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A CRITICAL REVIEW ON MATHEMATICAL MODELING AND ORGANSATIONAL PERFOMANCE

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ABSTRACT
Organizational effectiveness is the outcome of employee overall productivity and performance. The performance metrics is being assessed by the nature of work place environment, culture and organizational practices that are followed. Any changes in the criteria will have impact on individual, team work, or overall output of the firm. Though strategies are used very often, the very fact is that human touch is more than sum of individual criteria. The required motivation in the name of workplace safety and health issue are causes for concern. Healthy workplace is possible with mutual trust. The aim of this paper review the theoretical framework and summarizes the linkage of these two factors with the of application modelling. Also it explores the linkage between modelling and organizational factors. Many safety programs were conducted. Now a day's employees are facing lot of risk and uncertainty in the workplace. This paper calls for more of pragmatic approach and mathematical modelling which will bring positive workforce and health work environment. No doubt that any investment on workers will turn on big profit too. So, policy and guidelines should not be sidelined but rather it should go hand –in-hand for better results.
Keywords: Modelling, Safety, Health, Relationship, performance

INTRODUCTION
"It is unethical and short-sighted business practice to compromise the health of workers for the wealth of enterprises." Evelyn Kortum, WHO

Modern day business organizations introduces various schemes and program in order to augment the positive workforce in the name of workplace awareness, safety audit, safety week celebrations, creating safety culture, proper communication, workers training modules as a learning organization.

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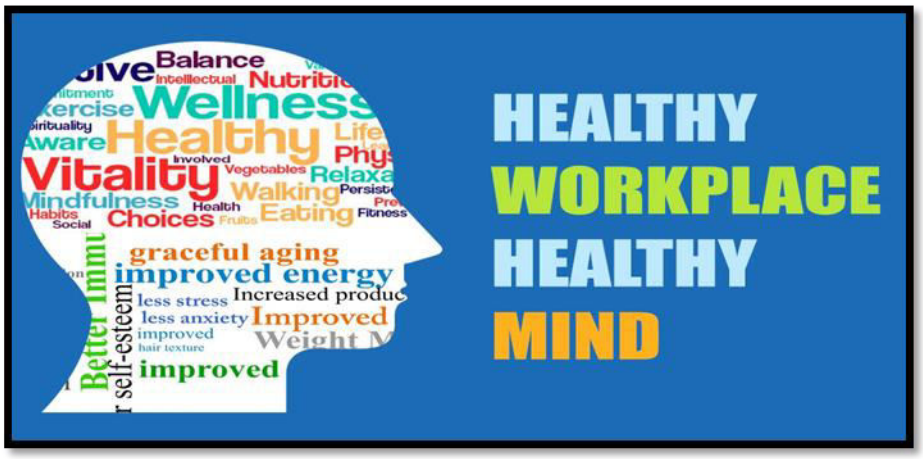

(Source: https://greenwgroup.co.in/keep-your-workplace)

Mathematical Models (MM) describe our beliefs about how the world functions. In mathematical modelling, we translate those beliefs into the language of mathematics. The application of mathematical models and tools will eventually solve the emerging problems of the organization. It provides solution to the problems. To be more vibrant it is necessary change the scale of operations and importance to dynamism in the production methods. The fact that no one can deny that safety program will leverage the outcome of the organization. Therefore, organization must look into this and address the issues on regular basis.

MM is used for varied purposes in industrial organizations. One of the main objective of the Mathematical model is to get desired objective and it depends on a) How well any objective is achieved b). State of the knowledge of the system and c) How well the modelling is done.

WHAT IMPACTS ON WORKPLACE SAFETY?

According to Haight and Thomas (2003), opinioned that health/safety activity means, " a system that is interactive and complex and involves the psychology of the people, a wide range of machine characteristics and a dynamic work environment".

Table No.1 OSHA safety and Health program

Implementing safety &health Program Can help employers to avoid direct costs that results workplace incidents such as	• Time Lost • Replaced workers injured • Loss of damaged machinery /material /property	Result in Indirect costs have been estimated to be at least 2.7 times Direct costs

(Source: Leigh, J. P. (2011), Economic Burden of Occupational Injury and Illness in the United States. Milbank Quarterly, 89: 728–772).

According to Injury and Illness Prevention Programs White Paper (January, 2012). Occupational Safety and Health Administration, "*Workplace incidents cause an enormous amount of physical, financial, and emotional hardship for individual workers and their families.*

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Combined with insufficient workers' compensation benefits and inadequate medical insurance, workplace injuries and illnesses cannot only cause physical pain and suffering but also loss of employment and wages, burdensome debt, inability to maintain a previous standard of living, loss of home ownership, and even bankruptcy".

Table No.02. Evidence from Reputed Organization: literature survey

Sr.No	Author/ Organization	Theme
1.	1800 -1900	• Queensland Master and server act gave rudimentary protection.
2.	Canada's Bill C-45, www.deloitte.ca	• Safety feature is going to be global scale if the problem not addressed properly. • It is linked with company reputation, talent retention and profit position of the firm and study cautions if not effectively implemented result in slow down in the production and protections will start further results in loss and liability.
3.	Anthony et al., 2007	• Address the issue of continues monitoring, employee involvement and emphasis on employee involvement, creating safety workplace and keeping problem free environment is must for the company
4.	La Botz, 2004	• Legal rights provides protective measures for the worker.
5.	Haines 2007	• Health oriented programs must produce positive outcome.
6.	Eysink et al., 2007 & Aneziris et al., 2008	• ORCA-Occupational Risk calculator developed to measure the impact of workplace occupational safety. • 5-10% occurs due to total occupational burden in nether land • Rest of them accounts for chronic exposure.
7.	Labar, 2008	• Various reforms took place in the factories
8.	OSHA 2010,	• Identified the ignoring safety nearly 41,000 inspections resulting 96,000 safety and health violations in 2010, 15 % increase over the previous year's 5-year period.
9.	Bratton & Gold, 1999	• Careless workers model resulting poor outcome. It spells out modern approach needed rather than old one; both owner and worker must resolve the issue.
10.	Siegel, 1962	• Attitude towards is matters • Safety first –that notion must be cultivated among the workers.
11.	Saxion University	• Stresses on safety workplace /safety environment are the

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		core
12.	Ynze Houten 2012	• Opinions on Strict enforcement and compliance are the key to solve the problem.
13.	Canadian Labour Code, 2015	• Vividly made that workers should be given all necessary safety instruments, and other appliance
14.	Dawson & Zanko, 2011	• Insists upon the regulatory mechanism should work for the favour
15.	Sass 1986	• Job design are the major source of concern (technical factor)
16.	Health safety commission	• Outlines the employee must be familiar with rules of the safety program. No confusion over in implementation etc.
17.	Rajagopal 2013	• Welfare measures must be undertaken. This helps in getting safe work environment in lie with employment act -1948 (India)
18.	Hilgert 2013	• Implemented at the operational level
19.	Safety work act 1989, welfare at work, 2015	• Shared responsibilities by both (Lawful activity + welfare measure)
20.	OSHA,1971	• Safe work place provisions + working conditions + safety assurance for the women
21.	Reilly 1995	• Union can be catalyst –can work for the promotion of conducive atmosphere.
22.	Gold 1999 & Bain 1994	• Safety issues are inevitable because of global pressure on productivity, performance, stiff competition • We must tighten the safety belt so that accidents or injuries can be reduced drastically.
23.	Siegel 1962	• Loss /injury/ accidents occur 10-20% because of uncontrollable. So management should device suitable strategy. Safety audit/inspection/ fault finding system must be evolved in order mitigate the issue.
24.	Braaton and Gold 1999	• Focus on reward system /appraisal schemes must go hand by hand with familiarity with safety mechanism
25.	Reber 1990	• Made observation on workers participation / suggestions taken into consideration
26.	Allendear 2011	• Work place safety/health are the twin theme for satisfaction and employee motivation

(Source: Author compilation)

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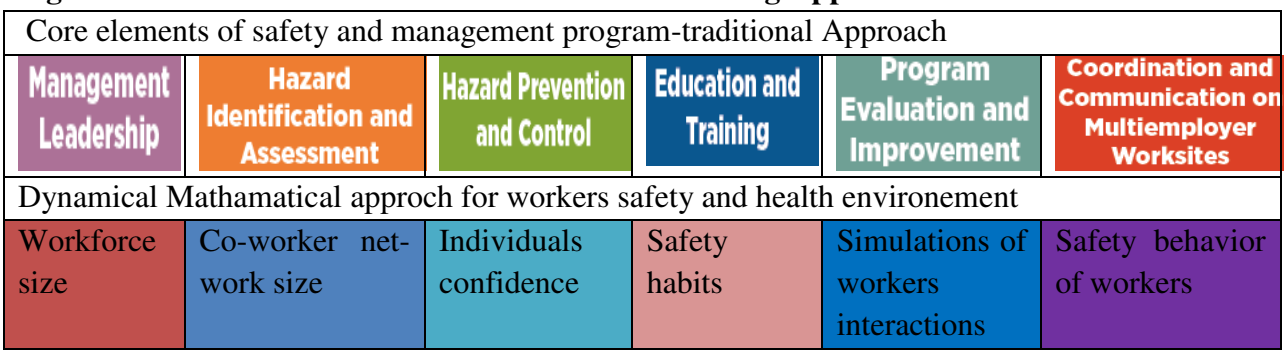
REVIEW RELATED TO MATHEMATICAL MODELLING TECHNIQUES:

Table No.3 Critical review on Mathematical approach /Techniques

S.No	Author /organization	Theme
1.	Groot 1974	• Mathematical model employed in Human behavior and interactions
2.	Shulgin et al, 1998	• Mathematical modelling came into force with infectious disease
3.	Deffuant (2000) Weisbuch (2002)	• Bounded confidence model came into force
4.	Deffuant (2002)	• Relative agreement model
5.	Cliff (2012)	• Re-examined model
6.	Meadows and cliff 2012	• Introduced with interactions with other workers
7.	Cliff (2012)	• From individual workers to group of workers methods are were employed.
8.	Krause, 2000	• It is hypothesized that workers who are confident in their workplace safety behaviours will only consider the behaviours of other workers very close to their own.
9.	Deffuant 2002	• Individual-based approach to modelling worker and workplace safety is not always the optimal modelling strategy
10.	(Winder, 2009).	• These strategies are employed to eliminate or minimise risks to health and safety of persons and to maximise safety conscience of workers and other persons at the workplace
11.	Thew et al (2014)	• Mathematical models that describe safety dynamics and investigate the impact of safety programs running would be of great interest and valueto industry

(Source: Author compilation)

Figure No.01. Traditional and Mathematical Modelling Approach



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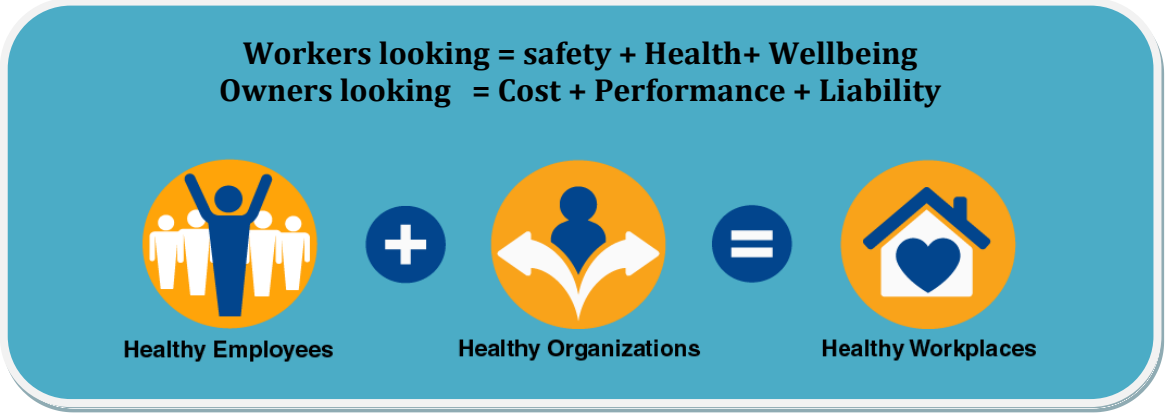
Increasing size of workforce result	Clustering and forming	Increasing co-worker network	Multiple cluster	Workers safety

(Source: Author compilation)

CONCLUDING REMARKS:

If very well stated pre-cautions are made then the optimal performance can be obtained. Resulting in better safety outcomes if strictly followed in the form of good leadership, engagement, safety management systems, risk reduction and performance measurement. Thus,



It is the joint responsibility of the employer to provide all the amenities and amend workable policies towards hassle- free and safe work environment. At the same time it is duty of the employers to follow suit the legal framework and necessarily get involve the safety mechanism and voluntary involvement for creating healthy employees, organization and health workplace. There has been awareness about industrial hygiene since the ancient time. One must learn to understand that employee health = Business health. Therefore, integrated approach will bring positive workforce and there by more performance of the organization.

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