketplace has been found as the involvement of the local community (farmers/traders) and good IT network availability (Chahal et al. 2012). In addition, the participants may pay a premium for a high level of trust assured by a neutral, third-party host provider (Vassalos and Lim 2014). Given this, roping in a third party for implementation, support, and technical operations by NAM, is a step in the right direction.

A successful e-platform in India is expected to provide instructions to farmers about how to get the best possible benefits out of B2B e-commerce. Such a B2B e-commerce platform, along with e-trading shall also provide information related to marketing, best practices, weather forecast, and rural development program (Rahane and Waghmare 2011).

Along with success factors come the barriers to success. The three significant barriers are: change in the value chain, multiple quality levels and high volume lots trading nature of transactions in agriculture (Leroux et al. 2001). The adoption barriers can be addressed by a combination of strategies based on; structure of the value chain (third-party service provider, alliances with ancillary service providers,

niche players, and virtual supply channels), expertise (market know-how, commodity knowledge, and risk profile), and organizational readiness (training, customer care, and knowledge sharing) (Leroux et al. 2001).

The fragmentation of markets, multiple handling of Agri-produce, and multiple market charges all end up with an unfavorable situation involving high prices for the consumers and low prices to the farmer. To address this situation and to meet the need of the hour, the Government of India approved a scheme for deployment of a unified B2B e-commerce platform "National Agriculture Market" (NAM). It is implemented in 585 large and regulated wholesale agriculture markets (APMC) by March 2018 out of a total of 2,477 APMC market yards. Now, the government has announced to extend NAM to an additional 200 markets (MOAFW 2017).

14.5.2 National Agriculture Market (NAM)

NAM is the flagship scheme of utmost importance since more than 50% of India's population is employed in the Agriculture sector. The scheme is operationalized by Small Farmers' Agribusiness Consortium (SFAC), with a budg et al. location of INR 2 Billion; out of which a maximum of INR 7.5 million is earmarked for each of the markets.

NAM (Fig. 14.1) is a "virtual" B2B marketplace for e-trading in a physical market ("Mandi"). The transaction process activities (e.g., registration of farmers/traders/buyers/agents, lot details at the entry, weighment, quality check, auctions/trade transactions, and payments) are online in digital form (Fig. 14.2), while actual material logistics is via the physical market. In any market, the select agricultural commodities are traded completely online on eNAM.

NAM is implemented based on the success of the Unified Market Platform (UMP) in Karnataka, where farmers saw an average income increase of thirty-eight percent in 2015–16 over 2013–14 (NITI Aayog 2017). A study on its impact assessment, conducted by the National Institute of Agricultural Marketing, reveals that about eighty-three percent of user opinion is that the operations have become more transparent and time efficient (NIAM 2013).

So far, NAM progress is slow but it will fill the infrastructure gaps that arose over six decades but would need the education of farmers and training (Suri 2018; Subramanian 2017). To facilitate quality grading of agricultural commodities for e-trading, common tradable parameters have been developed for 114 commodities, including wheat, paddy, maize, pulses, oilseeds, spices, vegetables, etc. (DACFW 2018). Globally, several commodities have converged to a single Internet trading platform (Wheatley and Buhr 2005) and NAM is a similar example.

The NAM initiative may prove to be a game changer for India's farmers and agriculture value chain if it is implemented in the right manner (Chand 2016).

Indian farmers are being encouraged and incentivized by the government to leverage ICT for achieving higher agricultural growth, and hopefully, they will make use

Fig. 14.1 **eNAM** e-trading portal. *Source* (DACFW 2018)

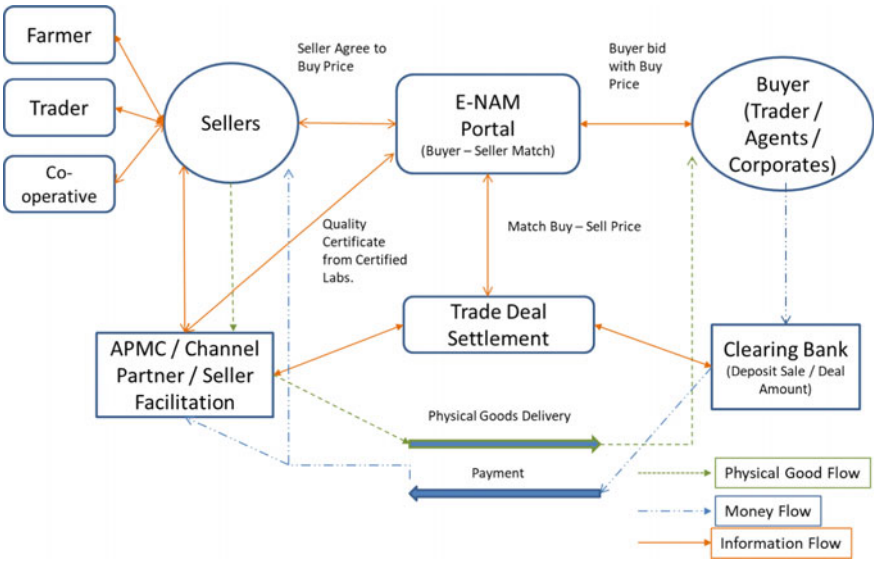

Fig. 14.2 eNAM outline. *Source* (DACFW 2018)

of NAM initiative. It is expected that farmers voluntarily adopt NAM and make use of the wide-ranging marketing opportunities made available through this platform.

14.5.3 Proposed: B2B E-Commerce AdoptionFramework

To get a better understanding of technology adoption, empirical research on e-commerce/technology adoption has been reviewed. In search of online research database "PRO-QUEST" on April 25, 2017, prominently among the search results is the Unified Theory of Acceptance and Use of Technology (UTAUT) with 1000 hits. The UTAUT (Venkatesh et al. 2003) theory has "behavioral intention" and "actual usage behavior" as the main dependent variables.

Based on the review, it is found that the UTAUT model has already been validated in a cross-cultural study for its robustness across countries (Oshlyansky et al. 2007). The UTAUT model has "behavioral intention" and "actual usage" as the main dependent variables. Since 2011, the UTAUT has emerged as a better choice based on the variance explanation analysis undertaken by several researchers. The UTAUT explains 70% of the variance in usage intention that is better than other competing models, which only accounted 17–53% of the variance in behavioral intentions to use the IT system, e.g., Technology Acceptance Model 2 (53%), Theory of Reasoned Action (36%), Theory of Planned Behaviour (36–47%), and Innovation Diffusion Theory (40%) (Venkatesh et al. 2003).

Based on the literature review, the UTAUT model has been adopted for analyzing "B2B E-commerce in Indian Agriculture Sector". The six constituting factors appear to be relevant determinants of B2B e-commerce adoption in Indian Agriculture marketing sector. These determining factors are shown in the proposed Framework (Fig. 14.3), with two additional factors in a modified UTAUT framework.

The main constructs in the framework (Table 14.1) are:

14.6 Analysis

To verify, practical applicability of the adoption framework, an opinion survey is conducted among NAM participants (farmer, trader, official) who have adopted NAM in the Meerut APMC market. The survey was conducted based on a questionnaire developed with the help of experts.

Out of 50 survey responses, 40 were found valid which have been used for data analysis. The internal consistency of constructs is tested using Cronbach's alpha. The values for each construct are found to be 0.65 or above, which is considered acceptable for the empirical research of this nature (Hair et al. 2006; George and Mallery 2011).

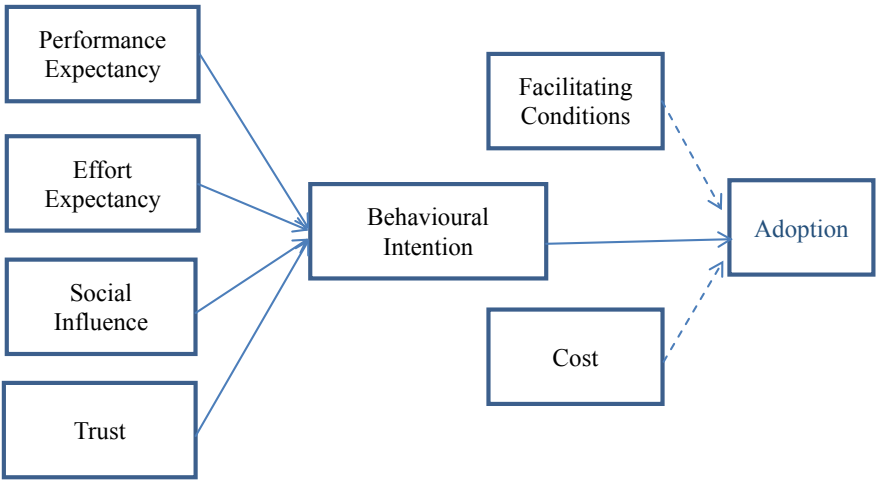

Fig. 14.3 Conceptual view of research framework

Table 14.1 Construct definition

As per the UTAUT (Venkatesh 2003):	
Construct	Definition
Performance expectancy	The degree to which an individual participant believes that using the NAM will help him or her to benefit in job performance, e.g., better price, more buyers, better quality, etc.
Effort expectancy	The level of ease associated with the use of NAM
Social influence	The level to which an individual participant perceives how important others (large farmers, known trader, buyer mill, the government) believe that he or she should use the NAM
Facilitating conditions	The level to which an individual participant believes that an organizational and technical infrastructure (labs, logistics, building, internet, PC, mobile) exists to support the use of NAM
Behavioral intention	The level to which an individual has made a conscious plan to adopt or not adopt NAM
Adoption	The user registers on the NAM portal and e-trade at least once
New constructs	
Cost (transaction cost)	The transaction costs in NAM platform (Clasen and Mueller 2006; Solaymani et al. 2012)
Trust	Trusted confidence in the trustee's actions. It is also a belief that the trustee's promise can be relied on and that the trustee will act in the spirit of goodwill (Casalo et al. 2011; Ridings et al. 2002).

The descriptive statistics are presented in Table 14.2. The observed mean value of the construct shows the relative significance of that constructs over other constructs with less mean value.

The mean opinion value of "Social Influence" construct (4.37) is relatively high. When asked, NAM users and officials at Meerut APMC market, quoted "government and senior management push", as the preliminary reason for adoption in the early stage. Next highest mean opinion value (4.16) is for "Performance Expectancy" construct. Once a user starts using the digital platform, he experiences a quick response and fast processes such as electronic payments. Further, their expectations for more benefits also increase. It is learnt from interactions with farmers that bigger farmers and traders realize better produce prices and low transaction cost (3.41). However, small farmers are yet to derive benefits from NAM. This is evident from the fact that in Meerut APMC, out of 6000 farmers and 735 traders registered on the NAM during 2017, on an average daily about six trades were completed with e-payments and 30 without e-payments. This highlights the need for a strong need for awareness building, promotions, and end user training at the small farmer and trader levels.

The mean opinion value of "Trust" construct is at 3.62. It shows that the website Information is accurate and a level of trust comes from the government ownership. Comparatively, the respondent in Meerut APMC was either unaware or gave low ratings to private alternatives, e.g., IFFCO bazaar, ITC.

The construct "Effort Expectancy" and "Facilitating Conditions" have low mean opinion value (3.28). It is evident by high dependency on contract staff, low availability of quality labs for sample testing, and low promotion level, e.g., one promotional event per month. The small farmer has a high dependency on authorized market agents. Among facilitating conditions, the broadband connectivity, low bandwidth, and frequent disconnection are an issue. This is evident from more and more farmers and traders opting for e-trading via the mobile application.

Among facilitators, a strong encryption and authentication mechanism for e-payments may be considered. This may increase the number of e-payment backed transactions. So far, only 85% of NAM markets have quality labs. The number of labs may be increased by authorizing select private lab reports. Even for the present labs, the working hours need to be increased to encourage participation by farmers.

14.7 Conclusion

This study proposes a comprehensive adoption framework for the B2B e-commerce adoption in Indian Agriculture sector. The univariate statistical analysis reflects upon the relationship between NAM "adoption" and framework constructs. This relationship is apparently positive as all the influencing constructs have the mean value between 3.28 and 4.37, on a scale of 1–5.

As per the results of an opinion survey conducted in the Meerut APMC market, the NAM project is characterized by high observed values of influencing constructs. The findings highlight the need to focus on the influencing variables, "Performance

Table 14.2 Univariate statistical analysis

Construct	Mean	Query	N	Minimum	Maximum	Mean	Std. deviation
Performance expectancy	4.16	Useful in trading	40	3	5	4.38	0.540
		Accomplish trading/payment quickly	40	3	5	4.15	0.700
		Help get a better price	40	3	5	3.95	0.677
Effort expectancy	3.28	Interaction with the system is clear and understandable	40	2	5	3.43	1.059
		The system is easy to use	40	2	5	3.30	0.939
		Learning to operate the system is easy	40	2	5	3.13	0.853
Facilitating conditions	3.28	I have the necessary knowledge and resources	40	2	5	2.95	0.986
		The system has compatibility issues other online/offline systems	40	2	5	3.13	0.911
		Help is available when required	40	2	5	3.78	0.862
Trust	3.62	Information (valid, credible and accurate)	40	2	5	4.03	0.920
		Trust in seller	40	2	5	3.58	0.781
		Trust in buyer	40	2	5	3.25	0.670

(continued)

Table 14.2 (continued)

Construct	Mean	Query	N	Minimum	Maximum	Mean	Std. deviation
Cost	3.41	Low-transaction costs	40	2	5	3.58	0.813
		Low procurement Cost	40	2	5	3.25	0.670
Social influence	4.37	People important, influencer) want me to use the system	40	3	5	4.45	0.639
		Senior management is helpful	40	3	5	4.23	0.480
		Organization support use of system	40	3	5	4.43	0.636

Expectancy", "Social Influence", and "Trust" among others. It may help in improving both the behavioral intention to adopt and the actual adoption of NAM.

In addition, looking at resistance to adoption for the trading community, the partners' expansion plan may include promotional efforts, e.g., technical and financial assistance to users with low organizational readiness (Iacovou et al. 1995). The influencers (farmers and traders who can affect their peer group) may be given special attention and promotional offers. The monthly promotional meet (Mela) may be organized more frequently with better advertising. Such efforts may result in increasing numbers of bids per lot, which after much effort are still averaging 4.54 (DACFW 2018).

For facilitating intra- and interstate trading, the physical logistic support to farmers (Sharma and Yadav 2017) will be a progressive step for strengthening NAM, e.g., case study of Meerut APMC shows that logistics are left to traders to handle and there is a demand–supply gap in storage. The storage facilities may be accredited and geotagged. In addition, the dispute resolution mechanism may be strengthened (DARPG 2017). Along with dispute resolution, the regular monitoring from APMC officials ("Secretary", "Market Inspector") may prevent the market from getting cornered again by cartels that rig the prices. Looking forward, all the states, need to expedite amendment of the State Agricultural Produce Marketing Committee Act (APMC) in tune with the central government model APMC Act, 2017 for creating a flexible ecosystem for marketing of agricultural produce in the country.

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Chapter 15
Prioritizing Best Practices for Logistics Service Providers

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Abstract Due to globalization and fast growing e-commerce businesses, the scale of Logistics Service Providers (LSPs) in India is expected to increase. LSPs support their client organizations to provide a smooth and timely delivery of goods. LSPs provide flexibility in their processes to meet the dynamic requirements of their customers. In this chapter, there is an attempt to identify the best practices followed by Indian LSPs and to rank the identified best practices. The best practices have been categorized into four major categories, that is strategic, operational, technical, and societal, based on literature review and opinion of experts. Further, twenty best practices were identified as subcategories under above-defined categories. The experts were asked to rate the 20 factors as per their importance. Further, to rank the best practices, a fuzzy AHP approach was applied. Based on priority weights, different categories were ranked in decreasing order as Operational (0.45), Strategic (0.41), Technical (0.10), and Societal (0.03). It has been observed from the study that the top 4 most important factors among all the 20 factors are safe delivery of shipments, use of eco-friendly fleet, reduction in carbon emission, and timely delivery. The study is likely to assist organizations in familiarizing with the strengths and practices used by Indian LSPs so that they can set up their perceptions and expect for their fulfillment. The research is also expected to help unorganized and budding LSPs to recognize their weak factors, which require further improvement and can excel to fulfill the dynamic market needs.

Keywords Best practices · Fuzzy AHP approach · Logistics service providers · Service quality

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15.1 Introduction

Due to advancement in technology and significant developments in the Indian economy, the logistics sector is transforming to align with changing business requirements. There is a need to bring flexibility in logistics operations to meet the dynamic and fast-changing requirements (Ecer 2018). Logistics is considered as the backbone of an economy, and it contributes around 13% in GDP as against 7–8% in developed countries (Outlook India 2017). In the past few decades, the logistics sector has shown tremendous growth, and at present, it has reached to around the US$225 billion industry. The logistics sector is growing at very high speed to matchup with the increased rate of market demand. The role of flexibility in operations and adaptability to technology are also increased to a big extent (Alkhatib et al. 2015). It is expected to grow around 10–15% annually. The growth in the Indian economy is bringing lots of opportunity for logistics sector to grow in terms of increase in volume handling, large traffic volume, and an increase in network coverage. In India, LSPs use their blend of infrastructure, technology, and dedicated manpower to provide a smooth flow of goods starting from suppliers and ending up with final consumers. There is also an increased need for flexibility in LSPs operations, including transportation, warehousing, inventory handling, or final delivery to the customers (Shukla et al. 2010).

Despite a few weaknesses, the logistics sector is witnessing huge growth in retail, e-commerce, and manufacturing sectors. LSPs support their client organizations in satisfying their end customers with better service quality and committed shipments. Logistics Service Providers (LSPs) or 3PL provides various services, including transportation, freight forwarding, warehousing, container services, shipping services, express cargo delivery, value added services, etc. to manage all logistical activities in the entire supply chain smoothly. At present, organized logistics players are adopting the latest techniques and technologies to meet increased and dynamic logistics requirements. Many best practices are being followed by LSPs to bring transparency, enhance service quality, and improve collaboration and coordination among supply chain members.

These studies focus on the identification of best practices followed by Indian LSPs and rank them by their importance by fuzzy AHP. The purpose of this chapter is to emphasize the LSP's best practices and their support to smoothen up the entire supply chain. The flow of the chapter is as follows. The first section is an introduction which is followed by a literature review, which has been discussed in Sect. 15.2. The development of a model is discussed in Sect. 15.3. Further, the research methodology has been discussed in Sect. 15.4. Section 15.5 contains findings and concluding remarks of the study are discussed in Sect. 15.6.

15.2 Literature Review

In past studies, many researchers researched the logistics services and logistics service providers. Selviaridis and Spring (2007) developed a taxonomy of 3PL studies and reviewed around 114 refereed journals for the papers published from 1995 to 2005. Marasco (2008) selvdid depth analysis of same studies by exploring around 152 articles which are published in 33 international journals. Many researchers discussed the innovative practices adopted in logistics management and Busse and Wallenburg (2011) reviewed similar studies for the period of 2001–2009. Nowadays, outsourcing has become so common for organizations in almost all industry sectors which indicate the increased scope of logistics services providers and their respective logistics services.

In the current market scenario, Logistics services are not limited to transportation or warehousing whereas LSPs offers multidimensional logistics services in the form of one-stop solution (Kumar and Singh 2012). The commonly known logistics services, which are offered by LSPs are transportation, warehousing, fleet handling, order management, etc. (Sahay and Mohan 2006). The adoption and usage of information technology tools had also increased to make effective communication among all supply chain entities (Fasanghari et al. 2008; Gilaninia et al. 2011). The logistics providers are also adopting innovative and sustainable practices to cope up with changing market needs. Jayaram and Tan (2010) discussed supply chain integration, which is an obvious requirement for LSPs to conduct smooth operations across complex supply chains. The tougher competitive markets and declining margins made pressure on LSPs to be equipped with all updated resources and technology for providing better customer satisfaction. The adoption of best practices becomes the requirement for survival, growth, and continuity of business in the future (Tan et al. 2014; Huang et al. 2014). Logistics service providers have initiated and adopted innovative and sustainable best practices along with their inbuilt operations to provide flexibility to the customers (Shukla et al. 2010). Optimal utilization of fleet (Basligil et al. 2011), flexibility in fleet management, scheduling and services (Naim et al. 2010), value-added services (Soinio et al. 2012), vendor managed inventory, use of warehousing software (Doerr et al. 2006), use of GPS technology for tracking and tracing of shipments (Hillbrand and Schoech 2007), shortest and optimal route planning (Ulku and Bookbinber 2012), and quick complaint handling are found to be the most frequent logistics functions which are provided by LSPs in their bouquet of services. In past studies, many researchers also studied LSPs environmental consciousness and their inclination toward the adoption of green supply chain practices and reverse logistics, etc. Dey et al. 2011). In literature, the LSPs also showed their concern toward society by adopting rainwater harvesting, planting more trees, making use of solar energy, taking steps toward a reduction in carbon emission, etc. (Lieb and Lieb 2010; Govindan et al. 2012).

Due to increased globalization, LSPs are required to redefine their strategies to meet international standards and enhance the capability to reach globally (Kumar and Singh 2012). This increases the scope of LSPs to cover a wider market reach and

improve connectivity with other nations. In some countries, the outsourcing of logistics services is still in infancy phase, whereas in developed countries, LSPs handles most of the non-core activities to provide logistical support to the organizations (Tan et al. 2014). It has been observed from the past studies that more than 50% of organizations outsource shipment consolidation to Indian LSPs (Bhatnagar et al. 1999), whereas order fulfillment, carrier selection, and freight payment in Singapore are approximately 40% outsourced to LSPs. Kumar and Singh (2012) had identified that the logistics outsourcing practices are comparatively faster in Asia-Pacific Region and Western Europe than North America and Latin America.

Existing literature suggests that best practices followed by LSPs are driven more by top management. The new ideas, new policies, and innovation are usually initiated by the senior management of an organization and finally turned into applicable strategies. Hoek et al. (2008) suggested that the other peer departments must be internally aligned with supply chain partners to enhance efficiency and integration. Ellinger et al. (2008) examined the market orientation and had identified that the efforts and dedication of manpower directly affect the performance of logistics service providers. Network Planning and enhancement and network distribution management by a hub and spoke systems are important components of strategic planning (Zapfel and Wasner 2002). The management always prefers to audit all the processes to maintain control and transparency in the system. LSPs need to maintain the confidentiality of the entire customer data used in transactions, so top management gives high importance to this concern. As operational best practices, the prime focus of LSPs is to deliver safe shipments in committed time (Stank et al. 2003).

The best practices are broadly categorized into four categories strategic, operational, technical, and societal. The subcategories taken under each category is defined in Table 15.1 along with corresponding references.

15.3 Proposed Framework

The existing literature on best Practices has been reviewed. A model is proposed to understand the hierarchy of best practices usually followed by Indian LSPs (Fig. 15.1). Almost all well-established and well-known LSPs practice their operations in the best possible way to ensure successful fulfillment of all commitments made to the customer. At the strategic level, the top management of the organization is directly involved in taking major decisions related to manpower management, network planning and enhancement, audit, and control of all ongoing processes, maintaining data confidentiality and identifies new innovative and customized solutions to satisfy the customer needs an efficiently. At the operational level, the best practices adopted by LSPs are more focused toward the satisfactory end delivery of the services to the customer. Their preferences for delivering the best of the service quality are planning of safe shipments, timely and accurate delivery, optimizing resources efficiently, managing inventory, and efficient route planning. At the technical level, this is almost mandatory for LSPs to make use of latest software and tools to

Table 15.1 Literature review on best practices followed by LSPs

Best practices	Definition/meaning	References
Organizational		Ellinger et al. (2008), Hoek et al. (2008)
Manpower management	Managing human resources involved in all logistics operations	Aghazadeh (2003), Sahay and Mohan (2006), Hamdan and Rogers (2008), Wong and Karia (2010), Juga et al. (2010), Jayaram and Tan (2010), Tezuka (2011), Ecer (2018)
Network planning and enhancement	Planning for maintaining existing network and enhancing new dimensions as required for expansion of business	Zapfel and Wsaner (2002), Ellinger et al. (2008), Basligil et al. (2011), Gilaninia et al. (2011), Kayakutlu and Buyukozkan (2011), Soinio et al. (2012), Gunasekaran et al. (2016)
Audit and control	The process to cross-check the correctness of the functioning of all processes in the organization	Comyn-Wattiau and Akoka (1996); Gilmour (1999), Fernando et al. (2018)
Data confidentiality	Keeping all records and data transactions with appropriate security measures	Farmer (1988), Tweddle (2008), Jothimani and Sarmah (2014), Fernando et al. (2018)
Innovation and customized solutions	Trying out new ways to provide services along with serving customer needs in a tailor-made fashion	Farmer (1988), Ghobadian et al. (1994), Huo et al. (2008), Busse and Wallenburg (2011), Yeung et al. (2012)
Operational		Isik et al. (2018), Stank et al. (2003), Yeung et al. (2012)
Safe shipments	Ability to deliver products safely	Parasuraman et al. (1985), Vandamme and Leunis (1993), Ghobadian et al. (1994), Philip and Hazlett (2001), Mentzer et al. (2001), Stank et al. (2003), Markovic (2006), Ecer (2018)
Timely delivery	Ability to deliver goods on time	Parasuraman et al. (1988), Millen et al. (1999), Sahay and Mohan (2006), Huo et al. (2008), Busse and Wallenburg (2011), Kumar and Singh (2012), Ulku and Bookbinber (2012), Yeung et al. (2012), Augusto et al. (2019)

(continued)

Table 15.1 (continued)

Best practices	Definition/meaning	References
Resource optimization	Optimum use of all available limited resources to LSPs	Aghazadeh (2003), Sahay and Mohan (2006), Naim et al. (2010), Tezuka (2011), Forslund (2012), Isik et al. (2018)
Efficient route planning	Planning of route for efficient movement of the fleet	Zapfel and Wsaner (2002), Madaan and Wadhwa, (2007), Basligil et al. (2011), Ulku and Bookbinber (2012), Ravi (2014)
Inventory replenishment	Adopting various ways to refill the inventory of customer at the earliest	Waller et al. (1999), Swenseth and Godfrey (2002), Sahay and Mohan (2006), Hua et al. (2011), Augusto et al. (2019)
Technical		Wang and Elhag (2006), Lai et al. (2008), Forslund (2012)
Use of warehouse management software	Use of IT and software for warehouse management	Doerr et al. (2006), Ketikidis et al. (2008), Tiwari *i.* (2018)
Data handling and extraction	Managing data handling and extraction of data through data mining tools	Evangelista et al. (2013), Kumar and Kumar (2014), Fernando et al. (2018)
Tracking and tracing of shipments	Using GPS technology to track and trace the exact location of transit shipment	Hillbrand and Schoech (2007), Shamsuzzoha, and Helo (2011), Sakun (2011), Kumar and Kumar (2014)
Use of the internet and (Electronic Data Interchange) EDI Systems	Access to the internet and adoption of EDI systems for increasing transparency of processes	Jharkharia and Shankar (2005), Fasanghari et al. (2008), Tezuka (2011), Wong and Karia (2010), Gilaninia et al. (2011), Evangelista et al. (2013), Tiwari et al. (2018)
Barcoding and RFID systems	Techniques which help in tracking the product or items	Musa and Dabo (2016), Doerr et al. (2006), Gaukler & Seifert (2007), Ketikidis et al. (2008)
Societal		Gruchmann et al. (2018), Centobelli et al. (2017), Mani et al. (2016)
Use of eco-friendly fleet	Use of more green and environment-friendly fleet to reduce the pollution level in an environment	Dey et al. (2011), Lieb and Lieb (2010), Colicchia et al. (2013), Anni-Kaisa et al. (2018)

(continued)

Table 15.1 (continued)

Best practices	Definition/meaning	References
Use of renewable energy sources	Use of those sources which can naturally replenish	Naim et al. (2010), Tezuka (2011), Ulku and Bookbinber (2012), Mani et al. (2016)
Use of reusable and recyclable packaging	Repeated usage of packaging either in the same form or another form as recycled one	Sahay and Mohan (2006), Lieb and Lieb (2010), Dey et al. 2011, Govindan et al. (2012), Anni-Kaisa et al. (2018)
Reduction in carbon emission	Step to reduce carbon emission in the environment by modifying transport and facility usage	Kim et al. (2009), Hua et al., (2011), Elhedhli and Merrick (2012), Anni-Kaisa et al. (2018)
Initiatives toward CSR	Organizational activities for society and environment as a part of corporate social responsibility	Colicchia et al. (2013), Juntunen et al. (2015), Centobelli et al. (2017), Gruchmann et al. (2018)

Source Singh and Sharma (2015)

keep updated their customers with basic requirements of tracing the exact position of goods, managing warehouses, data mining, etc. The best practices followed by LSPs to make their systems technically robust are the use of warehouse management systems software, use of barcoding and RFID technology, use of GSM-GPS technology, and Internet and EDI systems to make their system transparent and convenient. At the societal level, most of the LSPs are contributing toward Corporate Social Responsibility (CSR) activities by adopting major usage of renewable resources, eco-friendly fleet, and recyclable packaging materials. Moreover, they are also giving importance to the use of solar panels, tree plantation, and rainwater harvesting, especially at their warehouses and open areas.

15.4 Research Methodology

In literature, there are various methods available for ranking best practices of LSPs. The most common method used by researchers is Multiple Criteria Decision-Making (MCDM) techniques. These techniques give the opportunity to a researcher to deal with unstructured problems with multiple goals simultaneously. This reason accelerates the usage of these techniques (Lee and Eom 1990). In MCDM techniques, many mathematical techniques like Analytic Hierarchy Process (AHP), TOPSIS, Data Envelopment Analysis (DEA), etc. have been developed (Tyagi et al. 2015). Most of the approaches worked on the preferences and weights given by decision maker to various alternatives available to them. In this chapter, the identified best practices are ranked by using one of the effective tools of MCDM, that is, fuzzy AHP.

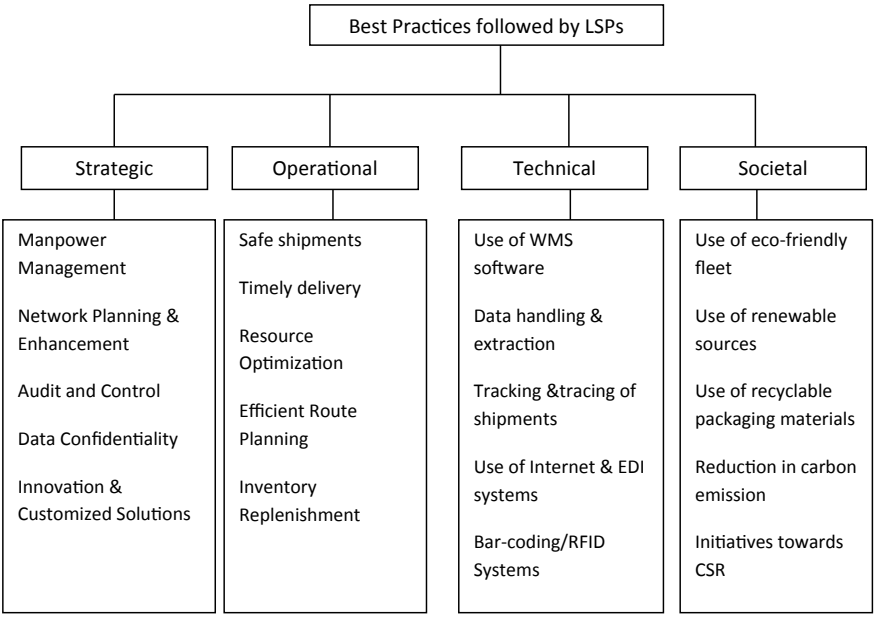

Fig. 15.1 Proposed model for best practices followed by LSPs

15.4.1 Fuzzy Analytic Hierarchy Process

AHP gives better results when we deal with exact and ordinary data, but fuzzy AHP is considered to be more appropriate to capture uncertainties associated with the data. The advantage of fuzzy AHP over AHP is to capture uncertain, imprecise judgment of experts in pair-wise comparison, which can be useful in dealing complexities with a 3PL selection. Proposed hierarchical framework (Fig. 15.1) will be used for applying fuzzy AHP. Linguistics scales for defining the weight of each factor is given in Table 15.2.

Let A = {a1, a2… an} be an object set and B = {b1, b2… bm} be a goal set.

Table 15.2 Factor importance rating as linguistic variable

Linguistic variable	Triangular fuzzy numbers
Equally significant	(1, 1, 1)
Weakly significant	(2/3, 1, 3/2)
Fairly significant	(3/2, 2, 5/2)
Strongly significant	(5/2, 3, 7/2)
Absolutely significant	(7/2, 4, 9/2)

In 1992. Chang explored extent analysis which stated that each object is taken and each goal y_i, is set respectively. Therefore, the extent analysis values for each object have been evaluated and are discussed as follows:

$$X_{y_i}^1, X_{y_i}^2, \ldots, X_y^m, i = 1, 2, \ldots, n, \tag{15.1}$$

where all the $X_{y_i}^j$ ($j = 1, 2, \ldots m$) are triangular fuzzy numbers represented by (u, v, w) where u, v, and w is the smallest, almost certainly, and largest possible numbers.

According to Chang (1996), the following are the steps of the fuzzy AHP:

Step 1: The value of a fuzzy synthetic extent concerning the *i*th object is defined as

$$X_i = \sum_{j=1}^{m} X_{y_i}^j \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} X_{y_i}^j \right]^{-1} \tag{15.2}$$

Now, apply the fuzzy addition operation of extent analysis values for a particular matrix such that

$$\sum_{j=i}^{m} X_{y_i}^j = \left(\sum_{j=1}^{m} u_j, \sum_{j=1}^{m} v_j, \sum_{j=1}^{m} w_j \right) \tag{15.3}$$

Now, apply the fuzzy addition operation of $X_{y_i}^j$ ($j = 1, 2, \ldots m$) values such that

$$\sum_{i=1}^{n} \sum_{j=1}^{m} X_{y_i}^j = \left(\sum_{i=1}^{n} u_i, \sum_{i=1}^{n} v_i, \sum_{i=1}^{n} w_i \right) \tag{15.4}$$

In Eq. (15.2), the vector is inversed and computed as

$$\left[\sum_{i=1}^{n} \sum_{j=1}^{m} X_{yi}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} wi}, \frac{1}{\sum_{i=1}^{n} vi}, \frac{1}{\sum_{i=1}^{n} ui} \right) \tag{15.5}$$

Step 2: Find $X_2 = (u_2, v_2, w_2) \geq (u_1, v_1, w_1)$ and then computed as

$$V(X2 \geq X1) = sup_{p \geq q}[\min(\mu_{X1}(p), \mu_{X2}(q)] \tag{15.6}$$

and can also be written as follows:

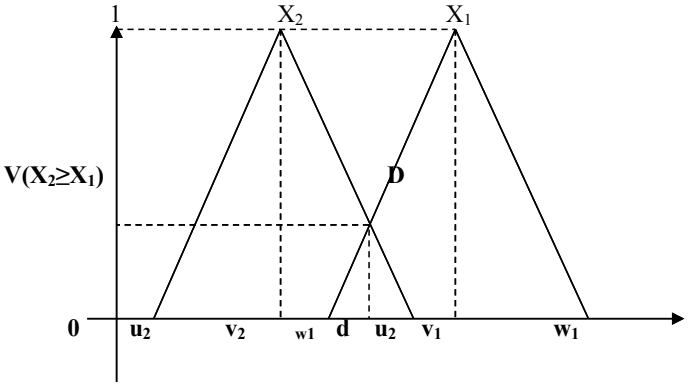

Fig. 15.2 The interaction between triangular fuzzy numbers, X_1 and X_2

$$V\ (X_2 \geq X_1) = \text{hgt}\ (X1 \cap X2) = \mu_{X2}(d) = \begin{cases} 1, & if\, v_2 \geq v_1, \\ 0, & if\, u_1 \geq w_2, \\ \frac{u_1 - w_2}{(v_2 - w_2) - (v_1 - u_1)} & otherwise, \end{cases} \tag{15.7}$$

where d is the ordinate of the highest intersection point D as shown in Fig. 15.2.

The values of $V(X_2 \geq X_1)$ and $V(X_1 \geq X_2)$ are compared.

Step 3: For a convex fuzzy number to be greater than k, convex fuzzy numbers X_i (i = 1, 2,…, k) can be defined as

$$V(X \geq X_1, X_2, \ldots, X_k) = V[(X \geq X_1)\ and\ (X \geq X_2)\ and \ldots and\ (X \geq X_k)]$$

$$\begin{aligned} V(X \geq X_1, X_2, \ldots, X_k) &= V[(X \geq X_1)\ and\ (X \geq X_2)\ and \ldots and\ (X \geq X_k)] \\ &= \min V(X \geq X_i), i = 1, 2, 3, \ldots, k \end{aligned} \tag{15.8}$$

Assume that,

$$d'(P_i) = \min V(S \geq S_k) \tag{15.9}$$

for, k = 1, 2, …, n and k ≠ 1.

Now the weight vector can be computed as,

$$W' = \{d'(P_1), d'(P_2), \ldots, d'(P_n)\}^T, \tag{15.10}$$

where Pi (i = 1, 2, 3…, n) are n elements.

Step 4: The normalized weight vectors by the method of normalization are given as

$$W' = \{d(P_1), d(P_2), \ldots, d(P_n)\}^T,$$

where "W" is a non-fuzzy number

Step 5: Combine the inputs of all experts by using a geometric average and then interpret the final output.

15.5 Findings of the Study

LSPs best practices are prioritized by using fuzzy AHP approach. Two experts have been chosen on the basis of their work experience with the logistics sector. The experts gave their inputs on various best practices adopted by LSPs. Expert-1 is senior operation manager in leading Logistics Company with experience of more than ten years. Expert-2 is supply chain head in well known Indian logistics company with 15 years of experience. The experts are working with well-established Indian logistics companies, and they provide their insights on the best practices followed by Indian logistics service providers in general.

The pair-wise comparison of all factors at each hierarchical level has been done on the basis of linguistics scale of Table 15.2. By using Eqs. 15.1–15.2, the pair-wise comparison matrices of all major and minor criteria in the form of a matrix are shown in Table 15.3. The final individual and global weights are evaluated by using Eqs. (15.3–15.10) by applying fuzzy AHP method and is shown in Table 15.4.

Results show that priority weight differs for all criteria. Based on priority weights, different categories can be ranked in descending order as Operational (0.45), Strategic (0.41), Technical (0.10), and Societal (0.03). The most important best practices are followed under the operational category. Under the operations category, safe shipments (0.44) and timely delivery (0.28) are two important sub-factors that are basically inbuilt operational practices required to serve customers. Resource Optimization (0.26) is also an important concern area where LSPs try to optimize their limited resources. After operational, the second priority should be given to Strategic. At the strategic level, the major sub-factor is Network Planning and Enhancement with priority weight of 0.31 followed by manpower management (0.28) and audit and control (0.23) as shown in Table 15.4. In today's market conditions, logistics service providers are extensively working toward the enhancement of network from domestic to global and simultaneously, emphasizing on manpower management to train them as per increasing market requirements. The weight for data confidentiality is 0.18, which shows that top management gives high importance to the security and safety of customer's data. Innovation and customized solutions (0.005) has less weight as compared as to other sub-factors. It reflects that LSPs give little importance to innovation rather than serving customers in a usual way.

In Technical, use of the internet and EDI (0.27) and use of WMS (0.26) are the two important sub-factors required for smooth communication between different supply chain partners. Common softwares like Electronic Data Interchange (EDI) and Warehouse Management software (WMS) brings transparency and reduces inventory

Table 15.3 Pair-wise comparison matrix of the major criteria and sub-criteria

a: Pair-wise comparison matrix of the major criteria

	Strategic	Operational	Technical	Societal
Strategic	(1, 1, 1)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(0.667, 1, 1.5)
Strategic	(0.4, 0.5, 0.667)	(1, 1, 1)	(2.5, 3, 3.5)	(1.5, 2, 2.5)
Strategic	(0.286, 0.334, 0.4)	(0.286, 0.334, 0.4)	(1, 1, 1)	(1.5, 2, 2.5)
Strategic	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(0.4, 0.5, 0.667)	(1, 1, 1)

The weight vector is computed as $W_{BP} = (0.41, 0.45, 0.10, 0.03)^T$

b: Pair-wise comparison matrix of sub-factors—strategic

	Manpower management	Network plan and enhancement	Audit and control	Data confi-dentiality	Innovation and customized sol
Manpower management	(1, 1, 1)	(1, 1, 1)	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Network plan and enhancement	(1, 1, 1)	(1, 1, 1)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(1.5, 2, 2.5)
Audit and control	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(1, 1, 1)	(0.667, 1, 1.5)	(1.5, 2, 2.5)
Data confi-dentiality	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)
Innovation and customized sol	(0.286, 0.334, 0.4)	(0.4, 0.5, 0.667)	(0.4, 0.5, 0.667)	(0.667, 1, 1.5)	(1, 1, 1)

The weight vector is computed as $Ws = (0.28, 0.31, 0.23, 0.18, 0.01)^T$

c: Pair-wise comparison matrix of sub-factors—operational

	Timely delivery	Safe shipments	Resource optimization	Effective route planning	Inventory replenish-ment
Timely delivery	(1, 1, 1)	(1, 1, 1)	(1.5, 2, 2.5)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Safe shipments	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(1.5, 2, 2.5)	(3.5, 4, 4.5)
Resource optimization	(0.4, 0.5, 0.667)	(0.223, 0.25, 0.286)	(1, 1, 1)	(3.5, 4, 4.5)	(0.667, 1, 1.5)
Effective route planning	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(0.223, 0.25, 0.286)	(1, 1, 1)	(3.5, 4, 4.5)
Inventory replenish-ment	(0.286, 0.334, 0, 4)	(0.223, 0.25, 0.286)	(0.667, 1, 1.5)	(0.223, 0.25, 0.286)	(1, 1, 1)

The weight vector is computed as $W_O = (0.28, 0.44, 0.26, 0.02, 0)^T$

(continued)

Table 15.3 (continued)

d: Pair-wise comparison matrix of sub-factors—technical					
	Use of WMS Software	Data handling and extraction	Tracking and tracing	Use of internet and EDI	Barcoding and RFID systems
Use of WMS software	(1, 1, 1)	(0.667, 1, 1.5)	(1.5, 2, 2.5)	(0.667, 1, 1.5)	(1.5, 2, 2.5)
Data handling and extraction	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)	(2.5, 3, 3.5)	(1, 1, 1)
Tracking and tracing	(0.4, 0.5, 0.667)	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Use of internet and EDI	(0.667, 1, 1.5)	(0.286, 0.334, 0.4)	(0.667, 1, 1.5)	(1, 1, 1)	(3.5, 4, 4.5)
Barcoding and RFID systems	(0.4, 0.5, 0.667)	(1, 1, 1)	(0.286, 0.334, 0.4)	(0.224, 0.25, 0.286)	(1, 1, 1)
The weight vector is computed as $W_T = (0.26, 0.25, 0.22, 0.27, 0)^T$					

e: Pair-wise comparison matrix of sub-factors—societal					
	Use of eco-friendly fleet	Use of renewable energy resources	Use of reusable and recyclable packaging	Reduction in carbon emission	Initiatives toward CSR
Use of eco-friendly fleet	(1, 1, 1)	(2.5, 3, 3.5)	(1, 1, 1)	(3.5, 4, 4.5)	(0.286, 0.34, 0.4)
Use of renewable energy resources	(0.286, 0.34, 0.4)	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(0.4, 0.5, 0.667)
Use of reusable and recyclable packaging	(1, 1, 1)	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(0.4, 0.5, 0.667)
Reduction in carbon emission	(0.223, 0.25, 0.286)	(0.223, 0.25, 0.286)	(0.223, 0.25, 0.286)	(1, 1, 1)	(0.286, 0.34, 0.4)
Initiatives toward CSR	(2.5, 3, 3.5)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(2.5, 3, 3.5)	(1, 1, 1)
The weight vector is computed as $W_{C4} = (0.51, 0.05, 0.43)^T$					

Table 15.4 Global weights of the main and sub-factors for selection of best LSP

S. no.	Factors	Individual wt.	Global wt.
1	Strategic	**0.41**	**0.41**
	• Manpower management	0.28	0.116
	• Network planning and enhancement	0.31	0.127
	• Audit and control	0.23	0.095
	• Data confidentiality	0.18	0.072
	• Innovation and customized solutions	0.01	0.005
2	Operational	**0.45**	**0.45**
	• Timely delivery	0.28	0.125
	• Safe shipments	0.44	0.202
	• Resource optimization	0.26	0.116
	• Effective route planning	0.02	0.011
	• Inventory replenishment	0.00	0.00
3	Technical	**0.10**	**0.10**
	• Use of WMS software	0.26	0.027
	• Data handling and extraction	0.25	0.026
	• Tracking and tracing of shipments	0.22	0.023
	• Use of the internet and EDI	0.27	0.028
	• Barcoding and RFID systems	0.00	0.00
4	Societal	**0.03**	**0.13**
	• Use of eco-friendly fleet	0.44	0.014
	• Use of renewable resources	0.06	0.002
	• Use of recyclable packaging material	0.07	0.002
	• Initiatives toward CSR	0.00	0.000
	• Reduction in carbon emission	0.44	0.014

integration in the entire supply chain. These findings have emphasized the increasing importance of communication by logistics providers to remain competitive in dynamic market conditions. Also, to serve across boundaries specifically in the era of e-commerce, competency of logistics provider can act as a competitive advantage to the firm. Data handling and extraction (0.25) followed by tracking and tracing of shipments (0.22) are also required sub-factors of a technical category. It helps in providing all essential informations related to data and exact positioning of the shipments to the customers.

Societal is the fourth important category. In this category, use of eco-friendly fleet (0.44) and reduction in carbon emission (0.44) is found to be the most important sub-

factor of societal. Further, the use of reusable and recyclable packaging (0.07) and the use of renewable energy sources (0.06) are the next important sub-factors of societal. These results clearly show that LSPs have started contributing toward society but not at a very large scale. LSPs are adopting best practices to serve customers in the best possible manner but still in the learning phase.

15.6 Conclusion

Logistics service providers are contributing hugely in the successful execution of all processes of organizations. At the same time, they are also trying to give the best of their services to fulfill their customer expectations. The best practices adopted by Indian LSPs are categorized into strategic, operational, technical, and societal on the basis of literature review and expert opinion. Further, twenty best practices were identified as subcategories under above-defined categories. The experts rated these sub-factors by their importance and further prioritized by using fuzzy AHP methodology. The main factors are ranked as Operational (0.45), Strategic (0.41), Technical, (0.10) and Societal (0.03). Safe shipments are the most important obvious best practice that is needed to be strictly followed by LSPs. Although LSPs focus comparatively less on societal factors, still use of eco-friendly fleet is found as one of the important best practices followed by LSPs. The importance of network planning an enhancement reflects the need for an increase in the existing distribution network and to serve more customers. Timely delivery and manpower management are two prioritized best practices where LSPs need to give more emphasis to be more successful. Delivering shipments on time and managing manpower to deliver best of the services are vital requirements of LSPs to make customer satisfied. Flexibility in processes is also a need of the hour to become compatible with customers' changing requirements.

Innovations and customized solutions, effective route planning, inventory replenishment, barcoding, and initiatives toward CSR activities are still in the infancy stage. Large logistics players have initiated these practices but small players are in planning state and if implemented, not at a very big scale. These best practices can further be implemented to bring improvement to the services of LSPs. The research can help client organizations to understand the processes and practices adopted by Indian LSPs closely and can assist them in making an appropriate selection of LSPs as per their requirement. The study will also enable unorganized and budding LSPs to identify the factors for improvement and can excel in satisfying the dynamic market needs.

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Chapter 16
Framework for Green Flexible Manufacturing System

Dimple Bhandari, Rajesh Kumar Singh and S. K. Garg

Abstract The growth of a country significantly depends on its economic health of the manufacturing sector. The product design and product models change very frequently with reducing product life cycle. It is becoming a challenge for the manufacturers to fulfill the market requirements without affecting the environment. This chapter develops the framework for a green flexible manufacturing system (GFMS). It consists of the application of advanced manufacturing technologies (AMTs), green process design and green product design as major components of the framework. AHP (Analytic hierarchy process) has been used for ranking of different factors. It has been observed that green product design has the highest ranking for green flexible manufacturing system. It is followed by green process design and application of AMTs.

Keywords Analytic hierarchy process · Eco-Friendly technology · Environmental pollution · Green flexible manufacturing systems

16.1 Introduction

The overall business environment requires industry to be extra vigilant and flexible to adjust and respond quickly to market changes. The forces that drive market requirement is corporate responsibility and sustainability. These are a great concern, which must be taken upon priority. The challenges during such a difficult time being downturn economic transition and companies deal with hard choices to survive. The industry needs to acknowledge and address these issues for long-term existence (Porter and Kramer 2006). In such a changing environment, the industry needs to

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be flexible and technology driven. The technological process plays a pivotal role to improve performance (Singh et al. 2005).

For manufacturing industry operating with an uncertain and turbulent market, flexibility has been considered as an important competitive armament. Technologies need to be environment-friendly. Also, the technology can help in creating manufacturing flexibility in production systems. The literature on green Manufacturing flexibility acknowledges that researchers appear to rely on flexible manufacturing processes. It is quite attainable to be flexible without being ingenious, but you cannot be innovative without being flexible (Bolwijin and Kumpe 1990). The strategic skills essential for a flexible manufacturing system (Roth 1996). Flexible manufacturing systems make organizations competitive in global markets (Roh et al. 2014; Tang and Tomlin 2008). The natural challenges change in climate, water, and air contamination, assets and exhaustion also compelled for manufacturing organizations to be sustainable (Bai et al. 2015). The manufacturing industry to compete worldwide, needs to develop their manufacturing capabilities economically such as cost, features, and flexibility while allocating upgraded environmental accomplishment (Deif 2011; Liu 2008).

The industry, in particular, the manufacturing sector must embrace a group of unified strategies that work together to accomplish the desired qualitative and quantitative objectives. The green manufacturing emphasizes the advanced manufacturing model that makes use of different green strategies and techniques, i.e., objectives, technology, and innovations to turn into more eco-friendly. The manufacturing product process and system need to be designed for less input material and energy consumption, utilizing nonpoisonous and renewable energy, decreasing undesirable outputs and changing outputs to inputs or its disposal and recycling. Thus, the word "green" is used to focus on environmental favorable awareness. It is used to explain the manufacturing method that is apprehensive of its product impact on the surroundings and assets. It also incorporates overall efficiency along with planning and control. The green practice is a very extensive term and covers up a large number of activities of a green supply chain, like green packaging of the product, green product, converting of wastes, green design, and low emissions (Kumar et al. 2017).

The increased green flexibility allows a manufacturing industry to adapt more conveniently to convert in the green customer and shareholder market place and environmental governance necessities while managing immense quality guidelines for its products and managing immense accomplishment of manufacturing systems (Liu 2008; Priore et al. 2006).

The author's proposed framework is for green flexible manufacturing in this study. The aim of this framework is to reduce energy, lessen emissions, recycling of waste and to increase productivity. In this study, the AHP method is applied for finding the priority weight for green flexibility factors.

The next section deals with the literature review for green flexible manufacturing systems followed by the analysis of the AHP approach/method. After this, results, discussions, and conclusion are discussed.

16.2 Literature Review

The manufacturing strategies are required to review new customer demands. It needs high awareness about the global competitiveness of the manufacturing units. The local and global market shares in the progressive condition must be studied for deriving opportunity to expand the green manufacturing (Wilson 2011; Ackerman, 1997). The green flexible manufacturing systems need to maintain a proper balance among cost, quality, time, and flexibility of operations (Fig. 16.1). Adopting flexible green manufacturing will also enhance customer's satisfaction and competitiveness in global markets.

The challenges are meeting the requirements of the current generation without understanding the capability of forthcoming generations to meet their requirements (World Commission on Environment and Development 1987). Sustainability is an idea and a model that has its distinctive application and analysis at distinct fields, for example, it is explained in the business to patronising business techniques and actions that coincides the requirements of the industry and its shareholders today while assuring, sustaining, and improving the human and natural assets that will be required in the forthcoming (Deloitte and Touche 1992). Minimizing hazardous emissions, reducing wasteful resource consumption and reusing are examples of sustainable green manufacturing activities.

The green flexible manufacturing systems refer to the enhancement in the flexibility of products and methods. It ensures economical usage of energy, waste reusing, green product designs, or corporate environmental management (Chen et al. 2006). The conceptualized framework to investigate the effective patterns of green flexible manufacturing systems adoption is shown in Fig. 16.2, which consists of applications of AMTs, green product design and green process design (Zhang et al. 2006). The primary focus of the technologies that are computer-aided process planning,

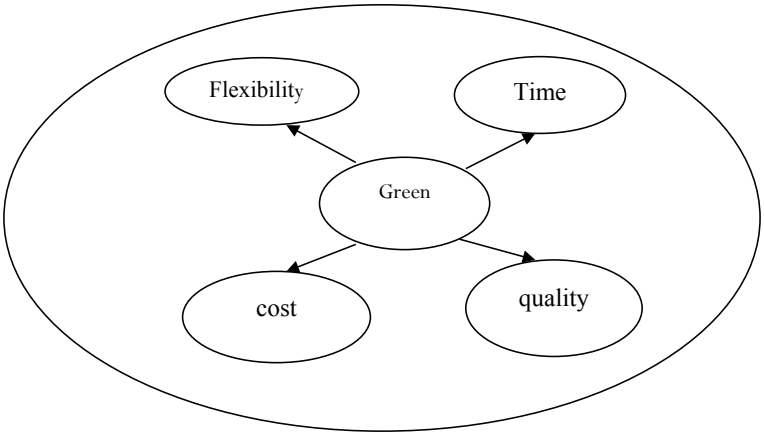

Fig. 16.1 Green flexible manufacturing and competitive manufacturing strategies

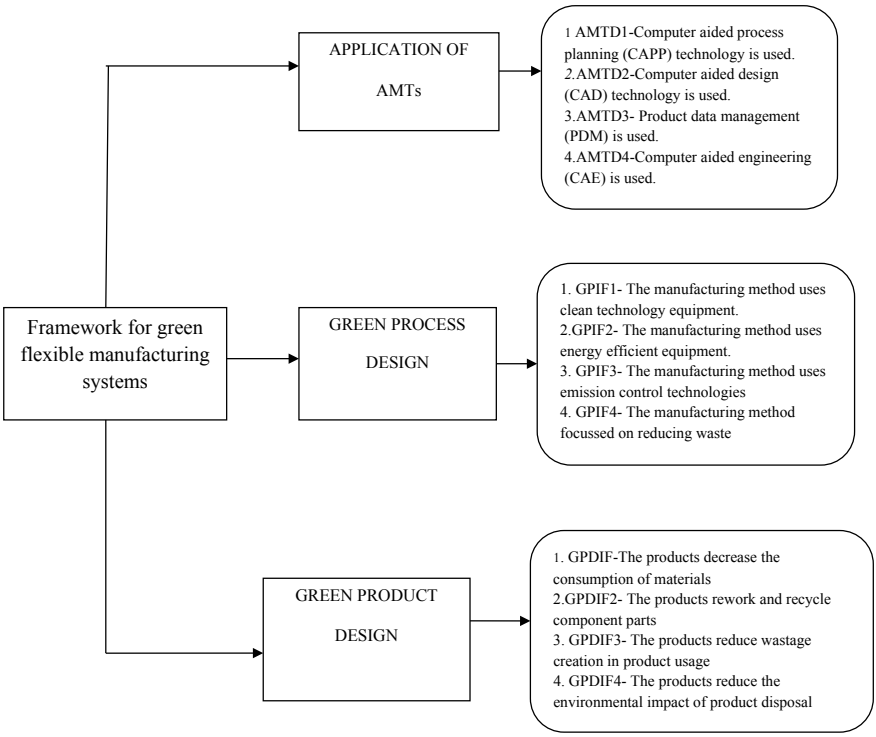

Fig. 16.2 Framework for green flexible manufacturing systems

computer-aided design, product design, related information processing functions, etc., are referred to as AMTs (Sohal et al. 2006). Given flexible green manufacturing, AMTs application is one of the valuable key factors and refers to a multifaceted approach that targets on technologies consisting with the computer-integrated manufacturing (Swink and Nair 2007; Das and Jayaram 2003). The technological knowledge, expertise, and information are examples of important strategic assets of the AMTs (Wagner et al. 2011).

The application of AMTs refers to critical assets and abilities that enable an organization to acknowledge the enhancing environmental pressure by creating and adopting green products and manufacturing processes. Green product design is also crucial for green flexible manufacturing system. Industries that are primarily in green product design should develop their products from the sustainability perspective rather than the traditional requirement of low cost (Chen 2008). Another vital factor is green process design, which describes about advancement in the current method and creation of advanced methods. The green process design not only avoids monetary loss in pollution but also minimizes expensive assets utilization and in the reduction

of total costs (Orsato 2006). The green product and process design can improve the efficiency of environmental management. It also assists businesses to achieve competitive benefits (Chen 2008).

16.3 Research Methodology

The proposed framework for green flexible manufacturing system has a total of 16 subfactors. These are grouped into three categories, i.e., application of AMTS, green process design, and green product design. To prioritize these subfactors, AHP has been used. AHP, the multiple criteria decision- making tool, uses an Eigenvalue approach. There is a wide range of applications of AHP in decision-making problems, which involve multiple criteria in systems of multiple levels. The method is highly efficient for structuring the problem hierarchically in reference to complexity, multi-person, multi-attribute and multi-periodicity. One of the key advantages of AHP is in its flexibility by which it can easily be integrated with numerous techniques like fuzzy-based logic, linear programming, etc. This facilitates the researchers to realize their research objectives more effectively by drawing benefits from all the methods collectively (Chabbra and Singh 2016; Bhandari et al. 2017; Singh 2012). This process also provides a methodology for measuring the quantitative and qualitative performance using the numeric scale. These numerical values vary from 1 to 9. The methodology involves some key and basics steps as follows:

Step 1. State the problem and broaden the objectives of the problem.
Step 2. The criteria that influence the behavior should be identified.
Step 3. Various levels in a problem constituting a goal, criteria, sub-criteria, and alternatives should be structured in a hierarchal manner.
Step 4. Each element is required to be compared with the corresponding level and assigned with some numerical value.
The total number of comparisons required = $n(n-1)/2$,
where n is the number of elements with the considerations that 1 is the assigned numerical value for the diagonal elements, and the other elements are the reciprocals of the earlier comparisons.
Step 5. Find the maximum Eigenvalue, consistency index (CI), consistency ratio (CR), and normalized values for each criterion/alternative.
Step 6. Once the maximum Eigenvalue, CI, and CR are found to be satisfactory then the decision is taken based on the normalized values; else the repeat the procedure to find the values in the desired range.
Step 7. AHP is useful in incorporating a group consensus. A questionnaire is used to compare each element and geometric mean to access a final solution.

For the pairwise comparisons among the subfactors, relative scores were provided using nine-point Satty's scales (Satty 1980).

16.4 Results and Discussions

There are a number of factors for achieving green flexible manufacturing systems which can be implemented. Out of them, the following are considered in the proposed framework:

(1) Application of AMTs;
(2) Green process design;
(3) Green product design.

Pairwise comparison and weight calculation for the factors of green flexible manufacturing systems are as follows and presented in Table 16.1.

$$\begin{aligned}\lambda_{\max}\,(\text{Maximum Eigenvalue}) &= 6 \times 0.164 + 3.5 \times 0.297 + 1.833 \times 0.539\\ &= 3.01\end{aligned}$$

$$\begin{aligned}\text{CI (Consistency Index)} &= \lambda_{\max} - \text{n/n} - 1\\ &= 3.01 - 3/3 - 1\\ &= 0.05\end{aligned}$$

$$\begin{aligned}\text{CR (Consistency Ratio)} &= \text{CI/RCI (Random Consistency Index)}\\ &= 0.05/0.58\\ &= 0.0862\\ &= 8\%\end{aligned}$$

Judgements are treated as consistent or feasible, if the value of consistency ratio is less than or equal to 10%,

There are four main important subfactors of application of AMTs for achieving green flexible manufacturing systems. Pairwise comparison and priority value calculation for the subfactors of application of AMTs for green flexible manufacturing system is presented in Table 16.2.

Table 16.1 Pairwise comparison and priority value calculation for the factors of a green flexible manufacturing system

	Application of AMT	Green process design	Green product design	Priority value
Application of AMT	1	1/2	1/3	0.164
Green process design	2	1	1/2	0.297
Green product design	3	2	1	0.539

Table 16.2 Pairwise comparison and priority value calculation for the subfactors of application of AMT for green flexible manufacturing systems

	AMTD1	AMTD2	AMTD3	AMTD4	PV
AMTD1	1	1/2	2	1/3	0.171
AMTD2	2	1	2	1/2	0.260
AMTD3	1/2	1/2	1	1/3	0.120
AMTD4	3	2	3	1	0.450

$$\lambda_{\max} = 4.08\,\mathrm{CI} = 0.027\,\mathrm{CR} = 3\%$$

There are four main important subfactors of green process design for green flexible manufacturing systems. Pairwise comparison and priority value calculation for the subfactors of green process design for green flexible manufacturing is presented in Table 16.3.

$$\lambda_{\max} = 4.26\,\mathrm{CI} = 0.086\,\mathrm{CR} = 9\%$$

There are four main important subfactors of green product design for green flexible manufacturing system. Pairwise comparison and priority value calculation for the subfactors of green process design for green flexible manufacturing systems is presented in Table 16.4.

$$\lambda_{\max} = 4.25\ \mathrm{CI} = 0.083\,\mathrm{CR} = 9\%$$

A summary of the local and global weight of factors and subfactors for green flexible manufacturing system is presented in Table 16.5.

On the basis of this study, it is found that the green product design is a most important factor (0.539) for achieving green flexible manufacturing systems followed by green process design (0.297) and application of AMT (0.164) at the local level.

Table 16.3 Pairwise comparison and priority value calculation for the subfactors of green process design for green flexible manufacturing systems

	GPIF1	GPIF2	GPIF3	GPIF4	PV
GPIF1	1	2	1/4	1/3	0.142
GPIF2	1/2	1	1/3	1/2	0.115
GPIF3	4	3	1	3	0.497
GPIF4	3	2	1/3	1	0.246

Table 16.4 Pairwise comparison and priority value calculation for the Subfactors of green product design for green flexible manufacturing systems

	GPIDF1	GPIDF2	GPIDF3	GPIDF4	PV
GPIDF1	1	1/3	1/2	1/3	0.107
GPIDF2	3	1	1/2	1/2	0.209
GPIDF3	2	2	1	1/3	0.235
GPIDF4	3	2	3	1	0.444

Table 16.5 Local and global weight

	Local weight	Global weight
Design AMT	0.164	
AMTD1	0.171	0.028
AMTD2	0.260	0.043
AMTD3	0.120	0.020
AMTD4	0.450	0.074
Green process design	0.297	
GPIF1	0.142	0.042
GPIF2	0.115	0.034
GPIF3	0.497	0.148
GPIF4	0.246	0.073
Green product design	0.539	
GPIFD1	0.107	0.058
GPIFD2	0.209	0.113
GPIFD3	0.235	0.127
GPIFD4	0.444	0.239

Source Bhandari et al. (2017)

As per global weights, environmental impact of product disposal (0.239) subfactor of green product design is most important for achieving green flexible manufacturing systems. It is followed by the manufacturing processes using emission-control technologies (0.148) as part of green process design, Computer-aided engineering (CAE) (0.074) as part of AMTs application.

16.5 Conclusion

To survive in highly volatile markets, organizations need to be flexible in terms of their different manufacturing functions. At the same time, functions need to be eco-friendly. Most of the organizations are not able to maintain the strategic balance between flexibility and sustainability. Therefore, this chapter has proposed a framework for green flexible manufacturing system. Totally 16 subfactors are identified for green flexible manufacturing system and further categorized into three groups. These are the application of AMTs, green product design and green process design.

The green product design (0.539) has the highest ranking for green flexible manufacturing system followed by green process design (0.297) and application of AMTs (0.164). Findings imply that organizations should focus on developing capabilities for green product design. It means organizations need to look the process of

material selection; manufacturing processes, from a sustainability perspective. Findings of this study will help organizations in designing sustainable production systems. However, this study has got certain limitations. The pai wise comparison of factors is based on the perception of experts. Mainly crisp data is used. Therefore, the chances of biasing are there. As a future scope of the study, fuzzy AHP may be applied. Framework for green FMS may also be validated with empirical and case studies.

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