Value Chains, Challenges and Concerns of Waste Based Business – A Study of Northern India

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Abstract

Waste has been a major environmental issue everywhere since the industrial revolution. Besides the waste created at home, schools and other public places it is also generated by various sectors like hospitals, industries, farm and other sources. Waste based business helps in addressing the problem of waste to a great extent. The present study analyses various actors in the value chain of waste business and perception of manufacturers regarding challenges and concerns of such business. The total sample size comprised of 156 manufacturers dealing in waste based business units from Northern India i.e. Punjab, Haryana and Himachal Pradesh.The study concluded that in waste based business, 13 different value chains were followed. The major challenges and concerns were found to be inadequate supply of electricity, shortage of raw material availability followed by shortage of labor, low demand of end product, rising prices of raw material, restriction on use of plastic, high taxes, high competition due to new entrants and excess interference by the government.

Keywords:

Waste based business, Value chain, Challenges and concerns, Anova

Introduction

Waste can be defined as any product or substance that has no further use or value for the person or organisation that owns it, and which is, or will be, discarded. But what is discarded by one party may have value for another. Thus, a broad approach to defining 'waste' can include products that are recoverable by others.

Waste is perceived to be a problem for many reasons, but the three reasons most often cited are that: waste disposal can harm the environment and human health; space for landfills is claimed to be becoming scarce; and waste is the end product of a life cycle process that can have upstream environmental and resource depletion implications. Some people also take an essentially moral view of waste generation, arguing that it is symptomatic of wasteful and undesirable overconsumption. The amount of waste we generate, and its actual or potential impacts on the environment, have long been matters of concern to governments and the community generally. In recent times, increasing emphasis has been given to resource recovery including

reusing, recycling and extracting energy from waste. Ambitious targets are being set, and more advanced (but more costly) approaches to recovering waste are being promoted.

Addressing the enormous environmental challenges that we face, waste management has become a growing field that offers entrepreneurial opportunities, room for innovations and investment prospects. Today, more and more venture investors are looking into waste management and value reclamation. Many business houses are involving themselves in waste management i.e. production of products with the use of agricultural waste, tyre/ Plastic waste, municipal solid waste etc. The various divisions that these business houses are dealing with are briquetting units, biogas, paper manufacturing, pyrolysis, plastics to gasoline, plastics to diesel process etc.

Waste based business is an effective solution to the problem of growing waste in India. In order to emphasize the importance of the study, some significant research studies have been reviewed. Dana (2011) discovered and understood the current situation of healthcare waste management of Bangladesh that includes waste handling, collection and disposal as well as the knowledge and awareness level of individuals involved in healthcare. This study also explores alternative options for the management of hospital wastes that is environmentally friendly. Study was based on secondary data on waste management of hospital. Various policy and guidelines were considered in the study. Hospitals in Bangladesh pose significant threat to health and environment on account of inadequate waste management need to raise awareness and provide educational training on medical waste management. Proper waste management policy is required to ensure health and environmental safety and it is recommended that simple changes in policy and support from government and private sectors would bring innovative changes in healthcare waste management. However the healthcare waste management guideline, planning and policy should be under the shadow of legislation, emphasis should be given in the development of educational training programme, record keeping, monitoring, review of existing situation and there should be collaboration between inter ministerial, hospital authorities, and active participation from the community. Sungsomboon *et al* (2011) focused on the implementation of STR technology. "Serial Self-turning Reactors" (STR) was an innovative technology, which was developed to be an alternative organic waste treatment for small communities in Thailand. The pilot-scaled prototype of the new technology has been tested to ensure its effectiveness. The study consisted of four parts: 1) selection of a target community and investigation of its current MSW practice, 2) preparation of a proposal which STR incorporated would and submit to the university's administration for approval, 3)

establishment of a demonstration plant and trial on actual practice, and 4) discussion and evaluation of the new technology in general and economical aspects. Thammasat University Rangsit campus was selected to be the target community to approach the new technology. An improvement program, namely "Recycling and Composting Pretreatment Program" (RCPP) was proposed and implemented. Trial operation on plant-scale performed effectively with low running costs. An economic evaluation of STR was carried out to generalize the system. Abadi and Dariush (2012) conducted a SWOT analysis to find all strength, weakness, opportunities as well as possible threats associated with waste management organization located in city of Shiraz, located in south west of Iran. Based on the results, appropriated locating strategies for burying garbage, training and increasing awareness regarding production and collection, attracting foreign investment in the field of recycling garbage, reconsidering environmental rules and burying garbage and its separation standards are the most important strategies. Ahsan *et al* (2012) emphasized on developing cities like Khulna, the third largest metropolitan city in Bangladesh, have now begun to confess the environmental and public health risks associated with uncontrolled dumping of solid wastes mainly due to the active participation of non-governmental organizations (NGOs) and community-based organizations (CBOs) in municipal solid waste (MSW) management. A survey was conducted to observe the present scenarios of secondary disposal site (SDS), ultimate disposal site (UDS), composting plants, medical wastes management and NGOs and CBOs MSW management activities. A total of 22 NGOs and CBOs are involved in MSW management in 31 wards of Khulna City Corporation. About 9 to 12% of total generated wastes were collected by door-to-door collection system provided by mainly NGOs and CBOs using 71 non-motorized rickshaw vans. A major portion of collected wastes was disposed to the nearest SDS by these organizations and then transferred to UDS or to private low-lying lands from there by the city authority. A small portion of organic wastes was going to the composting plants of NGOs. The participation of NGOs and CBOs has improved the overall MSW management system, especially waste collection process from sources and able to motivate the residents to store the waste properly and to keep clean the premises. Kaushal *et al* (2012) analyzed the changing trend in the MSW quantities and characteristics in major urban agglomerations in India over last four decades. The paper critically reviewed the present practices of estimating and forecasting of MSW and highlights their limitations. The changing need for the appropriate waste management technologies with respect to the changing pattern of the waste generation was also highlighted, which can help the urban local bodies responsible for MSW management in preparing more efficient plans. Okeniyi *et al* (2012)

investigated the energy recoverable potential from waste, using waste materials generated in a model community in Nigeria. For this model community of the country, Convent University, Ota, Nigeria was used, because of its existing form of waste management system. Solid waste generated in this model was characterized into its separate components and this was then subjected to an estimation model by which the recoverable energy potential from the waste was evaluated. For this, method of waste to energy calorific value evaluations was employed for predicting equivalent energy availability from the waste in KWh and in equivalent tones of oil. Results obtained from the study show abounding viability of favorable energy potential that could be as high as 8967.13MJ day-1 ,equivalent to 2490.87 kWh day -1 or 0.6227 tons of oil equivalent per day. These findings bare suggestions of the need for the development of waste management system infused with energy reclamation policy, from waste, for supplementing communal energy needs and annexing other social benefits accruable from such policy implementation. Omer (2012) argued a comprehensive review of biomass energy sources, environment and sustainable development. This included all the biomass energy technologies, energy efficiency systems, energy conservation scenarios, energy savings and other mitigation measures necessary to reduce emissions. This article gave an overview of present and future use of biomass as an industrial feed- stock for production of fuels, chemicals and other materials. However, to be truly competitive in an open market situation, higher value products were required. Results suggested that biomass technology must be encouraged, promoted, invested, implemented, and demonstrated, but especially in remote rural areas. The present study was carried out with the following objectives:

1. To study the value chains in waste based business

2. To understand the major challenges and concerns for manufacturers of waste based business

Methodology

For the purpose of the study, primary data has been collected from manufacturers using wastes as raw material with the help of well drafted, pre-tested structured questionnaire. 156 units from Northern India have been included in the sampling plan using snowball sampling. Three regions of Northern India–Punjab, Haryana and Himachal Pradesh have been selected for the study. From each state four types of wastes i.e. agricultural waste, Rubber/ Tyres, Plastic waste and Paper waste were considered. 13 manufacturers from each kind of waste from each state under sample were selected according to the availability and willingness to respond. The data analysis was carried across the three states under sample. Effort has been made to understand the entire value chain by getting information about different players/ participants involved in the entire value chain. Also, the perception of the manufacturer about the value added by each player was asked on 5 point likert scale. The data collected on scale was subject to one sample t-test to know the agreement and disagreement on statements and one way ANOVA was applied to know the difference across the states under sample. In order to identify the challenges and concerns 5 point likert scale was developed for each. The responses on likert scale were subject to one sample t- test and one way ANOVA. Other statistical tests include mean, standard deviation and percentages.

Results and Discussions

Actors in the value chain

In order to understand the value chain in waste business, the various combinations of actors was presented to the manufacturer. In all 13 different combinations were found in such business.

Table 1: Various actors in the value chain

CHAIN	PUNJAB	HARYANA	HP	TOTAL
Producer-Manufacturer-Distributor	0(0.00)	1(1.92)	1(1.92)	2(1.28)
Producer-Supplier-Manufacturer-Consumer	5(9.62)	3(5.77)	10(19.23)	18(11.54)
Producer-Supplier-Manufacturer-Distributor	3(5.77)	2(3.85)	2(3.85)	7(4.49)
Producer-Manufacturer-Consumer	9(17.31)	11(21.15)	2(3.85)	22(14.10)
Supplier-Manufacturer-Consumer	10(19.23)	9(17.31)	17(32.69)	36(23.08)
Supplier-Manufacturer-Distributor-Consumer	10(19.23)	20(38.46)	9(17.31)	39(25.00)
Supplier-Manufacturer-Distributor-Consumer	6(11.54)	3(5.77)	9(17.31)	18(11.54)
Collector-Supplier-Manufacturer-Consumer	4(7.69)	1(1.92)	2(3.85)	7(4.49)
Collector-Manufacturer-Retailer-Consumer	0(0.00)	1(1.92)	0(0.00)	1(.64)
Collector-Supplier-Manufacturer-Distributor-Consumer	2(3.85)	1(1.92)	0(0.00)	3(1.92)
Collector-Supplier-Manufacturer-Wholesaler-Retailer-Consumer	1(1.92)	0(0.00)	0(0.00)	1(.64)
Collector-Manufacturer-Consumer	1(1.92)	0(0.00)	0(0.00)	1(.64)
Supplier-Manufacturer-Wholesaler-Consumer	1(1.92)	0(0.00)	0(0.00)	1(.64)
Total	**52**	**52**	**52**	**156**

* Figures in parentheses indicate percentages.

Table 1 reveals that for almost 48 percent respondents the value chain starts with supplier going up to manufacturer and ending up with consumers with or without distributor. Most of the actor combinations consisted of three or four actors in the value chain. Longer value chains consisting of five or more participants are found to be very minimal (2.5 percent). Value chain with supplier at first place is found to be of maximum occurrence as compared to other actor combinations. No difference is observed across states as far as frequency of adopting actor combinations is concerned.

Perception of the manufacturers about actors in the value chain

Manufacturers were asked to rate 14 statements regarding their perception towards the actors in the value chain on 5 point likert scale, where 1 corresponded to strongly agree and 5 corresponded to strongly disagree.

Table 2: Perception of the manufacturers about actors in the value chain

S No.	STATEMENTS	Punjab	Haryana	H.P.	Total	F (B/w Places)	p value	t value (H_0=3)	p value
	Mean Score (Standard Deviation)								
1	All participants in value chain are equally important	2.34 (0.71)	2.29 (0.64)	2.40 (0.69)	2.35 (0.68)	0.373	0.689	-12.04	0.00
2	The weak and strong actors in value chain can be easily identified	2.55 (0.93)	2.48 (0.75)	2.57 (0.80)	2.54 (0.83)	0.193	0.824	-6.94	0.00
3	Same strategy is followed to deal with all actors in value chain	2.48 (0.94)	2.31 (0.64)	2.00 (0.48)	2.26 (0.74)	6.044	0.003	-12.49	0.00
4	The negotiating position of the manufacturer is the strongest	2.71 (1.07)	2.69 (0.89)	2.86 (0.90)	2.76 (1.01)	1.088	0.340	0.821	0.41
5	Timely information is provided to the actor by my organization	1.86 (0.344)	1.98 (0.24)	1.88 (0.38)	1.91 (0.33)	1.860	0.159	-41.41	0.00
6	Contractual arrangements are informal	1.88 (0.83)	2.06 (0.75)	1.86 (0.52)	1.94 (0.72)	1.141	0.322	-18.57	0.00
7	Contractual arrangements are flexible	1.83 (0.85)	2.02 (0.77)	1.90 (0.49)	1.92 (0.73)	0.921	0.400	-18.61	0.00
8	My business is committed to develop long term	2.09 (1.09)	.01 (0.78)	1.80 (0.77)	1.97	1.460	0.235	-14.32	0.00

9	The relationship among actors is conflict free	.34 (0.81)	2.44 (0.61)	2.34 (0.55)	2.38 (0.67)	0.359	0.699	-11.66	0.00
10	In case of conflict among actors manufacturer plays the decisional role	2.44 (0.61)	2.79 (0.74)	3.30 (0.70)	2.85 (0.77)	20.79	0.00	-2.49	0.14
11	The system of transferring product form one actor to another is smooth	2.02 (0.57)	2.54 (1.02)	2.42 (0.89)	2.33 (0.87)	5.347	0.006	-9.62	0.00
12	Each actor adds quality as product moves to next actor in the value chain	3.00 (1.10)	3.51 (0.80)	3.86 (0.49)	3.46 (0.91)	13.818	0.00	6.29	0.00
13	The innovation which adds value is easily replicable by other producers.	2.15 (0.72)	2.03 (0.56)	1.98 (0.82)	2.06 (0.57)	0.637	0.531	-2.68	0.008
14	Replication of value added/innovation by actors can be avoided if there are periodic inversions to maintain competitive advantage	3.50 (0.85)	3.86 (0.59)	4.00 (0.00)	3.79 (0.63)	9.673	0.00	15.56	0.00

Table 2 shows that manufacturers significantly agreed that all participants in value chain are equally important; the weak and strong actors in the value chain can be easily identified; same strategy is followed for all actors in the value chain; there should be timely dissemination of information to all actors by the organizations regarding raw material; the contractual arrangements are informal and flexible in nature; the business is committed to develop long term relations with key actors; the relationship between actors is conflict free; there is smoother system of transferring product from one actor to the other and producers mainly replicate innovations which add value.

Further, respondents disagreed significantly @5 percent level of significance that each actor adds quality as product moves to the next actor in the value chain; and replication of the value addition by the actors can be avoided if there is periodical inversion to maintain competitive advantage.

Respondents were found to be neutral that negotiating position of the manufacturer is the strongest; and the fact that manufacturer plays the decisional role in case of conflict among actors.

Among states, significant difference @ 5 percent level of significance have been found for the perception that there needs to be same strategy to deal with all actors in value chain. Thus, perception is strongly found to be in agreement among manufacturers of H.P. Significant differences among states were found regarding perception that in case of conflict among actors manufacturers play the decisional roles while manufacturers of HP display their disagreement towards same but those from Punjab and Haryana have

reflected agreement on the issue. Respondents from different states also significantly differ on perception of following smooth system in transferring one product from one actor to another as the respondents from Punjab have been found to be more in agreement toward the same. Also, significant difference among states regarding each actor adding quality as product moves to next actor in value chain. The manufacturers from HP were found to have more disagreement towards this as compared to rest of the sample. Same trend was observed in perception of the fact that

replication of value added by actors can be avoided if there is periodic inversions to maintain competitive advantage.

Challenges faced by or ganisation

To understand the challenges faced by the manufacturers running waste business units, various challenges were rated on 5 point likert scale, where 1 was strongly agreed and 5 was given to strongly disagreed. The challenges were then subject to t-test and for three states under sample, ANOVA was used. The results are presented in table 3.

Table 3: Challenges faced by organisation

S No.	STATEMENTS	Punjab	Haryana	H.P.	Total	F	P value	t $H_0=3$	P value
	Mean Score (Standard Deviation)								
1	Training & Technical Assistance is not easily available	3.15 (1.01)	3.48 (0.94)	3.50 (0.94)	3.38 (0.97)	2.10	0.12	4.85	.000
2	There is limited access to working capital & credit	3.29 (1.07)	3.38 (0.99)	3.40 (0.91)	3.36 (0.99)	0.20	0.81	4.52	.000
3	The business capacity is under utilized	2.60 (1.07)	2.69 (1.03)	2.37 (0.88)	2.55 (1.01)	1.46	0.23	-5.57	.000
4	Under utilization of business capacity leads to low performance	1.69 (0.73)	2.35 (0.74)	2.19 (0.71)	2.08 (0.77)	11.49	0.00	-14.87	.000
5	Setting up of infrastructure is tedious task	2.87 (0.93)	3.20 (0.92)	3.65 (0.72)	3.23 (0.91)	10.70	0.00	3.17	.002
6	The quality controls is deficient	2.52 (0.87)	2.62 (0.97)	2.65 (0.95)	2.60 (0.93)	0.28	0.75	-5.43	.000
7	There is lack of information availability about product marketing & Distribution	3.58 (0.80)	3.69 (0.83)	3.85 (0.61)	3.71 (0.76)	1.67	0.19	11.66	.000
8	The legal limitations are numerous	3.62 (0.74)	3.63 (0.793)	3.71 (0.57)	3.65 (0.71)	0.26	0.76	11.56	.000
9	The adequate skills & knowledge required is not available	3.54 (0.87)	3.17 (1.02)	3.26 (1.12)	3.33 (0.95)	0.90	0.40	2.57	.011

10	Cost of inputs is high	2.17 (0.81)	2.75 (0.93)	2.37 (0.84)	2.43 (0.89)	6.06	0.003	-8.02	.000
11	The internal regulations are inadequate	3.35 (0.48)	3.52 (0.58)	3.46 (0.61)	3.44 (0.56)	1.29	0.27	9.87	.000
12	Management of entire value chain is not feasible	3.40 (0.66)	3.40 (0.69)	3.15 (0.64)	3.32 (0.67)	2.44	0.09	5.95	.000
13	The relationship between the chain actors is strained	3.21 (0.89)	3.15 (0.80)	2.96 (0.90)	3.11 (0.78)	0.35	0.70	1.49	.137
14	There is insufficient support from government	1.62 (1.03)	2.10 (0.91)	2.10 (0.75)	1.94 (0.93)	4.89	0.009	-14.32	.000
15	Level of Taxes levied by Govt. is high	1.73 (1.17)	2.04 (0.63)	2.00 (0.77)	1.92 (0.90)	1.831	0.16	-14.91	.000

Scrutiny of table 3 reveals that manufacturers significantly agree at 5 percent level of significance on challenges like underutilization of business capacity, thus resulting in low performance; deficiency of quality controls, high costs of inputs, insufficient support from government, and high level of taxes levied by government, whereas respondents significantly disagree at 5 percent level of significance on inaccessibility to training and technical assistance, limited access to working capital and credit, setting up of infrastructure as a tedious task; lack of information availability about product marketing & distribution; numerous legal limitations; non availability of adequate skills & knowledge required; inadequacy of internal regulations; and infeasibility of management of entire value chain. Respondents were found to be neutral on strained relations between actors.

Respondents from different states significantly differed regarding underutilization of business capacity leading to low performance, wherein manufacturers from Haryana reflected low agreement as compared to manufacturers of Punjab. Significant difference was also found by manufacturers for setting up of infrastructure being a tedious task, wherein the respondents from HP strongly disagree on the same as compared to agreement displayed by Punjab manufacturers.

Although, the respondents from all states agreed that level of taxes levied by government is high yet there exists significant difference between them as respondents from Punjab have been found strongly agree on the same. Similar results have been obtained from the challenge that there is insufficient support from government to manufacturers dealing in waste.

Major concerns

Manufacturers were asked to rate on 5 point likert scale, their major concerns while conducting waste based business, where 1 was SA and 5 was SD

Table 4: Major concerns for manufacturers in conducting business

Major Concerns	Punjab	Haryana	H.P.	Total
Electricity	27(33.75)	25(29.41)	9(10.00)	61(23.92)
Low demand of end product	6(7.5)	8(9.41)	8(8.88)	22(8.62)
Shortage of raw material	18(22.5)	17(20.00)	26(28.88)	61(23.92)
Rising prices of raw material	2(2.5)	6(7.05)	9(10.00)	17(6.66)

Labour shortage	10(12.5)	11(12.94)	9(10.00)	30(11.76)
Lack of government support	0(0.00)	2(2.35)	0(0.00)	2(.78)
Harassment from Pollution Board	1(1.25)	0(0.00)	0(0.00)	1(0.39)
Rising rate of labour	4(5.00)	3(3.25)	0(0.00)	7(2.74)
Low margins	1(1.25)	1(1.17)	0(0.00)	2(.78)
Corruption at departmental levels	0(0.00)	2(2.35)	0(0.00)	2(.78)
High Taxes	5(6.25)	1(1.17)	4(4.44)	10(3.92)
High competition	0(0.00)	4(4.70)	6(6.66)	10(3.92)
Sewage Blockage Problem	0(0.00)	2(2.35)	0(0.00)	2(0.78)
Lack of Storage facility	0(0.00)	0(0.00)	2(2.22)	2(0.78)
Machinery Breakdown	0(0.00)	0(0.00)	2(2.22)	2(0.78)
Ban on Plastic	0(0.00)	0(0.00)	13(14.44)	13(5.09)
Outdated Technology	1(1.25)	0(0.00)	0(0.00)	1(0.39)
Government interference	4(5.00)	3(3.25)	1(1.11)	8(3.13)
No issue	1(1.25)	0(0.00)	0(0.00)	1(0.39)
Others	0(0.00)	0(0.00)	1(1.11)	1(0.39)
Total	**80**	**85**	**90**	**255**

Table 4 shows that majority of the manufacturers (23.92) percent believe that inadequate supply of electricity and shortage of raw material availability is a major concern. Other concerns include shortage of labour, low demand of end product, rising prices of raw material, restriction on use of plastic, high taxes, high competition due to new entrants and excess interference by the government. Among states, majority of the manufacturers of Punjab face the problem of inadequate electricity (33.75) percent along with shortage of raw material (22.5) percent. Manufacturers of Haryana have shown similar results. In HP manufacturers feel that shortage of raw material availability (28.88) percent and ban on use of plastic (14.44) percent is a major concern.

Conclusions

The amount of waste we generate, and its actual or potential impacts on the environment, have long been matters of concern to governments and the community generally. In recent times, increasing emphasis has been given to resource recovery including reusing, recycling and extracting energy from waste. Ambitious targets are being set, and more advanced (but more costly) approaches to recovering waste are being promoted. Today, more and more venture investors are looking into waste management and value reclamation. Many business houses are involving themselves in waste management i.e. production of products with the use of agricultural waste, tyre/ Plastic waste, paper waste etc.

The study concluded that in waste based business, 13 different value chains were followed. Most of the value chains consisted of three or four actors; longer value chains consisting of five or more participants were found to be very minimal. Manufacturers agreed that all participants in value chain are equally important; the weak and strong actors in the value chain can be easily identified; uniform strategy is followed for all actors in the value chain; there should be timely dissemination of information to all actors by the organizations regarding raw material; the contractual arrangements are informal and flexible in nature; the business is committed to develop long term relations with key actors; the relationship between actors is conflict free; there is smoother system of transferring product from one actor to the other and producers mainly replicate innovations which add value.

As far as major challenges and concerns, manufacturers believed that inadequate supply of electricity and shortage of raw material availability was a major concern. Other concerns included shortage of labor, low demand of end product, rising prices of raw material, restriction on use of plastic, high taxes, high competition due to new entrants and excess interference by the government.

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