

## Return on Investment in Skilling- Bulk Material Handling System( BMHS) focus

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**Abstract :** USD 1.4 Trillion worth of Investments in India's Infrastructural sector along with other major investments in Power, Steel, Cement and other similar high GDP growth sectors, has brought in Bulk Material Handling Systems ( BMHSs) to an important front stage. The Skill Shortage in India in this sector, like any other high Skills in various technological sectors, also prevalent in many other countries, is the issue which is as important like, buying a Costly BMHS. Expansion in Power Sector (consequential increase in Coal Imports), Steel, Cement and similar infrastructure sectors necessitates the expansion of BMHSs. The need of pouching an employee from competitors' yard, or re-skilling the own staff, or skilling fresh candidates with the required skills or even making the candidates ready for meeting market needs for India or abroad ( at this time of skilled and employable shortage of youth in many countries) needs an analysis on Return on Investment on the Skilling. Skilling – a need to meet the Technology upgrades or new induction of equipment or features for higher productivity of BMHS is to be matched by the higher productivity Skills of the manpower. The scope of this paper is w.r.t. O&M of BMHSs as in fig 1 and the technology behind the system. The skills required in manufacturing of BMHS have been very briefly touched. The Skill development for own organization is the main focus of the paper and touching briefly, developing a Skilling Centre for offering manpower to other organizations.

**Key Words:** Bulk Material Handling System, Skills, Return on Investment on Skilling,

### I. Introduction

Every time an Industry consumes raw material for conversion to an output or a customer picks up an item from a shopping mall shelf, the entire industry stands ready to make sure, that item is replaced and available for the next customer quickly, at a reasonable cost. It is easy to overlook the distribution infrastructure that fulfills demand for the large variety of goods; the consumers expect to be available anytime, anywhere<sup>1</sup>. Its importance has increased with the introduction of e procurement of bulk material, which is now a click away globally“

Material handling is the movement of raw goods from their native site ( mother earth, mines or finished / semi-finished output in bulk to the point of use in manufacturing, their subsequent manipulation in production processes, and the transfer of finished products from factories and their distribution to users or sales outlets. <sup>2</sup>BMHSs span the whole range of high GDP growth economy sectors. Each element of chain of economic Industry, on time performance, zero breakdown, zero spillage / wastage from these systems are the challenges, these systems face today. And BMHS supports at every stage of the value chain.

BMHSs accordingly need high skilled manpower. A Company may deploy training company for skilling, or utilize the services of Original Equipment Manufacturer (OEM) and may be go in for an 'on the job skilling'. All these approaches have different costs of skilling and accordingly Return on Investment (RoI) on skilling and time available for skilling and improving Productivity.

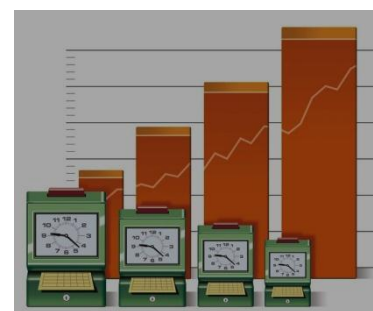


Figure 2 Productivity Improvement due to Skilling

<sup>1</sup>Mike Ogle "Material Handling Industry of America"

<sup>2</sup>Encyclopedia Britannica

## II. Return on Investment (RoI) of Skilling:

ROI methodology can be applied to almost for any given intervention or change in the inputs of practice of Skilling / Training as a way of evaluation to see what has been the impact or what might have been the consequences, had that Skilling inputs not been provided. A ROI evaluation could be carried out after implementing skilling program of a workforce for their skill development strategy or an introduction of a new Skilling programme as a way of quantitatively measuring the time and the costs vs. benefits of the new Skilling initiative. This approach can be effectively used for skilling in any sector of industry with appropriate Skill parameters.

## III. Skills Objectives And Related Costs Will Decide RoI

What to focus on (Fig 3), to achieve the team's specified level of skill sets, compatible with the Technology deployed, will decide the skill objectives and related costs (Outsourced or in-house at Plant or at away location) and time involved for such skilling intervention, one may work out the RoI. The benefit accrued may be subjectively evaluated initially as benchmark standards are not available as of now, but can be worked out precisely over a time horizon of 2-3 Years. HR as a Cost Center can have a profit center face with ROI concept. So far, the



Figure 3 Focus Skill Objects

concept that has been presented here is skilling for own organization under the banner of HRM as a profit center. This can be extended further for skilling and providing human resource to other organizations, which can be even abroad, in Countries facing skilled man power shortage. The foreign exchange remittances from Indian employee expatriates can improve substantially, which today stands highest at USD 70 Bn. Followed by China at USD 66 Bn. It makes a business sense that Indian organization take forward, the right foot out faster, before foreign companies come and set up their skilling bases here in India. It can best be done by even through joint venturing with developed countries with a need to sustain their economy but are constrained because of shortage of employable youth. Australia is one country that has initiated action to set up a center in North East of India for training youth in Bulk Material Handling in Coal mining as Australia exports in Coal has been badly affected as per Trade Commissioner of Australia in India. Australian Industry will take Indian Youth after skilling them, to Australia for their Coal Mining Industry Operations. If the Skilling is for the Host Company, then the Core values instilled will gel with the values of the Company rather than hybrid of divergent values that gets generated due to skilled manpower sourced from other companies with different values. Thus, in relation to the skilling, the benefit of using ROI analysis presents skilling solutions as an investment, not a cost and ensures alignment of skilling programmes to service and business needs. It helps "sell" the benefits to the organization and also gives a credible measure tool of value of skilling programmes to the organization as well as enhancing the design and implementation process.

## IV. Defining the ( RoI) On Skilling

Benefits/Cost Ratio (BCR) = Monetary Benefits/Programme Costs which generates a number

RoI = (Net Monetary Benefits/Program Costs) x 100 which generates a percentage (%)

General RoI Example

Skilling Costs for an Initiative	Rs. 500,000
Benefits from the Skilling	Rs. 1,500,000
BCR =	Rs. 1,500,000/500,000 = 3.0
RoI =	Rs. 1,500,000/500,000 x 100 = 300% (over a time span of the Skilling Period)

Return on Investment on HR Activities ( as per a study on National Study of Business Strategy and Workforce Development in USA.<sup>3</sup> has been compared by various other interventions as per fig 4

<sup>3</sup>Pitt-Catsouphes, M., M. A. Smyer, C. Matz-Costa, and K. Kane. 2007. The National Study Report: Phase II of the National Study of Business Strategy and Workforce Development. The Center on Aging & Work/Workplace Flexibility Research Highlight No. 04. [http://agingandwork.bc.edu/documents/RH04\\_NationalStudy\\_03-07\\_004.pdf](http://agingandwork.bc.edu/documents/RH04_NationalStudy_03-07_004.pdf)



Figure 4 RoI on various HR Activities

**V. A Right Mix With Quick Fix Skill Sets :**

Organizations adopt varying practices for O&M, partially offloading O&M (particularly for fixing the equipment on Annual Maintenance Contract-AMC, which has been noticed in Power Sector and also in a few other sectors. Even wear and tear of the parts on cumulative hours running basis of plant and machinery are offloaded through AMC. This approach can also be considered when comparing RoI on Skilling own team vs. offloading.

**VI. RoI Methodology:**

A systematic approach to the evaluation of the ROI and its impact on the skilling project(s) or initiatives is becoming more and more important. Common evaluations tend to generate following broad data which range over a length of time taken to gather and its usefulness of demonstrating the value of the skilling intervention.

Figure 5 Benchmarking Skilling



- [1]. Immediate reaction to a skilling project or program i.e. evaluation form completed on the final day or stage wise on intermittent days during whole length of skilling program spanned over a period of time.
- [2]. Learning of new skills & knowledge and its necessity.
- [3]. Application and implementation progress of Skilling
- [4]. Impact of Skilling on business related to the project or program of Skilling.
- [5]. Return on Investment by alternate skilling programs
- [6]. Skilling for Reducing Potential personal-injury risk and its impact on productivity.
- [7]. Learning on bulk materials wastage by spills around plant and risk hazard because of that.
- [8]. Un-wetted lumps of powder or bulk material making the discharge spout of smaller capacity.
- [9]. Intangible Benefits.

The most frequent evaluation carried out is on the basis of immediate reaction format which gets collected straight away, results analyzed and immediate evaluation made in respect of the success of the skilling program. It is more time consuming to perform an ROI analysis of a skilling programme over a period of defined time even though this might give more data useful in terms of justifying the expenditure of time or money. Many organizations are now venturing into ROI approach but many others lack time, money involved, lack of understanding or knowledge and the assumption that it can't be done.

To be a leader in the Industry best standards of Skilling as per fig 5 are required in every aspect and skilling is equally important.

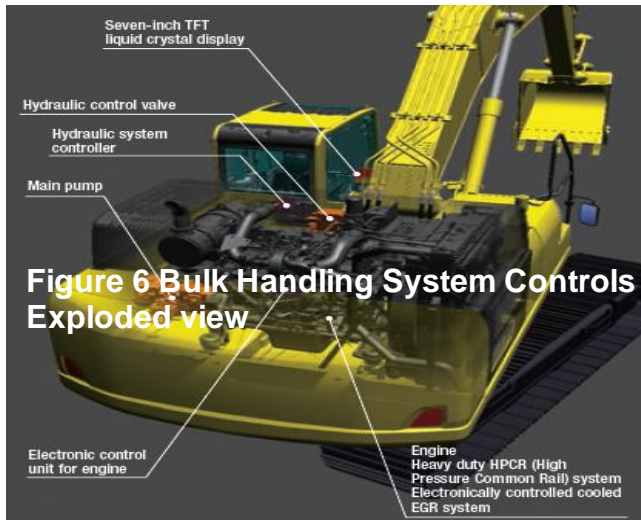
**VII. Table 1 Parameters of RoI based on width of Skilling:**

Sl.	Measure	Unit	Benefit (Saving)
i.	Multi-Skilling	Per 1% reduction in workforce or 1% non-idling time of specialized work force.	Industry Specific parameters can be worked out jointly by HRM, Finance and other experts from the field. The benefit may vary for each individual
ii.	Shrinkage of workforce (absence etc.)	Per 1% improvement due to making working easier.	
iii.	Turnaround time	Per 15/30/60 Minutes basis depending on the type of bulk machine handling operations.	

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iv.	Adherence to Project Delivery	Per 1 minute / hour per day or 1% improvement.	skilled. Thus, the benefit so accrued is based on the sum of the value addition / potential value addition by each individual after the Skilling program. <b>A right mix of Skills for quick fix skill solutions</b> as an individual or as a team, may have an impact on ROI on Skilling Initiative.
v.	Reduced down time , if breakdown is attended to promptly by own skilled force and reduced cost of maintenance by outside agencies	Per 15/30/60 Minutes basis depending on the type of bulk machine handling operations.	
vi.	Improved schedule adherence	per 1% of time (done through real time management).	
vii.	Schedule fit of various activities / project components	Per 1% improvement.	
viii.	Improved schedule fit	Per 1% (done through better schedules, effective reporting and planning prepared by experienced skilled work force).	
ix.	Energy savings in Bulk Material handling, reduced haulage/ idling time	Per Ton of bulk material hauled.	
x.	Reduction in Plant Life Attrition	Per 1 month addition to the Plant life cycle.	
xi.	Reduced consumption of Spare Parts by Skilled handling of Machines	Per Quarterly / half yearly consumption basis depending on age of the machine.	
xii.	Skill Level of work force ; Reducing Wastage due to rejection / damage/ Spilling of output or input	Per 1% Saving in material.	
xiii.	Technology Level ( High Automation – Partial Automation)	Per Extra Cost of Skilling Vs extra cost for Automation.	
xiv.	Environmental sensitivity of the work force, and innovation in waste management at site or facility rehabilitation, recycling or energy/water conservation.	To appropriately consider.	
xv.	Capability and understanding to handle maximum plant capacity beyond Design Capacity without imbalanced loss due to such change	Economic return per 1% Turnover of Plant.	
xvi.	Understanding the Safety requirements at the time of manual operations in case of exigencies any given level of capacity.	Saving in time loss due to accident free operation.	
xvii.	Sensitiveness of Containing Dust, sanitary requirements, Environment, innovation in Waste management, Water saving, facility rehabilitation at site.	Productivity increase due to no dust.	
xviii.	Cultural sensitivities when handling trans cultural/trans-national societies (when working with International organization or away from skilled person's home base).	Productivity change due to congenial working environment.	
xix.	Understanding the other sector specific measures when it comes to Economics.	to appropriately consider.	
xx.	Soft Skills	Productivity change due to correct presentation of the requirements / achievements.	

xxi.	Skilling level saves human life	Per 1 person loss of life, reduction in person loss / year (a difficult be prediction).	
xxii.	Attrition of trained Man power ( pouching )	Per Number in a year.	



**Automation in BMHS:** Any of the BMHSs depicted in Figs 6 to 11 whether handling on volume basis (generally food products) or weight basis (generally Industry Raw material) need automation controls which are at the heart of the system. Thus the skills in Automation- Pneumatic, Hydraulic, Electronic, Radio frequency controls, Robotics etc. become relevant for Manufacture of Bulk Material Handling Equipment and its O&M.

**Embedded Software:** forms an important ingredient of Electronic systems.

### VIII. The Depth Of Skilling:

Depending on the extent of Training (Skilling), time allocated for Absorption and then time under Deployment phase after / during skilling make the skilled man a specialist as per TAD learning process<sup>4</sup> and deployment quality measured then on, as per fig 12.

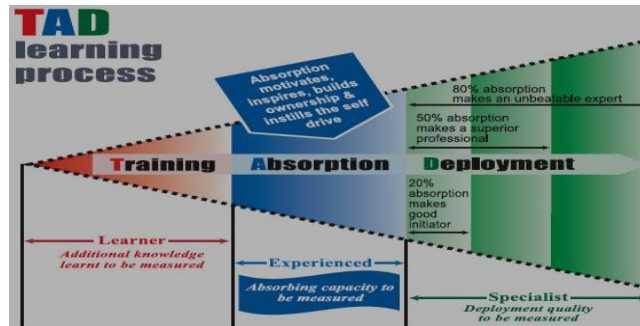


Figure 12 Depth of Learning Process

### IX. Limitations Of ROI:

It may not always be possible to effectively demonstrate the ROI in relation to new initiatives, as often the impact beyond the initial evaluation of skilling sessions is generally not measured so far. This may make it difficult to demonstrate persuasive impact and value, unless there are stage wise measurement systems in place. However, it is becoming more and more important that organizations are now able to recognize and report the perceived benefits of what they do, so that skilling investment is made in the right way to the right people for the right purpose. Reporting the impact as the value of skilling, and demonstrating the contribution to the sector will be very useful. ROI can be effectively used to improve skilling design and even more so, if designed at the very start of the program.

There might be a case that skilling department in some organizations are afraid that an unsuccessful evaluation will reflect poorly on their performance (career), a negative ROI will damage their skilling programme and therefore the likelihood of Skilling initiatives being continued. They might consider this Result Oriented Performance Evaluation (ROPE) as a rope around their neck. It may always be remembered that ROI is just one way of evaluating the impact of a skilling program and its results could be viewed and weighed up alongside other relevant factors.

### X. Multi Skilling :

Effective and well-targeted skilling program is aimed at multi-skilling and can be a powerful force in addressing current skills shortages in various sectors including Bulk Material handling. In India today, Bulk Material Handling is largely targeting the niche markets, precision, and quickly fulfilling specific time bound material handling demands.

So, an environment can be the best, where employees are able to do every job at Bulk Material handling site that can provide enormous flexibility in allocating labour to diversified. This in turn, leads to reduced manpower costs, as people are able to be utilized more efficiently making the operation as well as maintenance cost competitive.

However, this strategy requires commitment on the part of top managers, supervisors and employees to get committed to the idea of flexibility and multi-skilling. The difficulty of getting this genuine commitment shouldn't be underestimated. Often, such a skilling program takes several years to achieve real flexibility within a workforce. Yet, it is possible for first results to be seen quite quickly, say within 3 to 6 months, if the right skilling approach is taken and benchmarking ROI on skilling is done. The mechanics of the scheme are quite

<sup>4</sup>Shomnit Sengupta Foie- Grass- like training

simple: a matrix of people and skills, reviewed regularly, with goals set to broaden the individual's skills in a systematic way and on ROI parameters. Once people are committed to it, (or accept it, they won't go away) the ability to stick to the skilling program over the medium term is the key to success. The multi-skilling will lead to a workforce that is almost completely flexible and self-regulating to maximize labour efficiency and hence improve ROI on skilling. A well-structured and consistently applied multi-skilling program can deliver multiple benefits including reduced turnover of employees, measurable return on skilling investment, increased productivity and reduced waste through more skilled and engaged employees. Studies have shown that with multi-skilled workforce has a retention rate of approximately 90% versus non multi-skilled workforce with a retention rate of around 70%. Beyond that, a workforce which is engaged and performing competently will result in permanent better behavioral changes on the job and improved profits.

Positive return on skilling investment can be proven by isolating various processes, measuring outcomes (units produced, scrap minimized, time spent etc.) before and after skilling program and in terms of parameters as in table at Para VIII (table 1). In ever changing business dynamics and ever increasing competition, industries are forced to cut that extra fat and are under constant pressure to increase the quality & throughput of the product with minimum (optimal) work force that is required to be thoroughly skilled, reduced capital and operational expenditures. In such a scenario the unplanned shutdown of the plant may even affect the bottom line of the facility. Sometimes, the cost & production loss due to single, unplanned & unexpected shut down may exceed the annual maintenance budget sanctioned. Justification of unplanned & unexpected shutdown is becoming increasingly difficult. Thus, skilled manpower to bring back the plant back operational is essential that gives adequate returns on investment on skill. A ship, unloading bulk material has to pay very heavy port berthing charges, if its unloading gear breakdown. Similarly, for railway wagons, or even trucks have to pay to a smaller extent.



## **XI. Apprenticeships To Be Rediscovered:**

Apprenticeships are the traditional way to skill tradespeople, and after having largely slowed down this form of skilling over the last two decades in India. Bulk Material Handling is being forced by the extreme skills shortages in the Handling machinery to rediscover the value of offering and skilling people through apprenticeships.

This can have a very positive effect on the business as the apprentices start to become more skilled and begin paying their way and thus giving better return on skilling investment.

At a time of tight labour market conditions and skills shortages, multi-skilling and innovative approaches to skilling can deliver valuable solutions within a wide variety of Bulk Material Handling industry.

## **XII. Bulk Material Industry Size :**

Starting with USA, where relevant data is available on Material handling and the logistics associated with it, is a, \$60 billion dollar industry in the USA<sup>5</sup>, employing nearly 300,000 people. Employment at the ships, trucks, and airplanes used to carry goods is not included. However, yearly combined consumption of bulk material handling equipment (like cranes, hoists, conveyors, monorails, carts, lift trucks and robots, etc.) is included.

The employment figures above also include a host of related services in which data-based bulk material handling logistics play an ever more important role to ensure that the right product is delivered in the right condition, in the right quantity, to the right location, at the right time, in a safe manner, and at the right cost, thus is required to be considered for skilling in this industry.

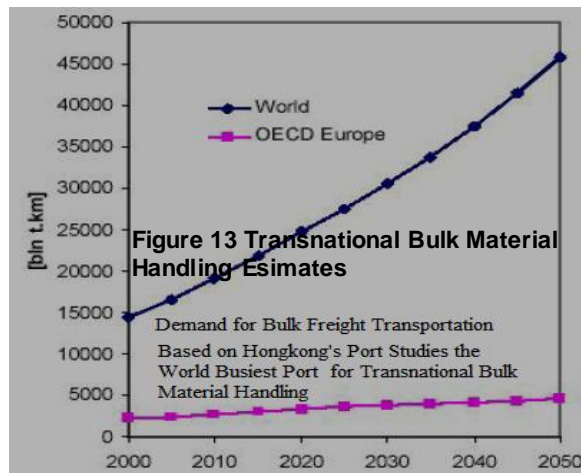
Given the all-pervasive nature of bulk material handling and the rapid increase in world trade, so far the skilled manpower numbers have not been arrived for bulk material handling in global terms. United States has estimated based on 20% world economy considers that material handling currently conservatively represents some \$250 to \$300 billion per year worldwide<sup>6</sup>.

Bulk Material handling world over is bound to increase based on the Hong Kong Port's anticipated engagement<sup>7</sup> as per fig 13

<sup>5</sup> U.S. Department of Commerce and Bureau of Labor Statistics,

<sup>6</sup> From an abstract of World Material Handling Equipment, by the Freedonia Group.

<sup>7</sup> Nexan's White Paper on Material Handling



### XIII. Workforce In Material Handling In USA:

Increased Automation in BMHSs has impacted the employment levels in the material handling equipment manufacturing industry which dropped during the 1980s and 1990s. In 1982, employment was 36,400 nationwide in USA, falling to 30,600 by 1993. This figure rose to 33,100 in 1994 and to 40,319 in 2000, and then dropped to 34,159 in 2002. Production workers numbered 18,362 and earned an average hourly wage of \$17.36 in 2002, compared to an hourly wage of \$14.17 in 1997. The bulk material handling equipment industry as a whole also saw a drop in its workforce. In 2002, there were 82,148 total employees in the industry, with 49,682 of these production workers, but the total number of employees dropped to 73,867 in 2004, with 45,606 of these production workers<sup>8</sup>. By 2009, the industry employed 73,853 people, about 62 percent of whom were production workers earning an average wage of \$19.73 an hour.

### XIV. India's Scene – Bulk Material Handling<sup>9</sup> :

Considering the momentum in the infrastructure sectors in particular power, ports, mining and cement, a steady growth rate of 20-30% can be witnessed in the Bulk Material Handling Sector for this decade. The traffic at Indian major ports is likely to grow at a CAGR of 8.03% and at non major Indian ports by 15.96% during 2012-20. Rapid expansion of Indian ports is going on and as a consequence, there is a steep increase in the demand of bulk material handling equipment. Iron ore, coal and fertilizers, are the major bulk materials, which are being handled at these ports and consist of 35% of the total capacity of commodities handled. In the next five years, the capacity handled at ports of these commodities is projected to increase by four times. Stockyard equipment, ship loaders and un-loaders are the demands of the BMHS sector. The capacity expansion of ports is under progress and the demand for high speed conveying system can be foreseen.



Figure 14 Bulk Mineral Sizer for Mining

Figure 15 Portable Telescopic Conveyor / Stacker



<sup>8</sup>U.S. Census Bureau data.

<sup>9</sup>U.V. Phani Kumar, *India's material handling equipment sector: Current & future market growth*



Seeing the growth of these systems the foreign manufacturers of Bulk Handling system are exploring to set up a manufacturing base in India.<sup>10</sup>for systems as in fig 14 & 15

## **XV. Conclusions:**

The Skilling in BMHSs is as important covering various factors as enumerated above in table 1 at para VIII, and also additional parameters depicted hereunder. The evaluation of the Skilling, is required in the form of RoI on skilling as per this paper

Skilling Features of Bulk Handling Systems

- [1]. Skills for Digital Age: Face to Face Sessions blending with Virtual Interfaces (Text + Multimedia – not just Power Point presentations and Projectors).
- [2]. Skill Shortages / Deficit Reported in: Power, Steel, Construction, Infrastructure and bulk handling systems associated with the sector.
- [3]. Reducing Skill Deficit in BMHS-Providing Multiple Horizontal and Vertical Pathways for Human Workforce – making People Employable and Enhance Gross Enrolment Ratio (GER).
- [4]. Available Mode of Distance Education in Re-learning, Re-skilling in BMHS.
- [5]. Vocation Oriented Skilling necessary for Campus to Corporate transition with BMHS focus.
- [6]. Soft Skill development, Challenges of Solving Real time Industry Problems in BMHS sector.



**Figure 16 Industrial Bulk Material Handling**

## **XVI. Recommendations:**

BMHSs are on the increase in usage in India and are growing very fast, keeping in view the GDP growth and market size of India. The countries in Africa, Middle East and South East Asia will also stand to gain from India's manufacture in BMHSs. Accordingly focusing on the development of O&M as well as manufacture of BMHS, is an important area for growth. **The Return on Investment approach needs to be applied courageously and skilling as a business to be considered.**

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