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MEASURES FOR ENHANCING PRODUCTIVITY OF LEATHER INDUSTRY BY USING NOMINAL GROUP TECHNIQUE (NGT)

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Abstract – *This study is aimed to identity the factors that influence productivity of Leather Industry. Initially, thirty leather industries have been selected. This group of industries agglomerates micro, small, medium and large. Various brain storming sessions & workshops were conducted with stake holders (owners, managerial, controlling, workers and customers). Nominal Group Technique (NGT) was used to identify the various factors of productivity enhancement. A detail study was carried out to enhance the productivity of Man, Machine, Method and Material.*

Key Words: Leather Industry, Productivity Improvement, Labour, Machine, Method, Material Productivity and Nominal Group Technique (NGT)

1. INTRODUCTION

The First documented evidence of leather appears in the Hindu holy scriptures of the Vedas. The Rig-Veda has documented the use of Leather 'Mashaks' or sacks as early as 3000 B.C as well as bottles. Skin of Leather was a valuable material even from the time of God. There is a particular reference of the skin of elephant used as cloth by Lord Shiva in the Hindu epic Mahabharata. Again, Lord Shiva, the Greatest Destroyer in the Hindu Triad was used to sit on a tiger's skin for his deep meditation and penance. The most popular Indian leather products include footwear and hand bags. The footwear comes in various designs of traditional embroidery, brocade of textile, bright colors and unique designs are used.

Since the rise of civilization, animals have been part of human life, both while they are alive and also when they are dead. In their death their skins are found of various uses, especially as leather products. Leather is preserving by animal skin. The process of preserving animal skin is known as tanning. The dead skin of cattle like cow, buffalo, pig, goat, sheep, and camel is detected through specialized expertise. Then the role of salt in keeping the wet skin up to rotting. After then salted skin is dipped into the powder mixture of the bark of Tarwar plant, which produced Tannic acid to convert raw skins into leather. This treated skin is then put into a tub of lime. After a week it transforms into leather. The leather is then washed clean in a pond. To give a finish touch to the leather fiber of a fruit is boiled in castor oil. On cooling this solution is systematically applied to the leather to give it a polished, smooth look.

1.1 Leather Industry: An Indian prospective

Own raw material source - 31% of world cattle & buffalo and 21% of world goat and sheep population are housed in India. More than 2 billion sq feet of leather produced annually. 2nd largest producer of Footwear and Leather Garments. 3rd largest producer of saddler and harness items. Generating employment for 3.5 Million people, mostly from the weaker sections with 30% women predominance. Nearly 80-85% of the production is in the small / micro sector. Promising technology inflow and Foreign Direct Investment. World-class institutional support for Design and Product Development, Human Resources Development and R&D activities. Presence of support industries like leather chemicals and finishing auxiliaries. Presence in major markets-Long European experience and strategic location in Asian landmass. Apart from a significant foreign exchange earner, leather industry has tremendous potential for employment generation. Direct and indirect employment of the industry is around 3.5 million. The skilled and semi-skilled workers constitute nearly 50% of the total work force.

Agra is famous all over the world not only for the beauty of Taj, but also for footwear production. The district of Agra is situated in the extreme southwest corner of the State of Uttar Pradesh. It lies between the parallels of 26□44' and 27□25' north latitude, and 77□26' and 78□32' east meridians of longitude. Rajasthan bounds it on the west; it is bounded on the south for some distance also by Rajasthan, and thereafter by Madhya Pradesh. The district of Firozabad bounds it on the east and it is surrounded by districts of Mathura and Etah in the north.

Agra derives its name from Agra Vans (Aelo Grove), where Lord Krishna used to sport with his female friends in his boyhood and early youth on the banks of river Yamuna. Agra's chequered history goes back to the times of Mahabharata, but its modern history begins from 1505 when Sultan Sikander Lodi of Afghan Dynasty chose it as his capital city. Sikandrabad, the place where Akbar is buried, takes its name after him. It is during the Mughal era that Agra gained the greatest eminence. Babar defeated Sikander Lodi at Panipat in 1526 and founded the modern Agra in 1558 on the left bank of the river Yamuna. Akbar built the fort and part of the palace inside it. The famous edifices of Fatehpur Sikri were also his creation. Jahangir, his successor, held his court most of the time. With Shah Jahan begins the greatest

epoch of Mughal architecture. Shah Jahan built the master piece Taj Mahal, besides many other such magnificent buildings, such as. Jama Masjid and Red Fort at Delhi, The present day Agra is like any other leading Indian city and a business and tourist centre. Agra went ahead in footwear production leaving other cities behind. Nowadays, it has become a prominent centre for footwear production.

In the British period, the Agra was famous in the manufacture of leather goods. Many became millionaires by supplying shoes & belts to British army during World War II, continued after independence as well.

About 1956, leather industry has been established in the form of export profession in Agra. Now days, It is rapidly growing up to 10,000 lather industries in Agra in the form of micro, small, medium & large scale production. At this time, about 30 to 35 percent of population is connected directly or indirectly through this lather industry in Agra. Living style and education of these types of worker is not up to mark. It is also observed that the working style of worker is not professional into more than 80 percent lather industries. Skilled worker is illiterate & educated worker is not skilled.

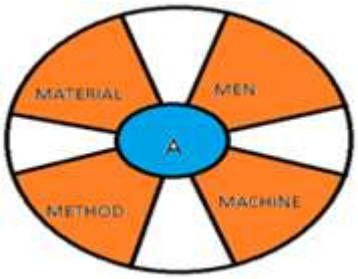
2. PRODUCTIVITY IMPROVEMENT

A productivity measure is expressed as the ratio of output to inputs used in a production process, i.e. output per unit of input. Productivity is a crucial factor in production performance of firms and nations. Increasing national productivity can raise living standards because more real income improves people's ability to purchase goods and services, enjoy leisure, improve housing and education and contribute to social and environmental programs. Productivity growth also helps businesses to be more profitable. Basically Productivity enhancement involves Advance Technology, Human Development and Leadership.

Agra lather industry has demanded of more lather here to boost private capital flow in the organized segment and enhance the productivity with future growth prospects. The industry also wants major policy changes for creating better infrastructure facilities, capacity building and skilled labor development. The Centre had proposed to set up seven mega leather clusters in Uttar Pradesh, Haryana, Tamil Nadu, Rajasthan, Bihar, Andhra Pradesh and West Bengal.

Industry has worried over growing skilled worker shortage and the lack of proper initiative at any level to address this problem. "The footwear industry has required skilled worker that for an order of five lakh pairs, a labor force of 250-300 is needed, which is hard to come by now-a-days due to several reasons, including other employment routes available to workers such as under National Rural Employment Guarantee Scheme,"

Productivity enhancement is one of the measure issues for enhancing more profit from same kinds of resources. Productivity is affected by several factors among others such as methods used, capital, technology, management, equipment breakdowns and shortage of raw materials. But, It was found during brain storming session and workshop that following four factor plays a vital role in the productivity enhancement of leather industry. These are Man, Machine, Method and Material-



A-PRODUCTIVITY ENHANCEMENT

2.1 Labour Productivity:

Labor productivity, also known as workforce productivity, is defined as real economic output per labor hour. Growth in labor productivity is measured by the change in economic output per labor hour over a defined period. Labor productivity measures the hourly output of a country's economy. Specifically, it charts the amount of real gross domestic product (GDP) produced by an hour of labor. Growth in labor productivity depends on three main factors: saving and investment in physical capital, new technology, and human capital.

Some definitions and keywords are shown in table-1.

Table -1: Labour Productivity Definitions and Keywords

S. No.	Definitions	Keyword
01.	Leather product industry enriches the profit by minimizing excess work of labour, to increase the Labour productivity.[1]	Minimizing excess work of labour [MEWL]
02	Labor productivity as a measure of economic performance and also environmental management has a negative impact on the labor productivity of company.[2]	Economic and environmental management [EEM]
03	Appropriate telework hours increase labor productivity, but when telework hours are too long, telework decreases labour productivity.[3]	Telework [TEL]
04	Culture is considered as one of the most powerful forces that shape human behavior and thereby economic activity like labour productivity.[4]	Human culture [HC]

05.	Unconditional convergence in real labor productivity for the service sector and also found the presence of unconditional convergence for individual sub-sectors[5]	Unconditional convergence [UC]
06	Several factors—such as the decline in interstate migration, rising housing costs in major cities, agglomeration, and structural changes in the developed countries that have reduced the role of manufacturing—may have contributed to the rise in the labor productivity.[6]	Convergence of labour productivity [CLP]
07	The economic impact of climate-change-induced labor productivity changes.[7]	Impact of climate-change [ICC]
08	Labour Productivity is lower than the opportunity cost of labour (e.g. 4 USD h^{-1}) in 10 out of 14 farms.[8]	Labour opportunity cost [LOC]
09	Technological investments in Information Technology and Research & Development contribute to labour productivity growth.[9]	Information Technology and Research & Development [IT & RD]
10	Access to electricity increases labour productivity significantly in the long-run.[10]	Access to electricity [AE]
11	A small group of informal firms could contribute to employment and labor productivity growth.[11]	Small group of informal firms [SGIF]
12	Increased labor market flexibility increases labor productivity.[12]	Labor market flexibility [LMF]
13	Relation between labor productivity and productive efficiency is verified by both input-output matrices, so productive efficiency is suggested based on input-output matrices.[13]	Input-output matrices [IOM]
14	Temporal demand variation is a core determinant of labour productivity and different forms of flexible working significantly influence labour productivity.[14]	Demand fluctuation [DF]
15	Understanding the unintended consequences of management strategies for improving labor productivity is crucial to enhance the stability of in regard to safety and productivity.[15]	Management strategies [MS]
16	The major factors limiting the growth of firms in the leather industry were access to capital, high per capita cost, shortage of skilled labour, taxation and regulations, appreciating rupee, competition from imports and high employee cost.[16]	Capital, short of skilled labour, taxation and regulations [CHSLTR]

2.2 Machine Productivity:

Machine Productivity is the measuring of a machine's proficiency in converting the raw inputs into a useful product. The critical element of cost efficiency is termed as Productivity. It is calculated by dividing the average output each period by the cost incurred in consuming the resources in the same period. The critical element of cost efficiency is termed as Productivity. It is calculated by dividing the average output each period by the cost incurred in consuming the resources in the same period.

There are several machines that are used in the factories for different purposes. Let us take the example of a sewing machine in the factory. This machine is used for stitching the garments in the factories. [17] There are some data essentially required for the calculation of Machine Productivity in the factory. The following data is to be considered while calculating the machine productivity-
1. The total stitching machines in the line must be counted.
2. The output of the line at the end of every day needs to be counted. In other words, the produced garments in the factory need to be calculated.
3. The timing of the shifts in hours and total hours of working in the factory needs to be noted down.
In this case, the machine productivity can be calculated by using the formulae given below:

$$Machine\ Productivity = \frac{No.of\ total\ garments\ produced}{No.of\ total\ stiching\ machines\ used}$$

Table 2: Machine Productivity Definitions and Keywords

S. No.	Definitions	Keyword
01	The milling accuracy and surface quality are usually regarded as the indicators of product quality, and these indicators are affected by CAD/CAM, machining parameters of CNC controller, servo loop, and feed drive system, etc. A data driven method to predict machining quality of product by ANFIS model. This predicted system can help user to achieve the required product quality and machining productivity.[18]	ANFIS Model [ANFISM]

02	By a real-time control approach for renewable sources to the machine tools & manufacturing process, no weather forecasts are necessary and the machine tools, productivity is maintained to using select machine components.[19]	Real-time control approach [RTCA]
03	Special end mills such as serrated or crest-cut milling tools can be used in roughing operations to decrease the cutting forces and increase the machine productivity. [20]	Design of Serrated End Mills [DSEM]
04	Additive Manufacturing (AM) systems are able to manufacture three-dimensional components and products directly from raw material and 3D design data. The layer-by-layer operating process of these systems does not require the use of tools, moulds or dies. By this AM can improve the machine productivity.[21]	Additive Manufacturing systems [AMS]
05	Frame work of machine productivity like combination of Genetic Algorithm , Principle Component Analysis and Numerical Taxonomy are efficiently used for all branches of the power sectors.[22]	Genetic Algorithm , Principle Component Analysis and Numerical Taxonomy [GA,PCA & NT]
06	The productivity of machining centers is influenced directly by the quality of Numerically Control programs.[23]	Numerically Control programs [NCP]
07	A new system Tool-part touch control for increasing CNC machining productivity is based on registering the moment when the cutting tool touches the work piece during a machining operation. [24]	Tool-part touch control [TPTH]
08	Machine productivity can enhance by a new micro-machining (laser-induced plasma micro-machining) process, in which plasma induced in a liquid at the focal point of the laser beam is used to perform micro-machining. LIPMM can machine a variety of materials including metal alloys, polymers and ceramics.[25]	Laser-induced plasma micro-machining [LIPMM]
09	Machine productivity can be enhanced by reduced the ideal time in any machine operation.[26]	Reduced the ideal time [RIT]
10	Machine productivity can improve by work on machine to reduced cost and time by certain activities.[27]	Extra certain activities on machine [ECAM]
11	Preventive maintenance of machines should be regularly performed on a piece of equipment to reduce the likelihood of failure. Preventive maintenance ensures that anything of value to our organization receives consistent maintenance to avoid unexpected breakdowns, costly disruptions and improve machine productivity.[28]	Preventive maintenance [PM]

2.3 Method Productivity:

This productivity method places an emphasis on setting daily, weekly, monthly and yearly goals. Its process then helps us organize our thoughts and streamline the path to our goals. Essentially, it is meant to make our workflow more efficient and expedite the work process.

A report by (Riley, 2012) outlined that higher productivity leads; to improved competitiveness, trade performance, higher profits, low average costs, higher wages and economic growth. Hence for sustainability of a nations economy, manufacturing industries should be nurtured for global market competitiveness. This means in the manufacturing sector, productivity has a positive and significant relationship to performance measurement for process utilization, process output, product cost, and work in process inventory and on time delivery (Mwinyihija, 2014). (Teklemariam, 2004) linked productivity with utilization of resources in a company which means one can achieve the maximum possible with minimum resource. A system is deemed productive if it takes less time to achieve the desired results. [29]

Some definitions are arranged in the form of following table-

Table 3: Method Productivity Definitions and Keywords

S. No.	Definitions	Keyword
01	In method productivity a Lean - Six Sigma to create an enhanced productivity framework for complex manufacturing.[30]	Lean - Six Sigma [LSS]
02	To develop a method to determine the optimal design of a new shopping centre based on the method productivity that is, taking into account both its attractiveness and the forecast costs.[31]	Attractiveness and the forecast costs [AFC]
03	A 3dimentional building information modeling assisted method productivity measurement prototype for field labour.[32]	3dimentional building information modeling [BIM]

04	By various well logging and mud logging curve data, summarizes the typical curve type, and made use of a mathematical method to form quantitative characterization in method productivity for tight sandstone reservoir.[33]	Logging curve [LC]
05	For method productivity, identify areas were analyzed to using method study principles in production unit. By this method improvement has been achieved through reducing travel time by locating new space for the off-loading site near the production department. [34]	Method study & Time Study [MS & TS]
06	Quantitatively and qualitatively evaluate to the motivation of the employees of three Portuguese Small and Medium Enterprises (SMEs) with the statutes of Excellence to improve the method productivity.[35]	Motivation of employees [ME]
07	Employers should always be care full about his competitors by improving method productivity.[36]	Competitors [COMP]
08	Employers should form a team, which assure the quality of product to enhance the method productivity.[37]	Quality of product [QP]
09	Improving shop floor layouts by using string diagram technique and ARENA software to enhance method productivity.[38]	String diagram technique and ARENA software [SDT&S]
10	The work content & variability reduction of MCV model for main assembly line in auto mobile industry improve the method productivity.[39]	Work content & variability reduction [WCVR]
11	For improving method productivity in gas-water wells, Darcy law, the law of conservation of mass, mathematical models of steady-state and unsteady-state seepage considering stress sensitivity of reservoirs and seepage capability changes of gas-water two phases could be established.[40]	Darcy law and stress sensitivity [DLSS]

2.4 Material Productivity:

Material productivity is expressed as the amount of economic output generated (in terms of GDP) per unit of materials consumed. It plays important role in cost of production. It depends upon how material is effectively utilized in its conversion into finished product. It can be increased by using skilled workers, adequate machine tools, good design of product etc.

Table 4: Material Productivity Definitions and Keywords

S. No.	Definitions	Keyword
01	The auto-regressive distributed lag model to investigate the dynamic impacts of energy intensity for secondary industry (SEI), tertiary industry value added per GDP (TVA), trade openness (TO) and domestic extraction per capita (DEC) on material productivity.[41]	Auto-regressive distributed lag model [ARDL]
02	Critical to monitor the intensity of natural resource usage when producing intermediate or final goods. Discovering which socio-economic variables influence the Material Productivity indicator and explain differences between economic units is, nowadays, a key issue.[42]	Socio-economic variables [SEV]
03	The material productivity of the urban ecosystem is analyzed using the background of urban metabolism and urban ecology.[43]	Urban metabolism and urban ecology [UMUE]
04	Environmental tax reform (ETR), a shift in taxation towards environmental taxes, has been implemented on a small scale in a number of European countries for increasing carbon and material productivity.[44]	Environmental tax reform [ETR]
05	Product performance and process versatility are key characteristics of composites but there is a trade off with material productivity and	Product performance and process versatility [PPPV]

	consistency. [45]	
06	There has been an increasing emphasis on its planned development, aimed at optimum utilization of available raw materials for maximizing the returns, particularly from exports in the form of material productivity [46]	Planned development, aimed [PDA]
07	By the ABC (Always Better Control) analysis to minimize the inventory cost such as labor cost, material cost etc. to the improve of material productivity.[47]	Always Better Control analysis [ABC]
08	Employer should always be analyze the VED analysis (Vidal Essential Desirable) to enhance the material productivity.[48]	VED analysis [VEDA]

3. METHODOLOGY:

Nominal Group Technique (NGT)

Since interactive management provides a general and flexible for conducting a process of inquiry to assist groups to deal with complex issues. A set of 30 domain experts derived from leather industries, government departments in the planning and administration of leather industries including authors were selected on the basis of a second generation system design paradigm, which supports a consensus –driven interactive-iterative process. The methodology of content analysis and Nominal Group Technique (NGT) has therefore been utilized to obtain the elements for improvement of labour productivity in leather industry;

Three workshop sessions in two stages were organized in order to examine the priority of elements of productivity improvement in leather industry. Four important aspects from the point of view of the productivity improvement in leather industry were prioritized and agreed upon by domain experts

1. Labour Productivity
2. Material Productivity
3. Machine Productivity
4. Method Productivity

In the second stage of the exercise, the domain experts were called upon to identify at least three elements that they considered to be most important for improvement of labour productivity in leather industry;

For this purpose following trigger question was posed to them

Which of the elements according to you has the greatest potential on the improvement of labour productivity in leather industry? Give a list of at least three elements. An integrated list was clarified, merged, edited and key worded. This reduced the total number of elements from 42 to 90. A list of such elements along with their codes and keyword is depicted in Table-5.

Table 5: Integrated descriptive elements for improvement of labour productivity in leather industry

Sr. No.	Elements	Keywords
01	To have a better infrastructural support	Infrastructural Support [IS]
02	To have provision for learning	Provision for Learning [PL]
03	To have provision for continuous evaluation system	Continuous Evaluation System[CES]
04	To have provision for staff development program	Staff Development Program [SDP]
05	To insure better quality of life	Better Quality of Life [BQL]
06	To have provision for medical facility	Medical Facility [MF]
07	Provision for incur raging workers to learn through training	Learn Through Training [LTT]
08	Emphasis on adult education program	Adult Education Program [AEP]
09	Provision for transportation facility	Transportation Facility [TF]
10	Provision for continuous assessment system	Continuous Assessment System [CAS]
11	Improper working posture	Working Posture [WP]
12	To develop an ability to work with inter – displanary group	Inter – Displanary Group [IDG]
13	To create an understanding of professional responsibility	Professional Responsibility [PR]
14	Insufficient salary structure as per work	Insufficient Salary Structure [ISS]
15	Provision for documentation facility	Documentation Facility [DF]
16	To inculcate in an individual the spirit of truthfulness	Spirit of Truthfulness [ST]
17	Opportunity to each worker for extracurricular activities	Extracurricular Activities [EA]
18	Insecure of the job	Job Insurity [JI]
19	Emphasis on integrated education	Integrated Education [IE]
20	Lack of Training Programme	Training Programme [TP]
21	Provision for financial	Financial Support

	support	[FS]
22	Insufficient incentive to staff	Insufficient Incentive [II]
23	Provision for Gravience Redressal Cell for staff	Gravience Redressal Cell [GRC]
24	Insured of the life	Insured of life [LOOF]
25	Provision for women empowerment	Women Empowerment [WE]
26	To develop an attitude of tolerance and sense of national unity	Tolerance and Sense of National Unity [TSNU]
27	Exertion by Government rules	Government Rules [GR]
28	Arrangement for Vocational Training	Vocational Training [VT]
29	Lack of labour and skilled worker	Labour and Skilled Worker [LSW]
30	Provision for computing facility	Computing Facility [CF]
31	To develop and promote scientific temper	Scientific Temper [ST]
32	To communicate effectively	Communicate Effectively [CE]
33	Improper quality of Life	Quality of Life [QL]
34	To cultivate spirit of simple living	Spirit of Simple Living [SSL]
35	Improper working environment and time	Working Environment and Time [WET]
36	To develop an ability to synthesize problems	Synthesize Problems [SP]
37	Repeated work	Repeated Work [RW]
38	To create awareness for duty and obligations for society	Duty and Obligations for Society[DOOS]
39	Lack of professional attitudes	Professional Attitudes [PA]
40	Availability of land, man, material, equipments & machine	Land, Man, Material, Equipments & Machine [LMMEM]
41	Regular professional competence test	Professional Competence Test [PCT]
42	To develop satisfying career	Satisfying Career [SC]

In the final stage of exercise, the domain experts were called upon to rank the elements using NGT. The use of NGT incorporated asking the domain experts to rank the elements that they considered to be most important for improvement of labour productivity. Finally 13 factors were considered. A list of such elements is presented in table-6.

Table 6: Elements Definitions and Keywords

Sr. No.	Elements	Keywords
01	Lack of professional attitudes	Professional Attitudes [PA]
02	Improper quality of Life	Quality of Life [QL]
03	Lack of Training Programme	Training Programme [TP]
04	Improper working environment and time	Working Environment and Time [WET]
05	Lack of labour and skilled worker	Labour and Skilled Worker [LSW]
06	Exertion by Government rules	Government Rules [GR]
07	Improper working posture	Working Posture [WP]
08	Insecure of the job	Job Insurity [JI]
09	Insufficient incentive to staff	Insufficient Incentive [II]
10	To inculcate in an individual the spirit of truthfulness	Spirit of Truthfulness [ST]
11	Availability of land, man, material, equipments & machine	Land, Man, Material, Equipments & Machine [LMMEM]
12	Repeated work	Repeated Work [RW]
13	Insufficient salary structure as per work	Insufficient Salary Structure [ISS]

4. CONCLUSION

It is evident from this brief review that manpower plays a vital role in the productivity improvement of leather industry. Thirteen elements have been identified for improvement of labour productivity in the city of Taj. The involvement of the satisfied worker in decision making along with the other stakeholders makes a significant improvement in productivity of machine, method and material also. This methodology will help management in enforcing suggested initiatives for worker productivity improvement.

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