

## **UNDERSTANDING OF CALIBRATION AND MEASUREMENT SYSTEM AT MSME INDUSTRIES IN INDIA**

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### **Abstract**

Entrepreneurs are those who launch a business based on a concept or technological advancement without the support of others. Whatever happens, whether it's a challenge or an accomplishment, belongs entirely to them since they're gambling everything on their pursuit of profit. They are all successful entrepreneurs that made it on their own. They are able to run several businesses and create a sizable number of jobs. A powerful entrepreneur has the power to influence a nation's economy. Everything begins with a modest start-up and a tiny amount of savings, but it has the potential to affect an entire nation. In the Government of India is providing the wonderful opportunity to the youngsters to experienced business magnets. These entrepreneurs are highly needed the calibration technology in their manufacturing and production units. Hence, the Government has launched the MSME-Technology Centres that have been formed nationwide as autonomous bodies under the Societies Registration Act by the Ministry of Micro, Small and Medium Enterprises (MSME), which supports micro, small and medium-sized businesses with technology and skilled labour. A large number of them were founded through bilateral partnerships with the governments of Germany, Denmark, and UNIDO/UNDP. Prior to then, these were called tool rooms and technology development centres. There were 18 Technology Centres available in our India (TCs). From the 18 Technology centres, ten centres were considered as Tool Rooms, This Tool Rooms are dedicated to creating and producing high-quality tools, dies, and moulds to help MSMEs compete more effectively in domestic and international markets. This study highlights about the calibration and measurement system at MSME industries in India. The study was analysed by the secondary data with past five years reports of the MSME.

**Keywords:** Entrepreneurs, Calibration, MSME-Technology Centre, Measurement System, Tool Rooms, Electronic System Design and Manufacturing-ESDM

## Introduction

Entrepreneurship is described as the process of establishing a new business or career while incurring the preponderance of the risk and reaping the preponderance of the profits. Entrepreneurs are individuals or groups who establish such businesses. It is the establishment of a business based on a creative and innovative idea that is directly tied to the solution of a societal problem. It also plays an important role in a country's general economic growth by creating jobs and expanding the numerous professions that exist in the economy. The Government of India's definition of MSME is based on investment in plants and machines. MSME also providing the technology upgradation to the entrepreneurs. The MSME is providing the Testing centre, in various states in our country, This accommodate with the testing and calibration services to the Medium, small, micro industries in different field such as mechanical, electrical, metallurgy and chemical sector. This centre serves the entire northern region including the Kolkata, Ludhiana, Indore, Ahmedabad, Aurangabad, Jamshedpur, Bhubaneswar, Guwahati, Jalandhar, Hyderabad, Ramnagar, Mumbai, Kannauj, Firozabad, Agra, Meerut and Chennai. This sector plays a critical role in delivering actual skill development training to over 2 lakh unemployed youngsters and industry employees, upto the year 2020 there are 18 Technology Centers established around the country trained 2,73,437 trainees and also supported them with 43,563 units, and earned with income level upto Rs350.96 Crore. These TCs have been established as Autonomous Bodies of the Ministry and are self-sustaining in terms of operational expenses. There are Four TCs have been established with bilateral partnership of the German and Danish governments, and three TCs also with collaboration of Denmark. The market is of the opinion that we deliver the greatest testing and calibration results because of our extensive experience and use of cutting-edge technologies. Not only does skill matter, but the dedication to the public good also sets us apart from the competition. They are dedicated to fostering the global sustainability and competitiveness of MSMEs. The Government of India organisation, MSME -TC, the New Delhi has made a substantial contribution to numerous initiatives including Make in India and Zero Defect Zero Effect.

Technology centres (TCs) offer technological assistance to the manufacturing sector by designing and producing tools, precision parts, moulds, castings, and so on. These TCs assist

industry by supplying qualified labour in the equipment engineering and manufacturing fields. These TCs are experts in the fields in which they work. There are eight technology centres that offer manufacturer assistance to MSMEs in the relevant industries. These centres also provide training in specialised product groups like forging and foundry, electronics, electrical measuring instruments, fragrance and flavour, glass, footwear, and sporting goods. In addition to providing complicated tool, part, and component design, development, and manufacturing help to MSMEs, several TCs have assisted the nation's strategic industries like defence, aerospace, and others with their Research and Development needs.

**Objective of the Study**

1. To study on the calibration and the measurement system of the MSME in India.
2. To analyse the testing facilitates available from the beneficiaries of the trainees in the technology centres in MSME.

**Methodology**

The study was blend of both the primary and secondary data sources in nature. Hence it's a primary and secondary source in nature. Hence the methodology is descriptive and analytical in nature.

**Measuring System in Technology Centres**

As established Autonomous Bodies of the Ministry, TCs operate on a self-sustaining basis to cover their operating costs. The Ministry of MSME initiated the TC Systems Programme (TCSP) with an expected projected cost of Rs 2200 Crores with a view to expanding and upgrading the network of TC (Tool Rooms and Technology Development Centers) in the country in light of the successful operation of the existing TC. The programme aims to set up 15 new TCs and improve existing TCs throughout the nation. The idea of TCSP is to create a cutting-edge ecosystem for the nation's MSMEs. The following States and UTs are where these 15 new technology centres are being established:

**Table1: The new Technology Centres Place in India**

<i>New Technology Center</i>	<i>Sectors</i>

Bhiwadi	Auto and Components
Pudi	General Engineering
Bhopal	General Engineering
Kanpur	General Engineering
Baddi	General Engineering
Puducherry	ESDM
Sitar Ganj	Auto and Components
Rohtak	General Engineering
Noida	ESDM
Imphal	Fragrance and Flavors
Durg	General Engineering
Kochi	General Engineering
Bengaluru	ESDM
Sriperumbudhur	General Engineering
Patna	General Engineering

Data: Secondary Source retrieved from “MSME annual Report 2022”

The MSME additionally has launched the new Training centres named as Bhiwadi, Durg, Bhopal, Rohtak, Pudi, Kanpur and Baddi. AICTE has granted permission for seven TCs to provide long-term programmes. The breakdown of trainees who were trained in core courses by new TCs during each financial year is as follows:

**Table3: Beneficiaries trained by the New TC**

<i>Years</i>	<i>Number of beneficiaries</i>
2018-2019	157
2019-2020	2571
2020-2021	2583
2021-2022	3068

Data: Secondary Source retrieved from “MSME annual Report 2022”

Each and every year the technology centres is providing and organizing different events like workshops, seminar topics about the electric vehicle and so on. Puducherry TC have organized the automotive swivel seat product for the differently abled people, who cannot

adapt the sit in the car. This product is consider as a creative in India. Durg TC provided the rear axle cover. Some other TCs were signed the MOU’s for different universities and also industries. To encourage young people to start businesses using locally accessible bioresources in the nature of aromatic plants and medicinal plants, TC Imphal co-hosted a digital industrial motivational campaign in collaboration with one of state's local universities. Additionally, TC Imphal assisted a budding entrepreneur in the processing of a fragrant crop. Hence every technology centres are doing and creating the new calibration and testing with the new technologies.

Each centres are doing the calibration activities by receiving the samples such as laser calibration of machine tools(linear and rotary axis), laser calibration machine used in the mechanical tools. The researchers have analysed by the past 10 year data with the calibration and testing activity was done by the- TC MSME.

**Table4: Calibration and Testing Achievements Laboratories**

<i>Financial year</i>	<i>Total Number of the beneficiaries</i>	<i>(calibration/test conducted)</i>	<i>Income Generated (Rs in Lac)</i>
2010-2011	2429	5077	228.5
2011-2012	2407	4546	241.81
2012-2013	2492	4932	361.78
2013-2014	2226	5135	408.22
2014-2015	2958	5967	436.25
2015-2016	3854	6025	452.87
2016-2017	3113	6155	432.08
2017-2018	2471	5567	485.91
2018-2019	2635	6183	532.37
2019-2020	2520	6241	508.2
2020-2021	1907	5386	378.9

Data: Secondary data obtained from “dcmsme.gov.in”

The above table shows that every year number of machines are receiving depends upon the need of the usage in the industry, in 2020, there were 6241 samples were received for testing. The testing department were conducted innovative products and importing the substitutes like Thirty Meter Telescope(TMT). The TMT team functionally evaluated five different prototype actuators made by MSME TC Jamshedpur (IDTR), and they were praised for obtaining the

requisite precision during the first testing itself. And IDTR tied with the long term business development and assigned with the business agreement. The second-largest steel manufacturer in the world, "Nippon Steel and Sumitomo Metal Corporation" of Japan, is affiliated with "Krosaki Harima." The Slide Gate Mechanism (AL-80) was initially created at a competitive price in India. The benefits are low cost delivery supply, cost will be effective and so on. Then IRDA successfully launched Dental Bracket and moulds introduced from Mechanical Engineering Research Institute(MERI) in Durgapur. And also by comprehending the intended usage and functionality of the system requirements, IDTR totally created a product known as the portable multi gas detector housing for Meth-CO-Meter. It is the first system of its sort created locally for locating dangerous gases like methane and carbon monoxide in mines. Meth-CO Meter is a single, incredibly small instrument that replaces two commonly used mining industry equipment, a toximeter and a methylometer.

**Equipment Part Development-** The MSME Technology Center in Jamshedpur produced a machine part that was created in the country. The component was reverse engineered and created to fit the needs of the machine as it operates now. The machine's foreign manufacture presented a problem. The business, an MSME, had difficulties when attempting to import a certain component from outside. The expense of importing from outside was very high. So, with the team's assistance, the first worn-out item was replaced. Additionally, it serves as the machine's initial input.

**Wheel Rim-**The method of making a rim is divided into 7 steps. Reducing the number of production phases was our key issue. The forming dies have been designed and developed by the MSME Technology Center in Jamshedpur in a method that can decrease the number of steps and has been successfully created in a 5-stage process for the industries.

**M/s Philips-**A combination tool was produced for Philips India Limited. The important thing to remember is that it features a special tool design that allows lancing and additional bending to be accomplished in a single motion. This tool is used to create holders for LED Bulbs. All of the lanced components must be at the same height and be simple to remove. As a result, the MSME TC team created a solution that met all of the requirements for this crucial component.

**Die-Casting-Philips India Ltd.** purchased a die casting die. Due of the component's complexity, much ideation was done in order to bring the component to perfection all at once.

Even though the casting of the component required a time-consuming, crucial manufacturing process, the MSME TC team was successful in producing the component as needed.

There are many aspects that generating the new ideas are implementing in the measuring system in MSME and bringing the feedback from the trainees in the MSME.

**Technical Knowledge of the beneficiaries in the MSME-TC and their work experience- One-way ANOVA:**

Technical skills are the knowledge and expertise needed to carry out particular physical or digital activities. No matter what business they work in, individuals will need to master a few technological skills to execute their daily tasks. They must be knowledgeable about management clients' platforms, such as a CRM. While retail employees need to be well-versed in point-of-sale and reassessments. Technical skills, which are often a sort of hard skill, are critical to the success of the business as well as the satisfaction of the employees, even if soft skills are important in the workplace. The researchers have used the One-Way ANOVA test to find out the technical knowledge of the trainees in the MSME and their working experience in the testing department.

Analysis of Variance (ANOVA) is used to determine whether there is any statistically significant differences between the two or more independent unrelated groups. It used there is a minimum of three, but not than two groups. Hence, the researcher has used the technical skills and the working experience using One-way ANOVA. The null hypothesis is that there is a significant difference between the experience and the technical knowledge in the organization.

**Table 5: Technical Knowledge of the trainees in the MSME and their work experience – One-way Anova**

ANOVA						
Technical Knowledge of the trainee		Sum of Squares	df	Mean Square	F	Sig.
I have heavy pressure in my job	Between Groups	1.835	3	.972	1.672	.023
	Within Groups	189.716	351	.513		
	Total	212.631	354			
Can able to plan as well as solve the mass balances in the continuous	Between Groups	.646	3	.272	.181	.009
	Within Groups	470.540	351	1.426		

improvement(kiosk)	Total	421.106	354			
To apply the phase transport models in order to describe the reaction.	Between Groups	3.213	3	1.084	.389	.761
	Within Groups	917.704	351	2.746		
	Total	980.917	354			
To use appropriate computational equipment	Between Groups	.670	3	.213	.499	.003
	Within Groups	156.897	351	.407		
	Total	157.566	354			
To use technical literature and other sources with the other trainer	Between Groups	8.132	3	2.712	.990	.005
	Within Groups	901.454	351	2.710		
	Total	969.589	354			
To perform my job in tense situations and work with multi disciplinary teams	Between Groups	2.194	3	.820	.866	.019
	Within Groups	376.130	351	.960		
	Total	319.024	354			
To use the knowledge of relevant basic sciences(Chemistry, mathematics, physics and so on)	Between Groups	2.237	3	.714	1.085	.045
	Within Groups	250.270	351	.713		
	Total	252.592	354			
I am not given with clear guidelines and required facilities	Between Groups	4.638	3	1.047	.977	.003
	Within Groups	555.154	351	1.519		
	Total	559.792	354			
Some of my job activities are boredom and monotonous in nature	Between Groups	4.994	3	1.806	1.190	.017
	Within Groups	495.360	351	1.413		
	Total	500.355	354			
To identify the steps involved in reaction mechanism and understand the limiting step concept	Between Groups	5.296	3	1.108	.636	.006
	Within Groups	918.941	351	2.504		
	Total	804.231	354			

Data: Primary Source obtained from statistical tool SPSS

The Table 4 explicates the results of the One-way ANOVA test. The significant value is less than 0.05 for all the variables which means that there is strongly significant difference between the work experience highly affects the technical knowledge of the trainees in the MSME organization.

### SEM Analysis of the Limitation of MSME- Structural Equation Model



Small firms don't have a lot of power or reasons to be supported individually. When a large tech firm, such as a multinational, opens a new innovation hub in a city, there is a lot of media and public attention, backing from the private sector and the government, a lot of interest from job seekers, and much more. It frequently takes years for many small businesses with a minimum of two to five people and a wonderful idea to gain traction, generate relatively little initial income, and reach a global level of job creation and tax generating. Additionally, many smaller businesses will follow a multinational's lead.

Managing money, which may be challenging for entrepreneurs, is a major challenge that emerges when beginning a new firm. Although entrepreneurs have many ideas, adequate funding is required to turn those ideas into profitable businesses. For the production process to remain seamless, there should be a reliable and consistent source of funding. Future obstacles can be overcome if this initial and most important barrier can be simply overcome. The researchers have adopted the SEM model for identification of the MSME limitation in this study that how MSME affects the business commitment to the entrepreneurs. MSME is providing the technology upgradation and also providing the employment opportunities to the people even though, it could not reach to 100 percentage benefits. Hence, it is considered as the one of the limitation of this study. When the small industries needed the new technology, at the same time they can face the government restriction also. The technology should be implemented in all the field. The major variables are followed as,

1. Ambition to do business
2. Government Restriction (MSME)
3. Business Commitment

It is now necessary to develop and put into practise new strategies to unlock the untapped talents of prospective entrepreneurs and human resources for the advancement of society. In this context, the Centre provides a wide range of services, particularly to micro, small, and medium-sized businesses in India. The researchers have evaluated the model used in the analysis part. There is a **convergent validity** among the variables and associated factors as all the noted variable has loading more than 0.6 associated with its factors (Std. Value > 0.6). Similarly, there exists **divergent validity** between each factor considered for the study as the noted loading between the factors is less than 0.6 (Std. value < 0.6).

**Table 6: Limitation of MSME- Factor Correlation Matrix**

<b>Factor Correlation Matrix</b>
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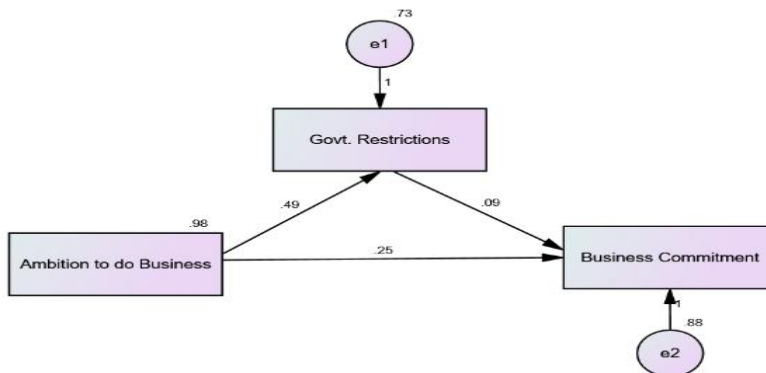
Factor	1	2	3					
1	1.000	.479	-.197					
2	.479	1.000	-.025					
3	.197	-.025	1.000					
Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.								
Model	Chi-square value	Df	Normed Chi-Square	P-Value	GFI	AGFI	CFI	RME SA
Study model	111.2872	50.9872	2.1672	0.0128	0.9428	0.9128	0.9128	0.0552
Recommended Value			Below 3	> 0.05	> .9	> .9	> .9	< .08

Source: (Primary data)

**Interpretation**

The estimated Factor correlation value indicates there exists divergent validity among the factors (estimated value < 0.7). Further, estimated GFI, AGFI, CFI and RMSEA value of the Confirmatory Factor Analysis has recommended value to Conduct SEM (Structural Equation Model)

**Figure 1: Structural Equation Model Representation**



**The hypothesis to be tested using Constructed SEM**

H<sub>0</sub>: Ambition to do Business impact the Business Commitment

H<sub>0</sub>: Government restriction Mediates Ambition to do business and Business commitment

**Table No. SEM – Model Fit Summary**

Model Fit Summary					
CMIN					
Model	NPAR	CMIN	DF	P	CMIN/DF

Default model	6.000	0.000	1.000	0.002	1.896	
<b>RMR, GFI</b>						
Model	RMR	GFI	AGFI	PGFI		
Default model	0.043	9.945	9.764	9.342		
<b>Baseline Comparisons</b>						
Model	NFI	RFI	IFI	TLI	CFI	
	Delta1	rho1	Delta2	rho2		
Default model	0.951	0.943	0.968	0.442	0.962	
<b>Parsimony-Adjusted Measures</b>						
Model	PRATIO	PNFI	PCFI			
Default model	0.956	0.956	0.956			
Model	RMSEA	LO 90	HI 90	PCLOSE		
Independence model	0.027	0.282	0.375	0.000		
<b>Regression Weights: (Group number 1 - Default model)</b>						
			Estimate	S.E.	C.R.	P
Ambition to do business	<---	Government Restriction	0.488	0.042	11.648	***
Ambition to do Business	<---	Business Commitment	0.093	0.053	1.750	0.080
Government Restriction	<---	Business Commitment	-0.251	0.053	-4.763	***

Source: (Primary data)

The constructed model has fulfilled more than three criteria, therefore the constructed SEM model can be considered as a valid model for this and futuristic studies. Also, the estimated degree of freedom is 1, which is positive, this indicates the model is overfit.

From the regression estimates, it can be interpreted that Start-Up Essentials (ambition to do business is significant to the government restriction but sometimes doesn't impact the government restriction. For getting the business license, proper documents, technology upgradation, taking the business risk in political aspects also affect the small business. MSME-TC is applicable to the limited sector, but it should be more convenient

**Conclusion:**

The Government of India established seven MSME-Testing Centers (TSs) in 1982 in Jaipur, Bhopal, Kolhapur, Hyderabad, Bangalore, Puducherry, and Ettumanur in an effort to provide testing services in the areas with clusters of enterprises and some critical places. These Testing Stations really serve the requirements of the enterprises located in remote locations by acting as an extension of the MSME-TCs. To meet the needs of the companies, and the Micro, Small, and Medium Sector in particular, located in their area, the MSME- Testing Stations continually update and modernise their facilities. The Indian government started

modernization programmes for MSEs through the Small Industries Development Organization to aid them in their quest for growth and development (SIDO). The Government of India, on the referral of the Projected Committee of Parliament, opted for the establishment of four Regional Laboratories, one each in the Northern (RTC, New Delhi), Southern, Eastern, and Western regions of the country. This was done in the MSE sector because it was realised that individual units would struggle to establish their own fully functional laboratories to test their products for compliance with national and international standards due to financial constraints.

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