

## A Financial Application of Game Theory Perspective to Indian MSMEs. An 'A Priori' Evidenced Study of Performance Parameters

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### Abstract

This study deals with problems of Indian MSME in the acquisition of capital and focusses on the supply chain of these business apart from the actions taken by the Government of India to assist MSME's overcome latent challenges to benefit the nation. As on 08-Jun-22, this segment had a strategic advantage by contribution to an extent of 44.95 percent of Indian manufacturing output, in terms of exports to an extent of 40.17 percent. Given the meteoric rise in employment generation of 68.64 million citizens in over 29 million units interspersed across the nation, this study analyzes to disclose the impact of finance and other macro-economic variables on MSMEs by an application of Shapley values for an Information Communication Technology structure of inputs modelled as dependent variables. This study also addresses the basic constructs and the associated appropriateness of the established mathematical model to primary dependent clusters of variables, and not as an iteration or computational methodology.

**Keywords:** Information communications technology (ICT); Finance; Supply chain management; MSME; Shapley method; CGSTME.

### Introduction

MSME's have a positive impact on India's GDP and it promotes employment opportunities in various sectors. India has nearly three million MSMEs, which account for almost 50 percentage of industrial output and 42 percentages of India's total exports. It comes second to the agriculture sector in terms of job employment opportunities estimated to be 110.27 million Indians [4].

This study also asserts that, a possible impediment for the slow growth of MSME's, is attributed to the imperfect credit delivery system, and owing to dynamic market factors; should there be a slow-down in cash flows, [6] the firm would be adversely impacted and there is no buffer system for external threat not acting in the best interests of the MSME's.

The MSME comprises of 2.97 Million units, of these 0.572 (19.46 per cent) are non-performing due to adverse market conditions. Had the CGSTME scheme been more profoundly implemented, the MSME could have contributed the additional 20% or more to Exports, Imports and employment [19]. The government of India has a well-established scheme, the Credit Guarantee Scheme (CGTMSE). In the event of a MSME availing collateral free credit facilities, fail to pay back the borrowed money back to the lender [21].

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The budget estimates for the FY 2015-16 was 24.74 (Re in Cr.) and the financial progress in the year 2015 (up to 31.12.2015) was 24.74 (Rs in Cr.). Since the time of inception i.e. since August 2000, about 345056 no.'s credit applications were approved with guaranteed reporting of Rs. 14673 Cr. and 2160975 number of credit application have been approved with guaranteed coverage of Rs. 104052 Cr. [19].

**Literature review**

Available literature recorded that developed nations have installed better performing supply chain financing and are superior to that in India not only in terms of efficient methods of financing, [22] but MSMEs also try to integrate technology to ameliorate the firms involved in the supply chain network. The developed nations have consciously tried to bridge the gap between small and large firms [3]. The firms in these nations are also using electronic platforms to make business with their customers simpler.

In India, smaller firms are only a nascent and dislodged group of the larger supply chains established [1] by larger trans-national corporations and this is negatively impacting large firm customers, [7] with payment delayed for many days due to the inherent blocks or disassociations present in the Indian version of the supply chain. The gap between the large and small firms is ever increasing [18]. Moreover there is little technological progress made in financing supply chains of Indian MSMĀEs, they were severally impacted by demonetization as well.

The government of India has come up with initiatives to improve the current situation of MSME in terms of acquiring finance [23]. The government has come up with an electronic exchange named TReDS but as with many other initiatives of the government, enforcement is difficult if not impossible. It has also come up with credit guarantee fund schemes that assist MSMEs to get collateral free credit from financing institutions i.e. CGTMSE [14].

Characteristics	Sources
Autonomy	Abugre, Charles (1994 - Pg. 157-175), Agarwal, B. (1997a - Pg. 3-5), Basu, S. (1997 - Pg. 267-286), Dewan, Ritu (2001), Kurtz, D.V. (1973 - Pg. 49-52), Portes, Alejandro (2000 - Pg. 43-67)
Sociability	Bhatt, V.V. (1983 - Pg. 43-49), Chen, Martha A. (ed.) (1996 - Pg. 87-89), Giddens, A. (1979 - Pg. 221-236), Holcombe, S (1995 - Pg. 41-44), Srivastava, P (2005 - Pg. 109-111), Toye, John (1995), Varman P., Mahendra (2005 - Pg. 116-129)
Communication	Lesser, E. L. (2000 - Pg. 32-38), Mahmud, Simeen (2002 - Pg. 91-119), North, D.C. (2005b - Pg. 16-24)
Negotiation	Dewan, Ritu (2001 - Pg. 31-38), Ellis, F (2000), Golding, Peter (ed.) (1986), Holt, Sharon (1994)
Cooperation	Marr, A (2002), Olson, M (1965)
Reactivity	Srivastava, P (2005 - Pg. 19-31), Singh, Ajit and Ann Zammit (2000 - 912-918)
Situatedness (Both Time & Space)	Williamson, O.E (1975), Yunus, Mohd (1997)
Ability to Influence Environment	Bisnath S & D. Elson (2000), Gasper, Des and Irene van Staveren (2003)
Reasoning/Problem Solving	Kloner, Stefan (2003)
Robustness	Kabeer, Naila & Ranjani Murthy (1996), Mahmud, Simeen (2003), Rhyne, Elizabeth and Maria Otero (1994), Staveren, Irene van (2002)
Coherence in Sensing Environment	Parmar, Aradhana (2003), Simanowitz, Anton with Alice Walter (2002).

Logistics providers say these are the company's strategic patterns [12], but are unable to provide the required service. The logistical partnerships that still exist are still practical and not of a strategic nature. Some logistics partnerships remain operational by nature and are still defined as strategic, although they do not understand the term and have not correctly considered the partnership of logistics in terms of competitiveness.

Show the relationship between the average logistics costs per component, customer demand and their mutual relationship and analysis. Products are transferred [18] directly or via one intermediate station to a large number of outlets through a warehouse. The optimum density of local shops and stations is determined by reducing average logistics or increasing total supply.

The needs of global co-operation are met by third party logistics by developing different alternatives. In order to reduce delivery time [8] and improve delivery reliability, the authors have introduced a new idea of applying collaboration in the implementation of Global Supply Chains, which is the management of co-operative transport (CTM). This is a proven fact that the delivery cycle time and total cost are minimized at the same time.

He says ports have great potential for logistics centers. It is possible to propose an appropriate framework for port performance by developing a concept of ports [2] through a logistics-based approach and supply chain management. To reduce

costs and customer satisfaction, there is an approach to logistics management (LM) and supply chain management (SCM). Cost assessment analysis is often applied between functions, processes and supply chain through a logistics approach. This benefits the efficiency of the port by focusing the port strategy on the most appropriate value added.

Third-party logistics and advanced information system are the most important logistics functions. For years, logistics functions have been expanded from marketing and production to storage, transportation, procurement, distribution [11], inventory management, packaging and customer service, where logistics activities are summarized and integrated. The relationship between logistics providers and customers has evolved from the tactical solution to reduce costs to the strategic alliance, apart from the abundant service functions.

At the moment, competition is more focused on services than on physical products. Outsourcing of services to another independent company becomes a common option, because the costs and efficiency of logistics will influence economic activity more [14]. Companies that provide such assistance are external service providers or external parties. Since the most common concept is the logistics of third parties. During these years, the logistics of third parties are accepted by most companies.

Dependent Characteristics	Key Success Factors
Related and Important Information Constructs	Richness, Precision, Packets of shared information
Quality of Information	EDI with methodology, measurable messages, authenticity of information
Competetion and Capability Constructs	ICT framework, qunatum metric experience, time-span, market capitalization
Aspects of Strategy	Understanding, Long-Term relation & viability, leadership exchange facilitation, economic characteristics

**Research Objectives**

**To examine avenues offered to end-users**

The MSMEs acquire their finance through banks such as Axis Bank, DBS bank and other financial institutions. However due to obstacles like lack of collateral and the assumption that financing MSMEs is risky, MSMEs fail to avail finance from banks and financial institutions. Thus they rely on money lenders, friends and family, non-regulated financial institutes as they are more flexible than formal source of financing [16].

**To determine the inter-linkage of small industries development and its causal link to availed finance**

“Indian MSME’s contribute to 45 percent to country’s GDP” -Business Insider India. Whereas in developed nations SMEs contribute to more than half of the nations GDP. “India has nearly three million MSMEs, which account for almost 50 percentage of industrial output and 42 percentage of India’s total exports”-Tradeidia.com [24]. Therefore, if the MSMEs acquire the required funds to finance their supply chain, it may as well bring a boom in India’s GDP.

**To asses government intervention to benefit the existing and upcoming MSMEs.**

The Government has come up with various schemes to aid financing MSMEs such as the CGTMSE and TReDs. These schemes benefit the MSMEs by providing them with necessary finance at the right time. We even dig into the problem as to why these schemes aren’t impacting MSMEs with the velocity it was supposed to impact.

**Methods and models**

Supply chain finance for MSME would not only strengthen inter-state business but might also make way for international trade which would support and sustain international relations. India is experiencing an entrepreneurial boom as the start-ups in India are ever increasing. In such a scenario, ease of access of funds without collateral is crucial for MSMEs to sustain in the competitive market [13]. Hence, with the right steps taken by the government, such as TReDS and implementation of technology in supply chain in terms of Block-chain and CGTMSE we may just see a boom in MSMEs in India which would impact on India’s GDP as India has nearly three million MSMEs, which account for almost 50 percentage of industrial output and 42 percentage of India’s total exports [24]. Hence, not only increasing the GDP but also increasing the employment opportunities for India which is estimated to have a young workforce.

This paper will shed light upon the problems faced by the MSMEs in opting funds to finance their supply chain and the steps taken by the government in order to overcome the problems faced by these MSMEs in the Indian context. MSME face

various problems such as lack of knowledge and awareness of schemes [12] rolled out by the Government for MSME, cumbersome regulatory practices, delay in payments from buyers, low utilization of insurance and credit schemes offered to MSME due to lack of awareness, unable to tap modern technology.

**Applicable mathematical models**

The Indian Supply Chains are disintegrated and hence the identified parameters are to be modeled and forecasted in terms of their integration with one another.

The study also looks at how the government interviews so that the MSMEs can overcome their challenges of acquiring finance [20] and once this is done we try to study the interlink of MSMEs to the Indian GDP [25]. For the interaction of these variables for the Indian context this mathematical model can be applied by Shapley allocation.

Shapley method is derived from economics and is a chosen option for variable definitions and building constructs [14,18].

Below the study describes how costs can be formally described by marginal procedure. The impact of the last arrived order being of size  $n$  is

$$t_{|Q|}(Q, n) \quad [12]$$

The average of  $t_{|Q|}(Q, n)$  is taken for the cases where  $n_{|Q|} = n$  to arrive at the rate

$T(n)$  to be applied to an order of size  $n$ ,

$$T(n) = E(t_{|Q|}(Q, n) / n_{|Q|} = n) \quad [8]$$

For an order pool  $Q = (n_1, \dots, n_{|Q|})$

The following recursions are taken into consideration, for calculating numbers  $t_{|Q|}(Q, n)$ , referred to as allocations, and numbers  $n_{|Q|} = n$ , referred to as reminders,

$$\alpha_i = \min\{\omega_i \rho_{i-1}, \#(n_i)\} \text{ and } \rho_i = \rho_{i-1} - \alpha_i$$

With  $p_0$  some given positive number and weights by

$$\omega_i = n_i / (n_i + \dots + n_{|Q|}) \quad [12]$$

Note that  $\omega_{|Q|} = 1$ . The allocation  $\alpha_i$  is such that if  $n_i = n_{i+1}$  then

$$\alpha_i = \alpha_{i+1}.$$

The subsequent theorems shows the allocating  $\alpha_i$  to order  $n_i$  is efficient provided orders are sorted according to decreasing size.

Here, an order pool  $Q = (n_1, \dots, n_{|Q|})$  is said to be sorted if.

$$n_1 \geq n_2 \geq \dots n_{|Q|}$$

The pool is said to have LTL orders only if  $n \leq F$  for all  $n \in Q$ . Note that in an LTL-orders only pool  $\#(n) = 1$  for any  $n$  in that order pool.

**Discussions**

Referencing the first objective, there are various sources through which MSMEs can acquire finance. They sometimes are provided as advance from their customers, or purchase raw material on credit from their suppliers. They can even opt for factoring or approach financial institutions, micro financing in-

stitutions, venture capitalists and registered money lenders [9].

However this is all sweet when said than done as the above mentioned options require the MSMEs to provide paper work and security in terms of collateral which is tiring and difficult for MSMEs to attain [5]. Thus they opt for other sources for financing their business such as borrowing money from family members and friends, owner’s equity, unregistered money lenders.

Not only does this have a negative impact on the MSMEs as the interest charged by these lenders are sky high and aren’t secure or liable, but they are burdened to repay the borrowed amount with high interest in a [10] short duration of time and there is a high chance of them getting into a debt trap. Knowing this, MSMEs still opt this source as it’s flexible and it provides them with quick finance to run their day to day activities.

This is because MSMEs are often short on capital; most of their financing comes from the proprietor’s pocket. This is a setback for the entire sector as growth opportunities are limited due to limited capital. To overcome this MSME should be provided with the right amount of funds at the right time [17].

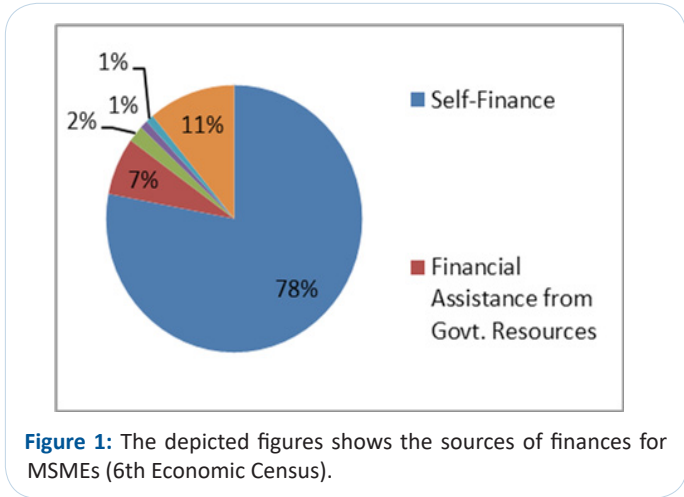


Figure 1: The depicted figures shows the sources of finances for MSMEs (6th Economic Census).

Subsequent to the literature review regarding the second objective to study the interlink of small industries development and its casual link to availed finance, it needs to be noted that, Indian MSME’s contribute 45 percent to country’s GDP” -Business Insider India. India is growing at a rate of 5.7% as per the first quarter of 2022-18 projections [17]. The MSME in India constitute to almost half of the GDP with the current scenario of sources of finance available to them. If the government executes the initiatives taken up then the contribution of the MSME will be enormous as India has nearly three million MSMEs, which account for almost 50 percentage of industrial output and 42 percentages of India’s total exports. The MSME comprises of 2.97 Million units, of these 0.572 (19.46 per cent) are non-performing due to adverse market conditions. Had the CGSTME scheme been more profoundly implemented, the MSME could have contributed the additional 20% or more to Exports, Imports and employment [20].

The MSMEs in India not only tend to the needs of the nation but also help satisfy global needs as well as these units are a part of each sector. They have also bridged the gap between the urban and rural areas by providing job opportunities to rural areas as well [24]. MSME provides opportunities not only to people in urban areas but to people in rural areas as well. As it comes second to the agriculture sector in terms of job employment opportunities estimated to be 110.27 million Indians.

So when MSMEs avail the finance opportunities available to them then not only do they sustain their business in the market and grow, they even increase the GDP of the nation [25].

The third objective was to understand government intervention to benefit the existing and upcoming MSMEs. The government has come up with innovative schemes to aid MSMEs to attain finance easily. The government along with the RBI has come up with Trade Receivables Discounting System (TReDS) which is an electronic exchange facility [14].

In order for the MSMEs to boom and flourish in the competitive market they should be aware of the schemes available in favor of them and they should take full advantage of it. Even the eligible lending institutions should take initiative to bring awareness and knowledge to the MSMEs and provide them with necessary finance [13]. As this will boost the businesses of MSMEs and eventually help boost the economy of India.

Summary & perspectives

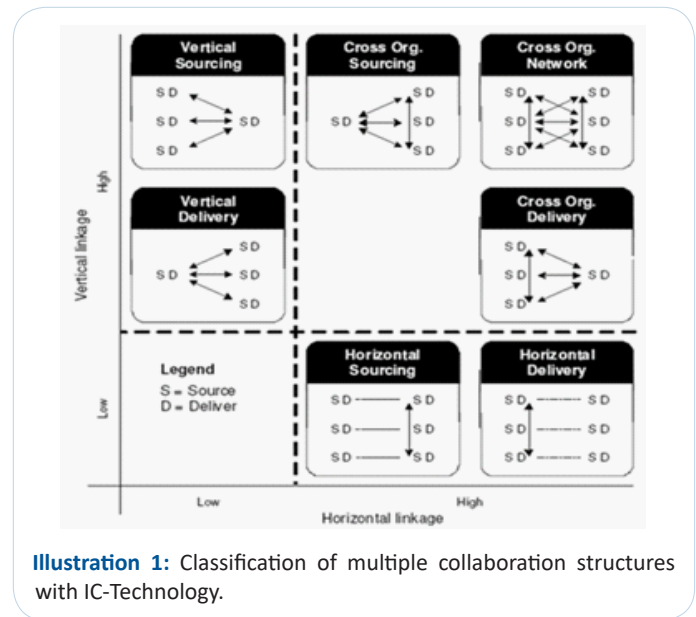


Illustration 1: Classification of multiple collaboration structures with IC-Technology.

The Source and Deliver Model integrates the aspect of Multi-Agent Systems, which can be readily applied to the integration of Supply Chains, ICT and profitability associated with ease of access to credit.

A computerized system composed of several interacting smart agents within a location is termed to be a multi-agent system (MAS) [2]. They solve the issues that are impossible to solve by a monolithic system or a single agent.

An Agent-Based Model (ABM) is not the same as MAS [5] regardless of the overlap and similarity. An MAS is “intelligent” whereas an ABM aren’t necessarily “intelligent”

The tables represent the physical and financial progress achieved by the government in the CGTMSE scheme for the 11th plan (2007-12) and the 12th plan (2013-15). The estimates are in Indian Rupee. (in Crore) [11].

Identified characteristics for the MSME’s of 2022 and way forward from an Indian perspective

No of Applications Received			Financial Progress			
Year	Target	Achievement	Year	BE	RE	Actual
2017-18	30000	30285	2017-18	190	190	190
2018-19	50000	53708	2018-19	122.1	136.01	136.01
2019-20	100000	151387	2019-20	122	122	122
2020-21	180000	254000	2020-21	200	198.75	200
2021-22	200000	243981	2021-22	1	4.9	1
Physical Progress			Financial Progress			
Year	Target	Achievement	Year	BE	RE	Actual
2018-19	240000	288537	2018-19	35	35	35
2019-20	270000	348475	2019-20	74.99	74.99	74.99
2020-21	270000	273789	2020-21	74.99	74.99	74.99
2021-22	Open	350056	2021-22	24.74	24.74	24.74

The study tries to depict the importance of CGTMSE to MSMEs as this scheme provides guarantee for credit availed from financial institutions. Apart from easing financing options to the borrowers without collateral and even settles the loss incurred by the borrower if a MSME is unable to pay back the borrowing.

### Conclusion

“All the good things in life take their own sweet time”. In the Golden era of Start-up boom, today’s MSME has the potential to be tomorrow’s Large Scale Company. Which makes way to job opportunities to the youth of India as the workforce of India is a young one. This further increases the GDP of the nation. All this is only possible when the financial needs of MSMEs are fulfilled. This can be achieved by spreading awareness and making conscious effort to improve the state of MSMEs in India.

The MSME sector has grown exponentially and have a positive impact on the economy of nations across the globe in various cultures. It has been formed systematically, has addressed a profusion of challenges faced from all the sectors and has become more fortified and robust in terms of execution. All of this in just fifty years.

MSMEs are providing job opportunities to skilled workforce otherwise trained for the job and are constantly finding ways to innovative address future challenges. MSMEs are bridging the gap between rural and urban areas as MSME’s are contributing to an increased share of 67.24 percent for integrating the rural, tribal and other designated backward areas leading to a reduction in the infamous imbalances of regions and assisting the rational distribution of income generation.

MSME’s have carved for themselves, as a prime dependent and as the only enabler for larger Industries over the last 45-48 years, in this, attributing to an impressive 15.81 per cent for the 2016-17 period in the socio-economic amelioration of the nation, as against a recorded 9.42 per cent for the year 2015-16. The Sector comprises of 35.17 million units, as on date, caters to an employment based (Skills & Vocational) to over 81.57 million persons. MSME’s manufacture a total of 5981 earmarked and categorized products and occupies about 8.09 per cent of India’s Gross Domestic Product [12] besides a 44.97 per cent to the assembled and production market output and a 39.46 per cent of the services and products are routed as exports from the Export Oriented Units interspersed across the country.

This study recommends that the MSME sector should be prioritized and more mathematical and methodical research should be conducted in other areas such as the Political, Economic, Social and Technological aspects of the MSME sector.

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