Industry Innovation and Infrastructure SDG-09

INDUSTRY, INNOVAT AND INFRASTRUCT

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Industry, Innovation and Infrastructure SDG-09

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Preface

A functioning and resilient infrastructure is the foundation of every successful community. To meet future challenges, our industries and infrastructure must be upgraded. For this, we need to promote innovative sustainable technologies and ensure equal and universal access to information and financial markets. This will bring prosperity, create jobs and make sure that we build stable and prosperous societies across the globe.

The UN explains: Investments in infrastructure-transport, irrigation, energy and information and communication technology-are crucial to achieving sustainable development and empowering communities in many countries. It has long been recognized that growth in productivity and incomes, and improvements in health and education outcomes require investment in infrastructure.

The UN has defined 8 Targets and 12 Indicators for SDG 9. Targets specify the goals and Indicators represent the metrics by which the world aims to track whether these Targets are achieved. Below we quote the original text of all Targets and show the data on the agreed Indicators.

Thanks

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A Comprehensive Study of Management Practices during COVID-19

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Abstract

Management Practices during the period of "COVID-19" have been a challenging paradigm shift for the entrepreneurs. Here, in this study, concerted attempt has been made to highlighting the management practices implemented in organizations during Corona Virus (COVID19) pandemic. COVID 19 is a horrible global crisis that creates a massive destruction to the social and economic systems in the world. This study deployed secondary data analysis of various newspaper articles, management expertise and economists. Furthermost, The Research Design for this study is explorative whereby the secondary data base collection and analysis will be the major research frame work and to measure the impact of COVID-19 in various domains of Management. The results of this study shows the threats and opportunities emerging from the pandemic along with innovative ideas and solutions put in place in the areas of human resource management, production, MSME, service sector and work organization as whole. Further this study offers insights for managers and policy makers into possible future organizational direction for any uncertain disaster in the future.

Keywords: COVID-19 pandemic, massive destruction, threats and opportunities, innovative ideas and solutions, work organization.

Introduction

The Corona Virus Disease (COVID-19) is one the most horrible global crisis reported during 21st century that has shaken the whole world. It has affected all segments of population. Given the rapid spread of the Corona Virus, various policies, and practices like "Social Distancing" and "Stay at Home" were implemented. Furthermore, various lockdown measures were implemented, people were quarantined. Schools, universities, businesses and other organizations were temporarily closed, travel was restricted, national and international flights were either on hold or cancelled, mass gathering, and social events have been prohibited. It suddenly affected the whole sectors of economy. COVID-19 changed the way of perceiving life as well as living the life.

As the pandemic affected every industry differently. Some industries saw a dramatic drop in business, prompting some to temporarily close their business whereas some industries have grown their business during the pandemic. So, every type of business operated in newer way to deal with this disaster. This study reveals about the practices followed in respect of various domains of management like HRM, Marketing Management, Production and Operations Management and impact on Micro enterprises, Service Sector and Education. Identify the challenges faced by these functional areas, then discuss about the opportunities which created due to COVID-19 and furthermore discuss about the future direction for managers and practitioners to cope up with uncertain pandemic in future.

Objectives of Study

- 1. Identify the challenges faced by the various functional areas of management during COVID-19 and prospective ideas/suggestions for handling any uncertain disaster in the future.
- 2. To identify the practices followed by the entrepreneurs and managers during the pandemic to deal with this disaster
- 3. To know about the strategies followed by organizations during this pandemic to operate in resilient way.

- 4. To know about the opportunities arise due to this outbreak.
- 5. To find out the Agility Model for enterprises to deal with any uncertain disaster in future.

Methodology

This paper is general literature review, which aims to study the impact of COVID-19 on management practices. I have searched various articles published with business and management domains, and the related studies on Google Scholar by using the combination of various terms like COVID-19 and HR, COVID-19 and Marketing, COVID-19, and Production etc. Research design for this study is Explorative whereby secondary data is base to measure impact of COVID-19 on various domains of management.

Discussion and Interpretation



Table 1: Factors/Variable Considered for the Study

1. COVID-19 impact on Human Resource Management

According to Flippo, "Human resource management is the planning, organizing, directing and controlling of the procurement, development, compensation, integration, maintenance and reproduction of human resources to the end that individual, organisational and societal objectives are accomplished." COVID-19 had a considerable impact on the HRM which further generated the various challenges for the HR managers and practitioners. These challenges in various domains of HR are discussed as below (Table No.2):

Domains	Challenges	Practices Followed
COVID-19 impact	Industries in	Industries in Declining
on Recruitment,	Declining Stage:	Stage: Downsizing,
Selection and	Faced Financial	Lay Off
Retention	Difficulties	Industries in Growth
	Industries in Growth	Stage: Virtual
	Stage:	Recruitment and
	Uncomfortable for	Selection
	ICT Tools	
COVID-19 impact	Employees are not	Virtual Training
on Training and	familiar to ICT tools	Session (webinars, E-
Development		workshop)
		Online Courses
COVID-19 impact	Difficult to Supervise	Micro-management
on Performance and	Difficulty to decide	Style of Management
Compensation	the performance	Paid Sick Leaves
Management	measurement	Treatment related to
	parameters	COVID-19
	Harmful impact on	
	Employer-Employee	
	relationship	
COVID-19 impact	Un-availability of	Work from Home
on working	ICT tools	(Remote Working)
conditions	Lack of face to face	Virtual Socialization
	communication	Activities (virtual
	Techno stress among	lunch, tea breaks etc.)
	employees	
	Family Distractions,	
	Multiple Role &	
	Urgency of constant	
	availability	

Table 2: Challenges and Discourses Adoptionunder HR domain during COVID-19

a. COVID-19 impact on Recruitment, Selection and Retention of Employees

These all processes are greatly affected by COVID-19. As earlier discussed, that, COVID-19 has a diverse impact on various businesses. Industries those are facing financial difficulties, downsize their human resource to reduce the HR cost and to sustain their business. These types of organizations reduced their recruitments to negligible number and even laid off their existing employees. This practice has resulted that millions of people became unemployed.

Although, at the same time some organizations have extended their business during the pandemic. These types of industries also have faced the challenges like shortage of workforce and problem of retention of employees. At this time, the main problem for recruiters is that how to recruit new workforce when face to face interaction is restricted due to COVID. Then due to this, a new management practice came into force i.e. Virtual Recruitment and Selection Method. However, it was a further challenge for both organizations and job seekers because they are not comfortable with the Information and Communication Technology (ICT) tools; moreover, they are not prepared in advance for this type of unexpected change. But this transformation from Traditional Recruitment method to Virtual Methods further opened doors for new opportunities and reduced the overall Recruitment and Selection process cost.

b. COVID-19 and Training & Development

Training refers to improvement of required skills in the employees whereas development aims to improve overall personality of the employees. During the pandemic, the HR Managers go beyond the Traditional Methods and conducted the Virtual Training Sessions for employees. Organizations conducted various online webinars, sessions, online courses to improve the skills of employees while working from remote areas popularly known as Work From Home (WFH).

c. COVID-19 and Performance & Compensation Management

Performance Management refers to a continuous process of identifying, measuring and developing the performance of employees and aligned the performance with the strategic goals of the organization. So during the pandemic, it was difficult to measure the performance of employees because they are working from the remote areas. So organizations followed the "Micromanagement style" whereby manager closely supervise and remind the wok to the employees. But this practice is harmful for the Employer- Employee relationship.

Compensation Management is the process of managing, analyzing and determining the salary, incentives and benefits that each employee receives. During the pandemic, many countries implemented various policies like paid sick leave, treatment related to COVID-19 and provided financial support to the employees to retain, engage and motivate them.

COVID-19 and Working Conditions

Working Conditions refers to the circumstances such as "working hours, stress, degree of safety or danger that affect the workplace." COVID-19 crisis has changed the working conditions in the organizations. To continue their business, organizations shifted to working from remote area i.e. Work from Home. But this practice further posed the challenges in front of managers as well as employees because remote working requires the availability of ICT tools for communication between managers and employees. Various ICT tools and apps like: Microsoft Teams, Zoom, Google Meet, WebEx etc., were used.

But studies revealed that remote working lead to working in isolation, which cause stress among employees because of absence of one to one interaction between employee and employer and family distraction because of multiple role while working from home. Furthermore, growing usage of ICT tools might create a sense of urgency and constant availability of employees. However, HR mangers and practitioners stand resilient to deal with such type of challenges. The new practices like Virtual Socialization activities were performed which included the "Virtual Lunch and Coffee Breaks". These type of practices supported employees in tough crisis.

1. COVID-19 impact on Marketing Management

According to American Marketing Association (AMA),"Marketing includes all those activities having to do with effecting changes in ownership and possessions of Goods and Services. It is that part of economics which deals with the creation of time, place and possession utilities and that phase of business activity through which human wants are satisfied by the exchange of Goods and services for some valuable considerations".

The COVID-19 crisis has affected the marketing philosophy and the way of marketing. The marketing before COVID-19 is different. Lots of challenges were faced by the marketing department due to change in consumer perception, consumer behavior, lower consumer income etc. However, this gives birth to lot of new practices followed in each area of marketing which is discussed as below (Table No. 3):

Domains	Challenges	Practices Followed
Product	Decrease in demand of	New Product Development
	Luxury Products	Add new product in existing
	Surge in demand of	Product Portfolio
	essential Products	
Price	High volatile demand of	Temporary discount offers
	Goods	
	Low income of consumers	
Place	Transportation problem	Online order receiving
	because of COVID	Home Delivery Service
	restrictions	Digital Stores
		Payments received through

 Table 3: Challenges faced and Practices adopted by marketing

 domain during COVID-19

		bank transfer and E- Wallets
		Multi channel strategy
Promotion	change in consumer	Digital Marketing
	perception change in	
	consumer behaviour	
	Reduced Budgets	

a. Pricing

During the COVID-19 crisis, demand was volatile, which created a variety of pricing challenges. Every type of organization has faced a unique array of challenges. Like:

i. Companies which were experiencing a sharp and unprecedented drop in demand due to COVID-19 restrictions are airline, hotels and food services.

Studies showed that many of these companies are getting request for steep discount and new terms to attract the customers but some companies focused on maintaining cash reserve and preserve key asset and talent to survive the crisis.

- ii. Companies experiencing an explosive increase in demand such as medical supplies, shipping, cleaning and entertainment.
- iii. Companies with muted or lumpy demand such as home improvement, landscaping, and consumer electronics. Some Companies gave temporary discount offers in response to the increase price sensitivity.
- b. Product

During the pandemic, companies modify their product portfolio. Research and Development department invented the new products in the existing product line. The prominent examples of such companies are those companies which added new products like face mask, hand sanitizers etc., in their product portfolio.

c. Place

Place refers to the geographical location in which the company sells its products and provides its services. Products are distributed to end consumers through the various channels like wholesalers, retailers and agents etc. Research shows that consumer behavior during COVID-19 shifted from offline to online. In the crisis, online shopping increased. As a result, online stores have increased their sale, customer and company turnover.

d. Promotion

According to the American Marketing Association promotion means "media and non media marketing pressure applied for a predetermined, limited period of time in order to stimulate trial, increase consumer demand or improve product quality."

During pandemic, companies have increased the usage of "Digital Marketing" as a marketing tool of communication between consumers, suppliers and channel partners. Digital Marketing is used to inform the target audience about the features of product and service and brand name. This practice has increased the product and brand awareness among the consumers while they are shopping from home.

The innovative ways helped the companies to generate sales or create brand loyalty. However, various researchers showed that the companies have used the blend of offline and online channels, flourishing their business even in the pandemic situations.

1. COVID-19 impact on Production and Operations Management

Production and Operations Management is defined as the design, operation and improvement of the transformation process, which converts the various inputs into the desired output of product and services.

	0		
	Challenges		Practices Followed
•	Weakening demand of several	٠	Companies start
	products such as Automobile, public		repurposing and
	transport, textile and luxury Goods		temporarily retooling
•	unavailability of raw material due to		their production lines.
	trade and transport restrictions	•	Formulate policies

Table 4: Challenges faced and Practices adopted by Production domain during COVID-19

•	unavailability of adequate no. of		regarding health and
	workforce on site because of remote		safety of workers
	working is not suitable for	•	increased usage of
	manufacturing firms		technology
•	suddenly surge in demand of		
	essential products but insufficient		
	production because manufacturing		
	plant working with lower capacity		
•	Production cost increased due to		
	supply chain disruption.		

The COVID-19 pandemic has seriously influenced the global production and supply chain management. As the majority of raw materials were imported from china, this crisis has broken the transportation link as well as distribution channels. As a result, there was decrease in the demand of non-essential products, due to which some organizations shut down their business while others are working with minimum capacity. Most of the sectors have suffered the negative consequences of this pandemic but at the same time there reported an increase in the demand for essential Goods and services. People started pandemic buying and start hoarding of these Goods due to uncertainty. So in this crisis, various challenges were faced by the production and operations department which are discussed as below:

- a. Weakening demand of several products such as automobile products, public transport, textile products, luxury Goods etc.
- b. Unavailability of raw material due to trade and transport restrictions.
- c. Unavailability of adequate no. of workforce on site because remote working is not suitable in manufacturing Goods.
- d. Suddenly surge in demand of essential Goods but insufficient production because manufacturing plant working with lower capacity.
- e. Production cost increased because of supply chain disruption. The manufactures had to seek alternative suppliers, which results manufactures had to bear higher cost of raw material.

Practices followed by production and operations department during COVID-19

Studies have shown that most of the global manufacturing leaders have changed their production strategy in resilient way. As there was more demand of pharmaceutical products such as ventilators, surgical mask, hand sanitizers, masks, respirators etc. So, some manufacturing firms started producing these items to overcome COVID-19 and as well as for survival of their business. So, companies started repurposing their production lines to fight against COVID-19 and to survive.

 Table 5: List of some companies which temporarily retooled their

 Production strategy

SI.	Companies	Before COVID-19	During COVID-19		
No.		manufacturing	manufacturing		
1	LVMH	Perfumes and Cosmetics	Hand Sanitizers		
2	Ford	Vehicles	Respirators &		
			Ventilators		
3	L'Oreal	Perfumes, Cosmetics,	Hand Sanitizers,		
		hair care and skin care	Surgical Mask		
		products			
4	GE	Automobile	Ventilators		
5	Gucci	Clothing	Masks		

- a. Apart from this, companies have been implemented modified methods and process of production to maintain social distancing at workplace. Health and safety of workers become top priority of operations managers.
- b. Increased usage of technology, which results that reduced repetitive task and reduced cost.

1. COVID-19 impact on other domains

Table 6: Challenges faced and Practices adopted by MicroEnterprises, Service Sector and Education Sector during COVID-19

Domains	Challenges	Practices
		Followed
Micro	Financial Crisis	Started to produce
Enterprises	IT competencies'	Emergency
	low demand	Products
		Digital Marketing
		Online order
		receiving
		Home delivery
		starts to receive
		online payments
Service	It includes Travel and tourism,	they also changed
Sector	transport industry, education,	their strategy for
	public services etc., faced no. of	example hostels
	challenges because of COVID 19	become quarantine
	restrictions	centers
Education	Limited computer access	Virtual Teaching
	Wi-Fi issues not familiar with IT	and Learning
	tools	Innovative methods
		of teaching
		Students enhance
		their ability by
		using IT tools.

a. Impact on MSME:

- Micro enterprises also changed the way of doing business. They also started to produce emergency products such as essential food, cleaning, masks and sanitizers etc., to meet the customer's demand.
- Use digital and social media like Facebook, WhatsApp and Twitter for marketing.
- Implement home delivery service

• Starts to receive online payments through Bank Transfer and e-wallets.

b. Impact on Service Sector:

Due to lockdown, service sector like Travel and Tourism, Education, Transport industry, Entertainment and public services etc., have been deeply affected. Due to entry and exit barriers and danger of spread of Virus, people have escaped from travelling.

c. Impact on Education:

Various studies revealed that billions of students have been affected due to closure of educational institutions on the crisis. The educational institutions have been shifted from traditional teaching to online teaching and learning. Institutions used the online platforms like Zoom, Google Meet, Teams etc.

However, no. of issues faced during pandemic by education institutions as well as students. Initially the online teaching was not viable for those residing in the rural and backward areas as they have limited computer access, erratic Wi-Fi issues and power cuts results being virtual classes was very stressful for teachers and students who are not used to of working with technology.

However, it also creates opportunity for both teachers as well as students. Teachers were able to explore their new and innovative methods of teaching with the help of technology.

Similarly students were able to develop and enhance their abilities by using online tools and method.

Emerging Opportunities from COVID-19 Pandemic

COVID-19 crisis leaves the unexpected impacts for which existing crisis plans and teams were unprepared. In spite of lot of problems and challenges, this crisis was posed number of opportunities in every domain of management which is explained as below (Table No. 7):

Domains	Opportunities
Human Resource	HR personals go beyond the traditional
Management	methods of Training, Recruitment, Selection,
	Developments, meetings etc.
	Remote working leads to flexible working
	hours.
	Reduced the cost of office space, working
	conditions etc
	opportunity to develop and upgrade the digital
	competencies of employees
	Brings up the creativity of mangers and
	practitioners
	due consideration towards safety and health at
	workplace
Marketing	Pushed the marketing to online platforms
Management	Digital Marketing leads to customer access,
	better coordination, higher customer generation
	and lower cost
	Online Buying and Selling encourage E-
	Commerce
	Use of Social Media for marketing leads to
	brand building and customer retention
Production and	New Product Portfolio open for manufacturing
Operations	firms encouragement to Vertical Integration
Management	and self reliant for supplies of raw material
	encourage digitalization and automation
Micro Enterprises,	Automation
Education and	Birth of new and improved innovative methods
Service Sectors	

 Table 7: Opportunities emerged in various domains during COVID-19

1. Opportunities in HRM

HR personals go beyond the traditional methods of training, recruitment, selection, development, meeting, communication etc.

- a. Remote working leads to flexible working hours, foster job control and everyone experience the use of ICT which will help in the future in no. of ways.
- b. Optimum utilization of Men, money, material, methods. Furthermore reduced the cost of office space, working conditions etc.
- c. Opportunity to develop and upgrade the digital competencies of employees.
- d. COVID-19 crisis brought up the creativity of managers and HR practitioners.
- e. Organisations start duly consideration towards safety and health at workplaces.

2. Opportunities in Marketing Management

- a. Pandemic has pushed the marketing to online platforms.
- b. Digital marketing leads to create customer access, better coordination, higher customer generation and lower cost.
- c. The CMO Survey proves that online sales have grown to the highest level even the small companies also started selling online to their products.
- d. Marketers used social media for brand building and customer retention during pandemic and researchers proves that this strategy has paid off.
- e. Increased use of online channel allows companies to collect data about potential customers. So this was a way to identify the target audience and then customize the product according to their need. So it was great opportunity for marketers for customer acquisition.
- f. Online buying and selling further encourage E-Commerce.
- 3. Opportunities in Production and Operations Management
- a. New product portfolio open for manufacturing firms.
- b. Encouragement to Vertical integration and self reliant for supplies of raw material.
- **c.** Encourage digitization and automation which results reduced repetitive task and cost.

4. Opportunities in other domains

All the service sector including education, travel and tourism, banking etc., adopted the automation in their system and invented the new and improved methods of doing business.

As COVID-19 crises impact every industry differently so every industry should conduct "After Action Review" so industries can priorities their action to enhance the business value today and build strategic resilience for tomorrow.

Suggestions and Recommendations

It can be generalized that there is no formal crisis management planning or any contingency planning employed by industries. COVID-19 crisis creates no. of threats in front of entrepreneurs. However, variety of new practices and approaches were followed by organization to deal with this destructive crisis.

Number of new practices including work from home, digital marketing, virtual recruitment, online teaching, online order receiving, online wallet transfer, multi channel sale strategy etc were followed to coping with crisis impact.

The globe wide pandemic has made us to realize that future is uncertain and every organization has to make contingency plans for future uncertainties. So that company can face the challenges without effecting day to day working because pandemic does not give time to plan and execute so it is very important to plan everything in advance. Following are the suggestions and recommendations:

- a. Companies have to formulate Smooth emergency plan and strategy for any pandemic situation
- b. HR Managers should discuss various scenarios with the employees and also trained them to tackle with uncertain pandemic
- c. Organizations must focus to improve the virtual capability of the employees which could lead to digital fitness of the work pattern.

- d. Marketing Managers must develop agility, creative and innovative skills in the employees to deal with any unexpected crisis in future.
- e. Production Managers should contact with multiple suppliers so that if one supplier is unable to meet raw material requirements of company then companies can shift on another supplier and continue their production to meet demand of customers. It also provides competitive advantage to firms over its rivals.
- f. Organizations must shift their production strategy to "Industry 4.0" which will help to promote the digital technologies such as Artificial Intelligence (AI), big data, Internet of Things (IoT), robots, digital manufacturing for production of Goods. It will also help in more resilient supply chain management system for the future by enhancing the accuracy of data and encouraging data sharing.
- g. Build organizational resilience by establishing high-level resilience governance and fostering a culture of resilience.



Figure 1.Agility Model (Proposed Resilience Model by the writer of this Research paper)

Conclusion

COVID-19 crisis brought multiple unexpected impacts on the enterprises and management practices. Lot of challengers were faced by the managers and practitioners in various domains like HR, Marketing, Production, Service Sector because companies were not fully equipped with IT, digitalization, resources, skills, emergency plans to deal with such type of pandemic. Besides the challenges this pandemic reduces the global carbon emission and improves the environment sustainability. COVID-19 opens the door to opportunities for the organizations. As no. of new management practices come into force in this pandemic era. Study results that crisis are inevitable. No one accurately predict the crisis. The crisis such as COVID 19, organizations were unprepared. So by learning the lessons from this pandemic organizations must focus on 4 parameters of Agility Model to cope with any uncertain natural and unnatural disaster in future.

References

- 1. Aalok Kumar, Sunil Luthra & et, al, 2020, "COVID-19 impact on sustainable production and operations management" Elsevier B.V. on behalf of KeAi Communications Co., Ltd., P.1-7.
- 2. Fabeil, Noor Fzlinda & et.al, 2020, "The Impact of COVID-19 Pandemic Crisis on Micro- Enterprises: Entrepreneurs' Perspective on Business Continuity and Recovery Strategy", The Asian Institute of Research, Vol.3, (No.2), P.1-9.
- Jain, G, 2020, "Emerging Trends of Education During & Post COVID 19: A New Challenge", Solid State Technology, Volume: 63 Issue (1s), P.1-12.
- 4. Janny C. Hoekstra & Peter S. H. Leeflang, 2020, "Marketing in the era of COVID-19", Italian Journal of Marketing, P.1-12.
- Khaled (M. K) Ismail Alshaketheep, Ali A. Salah & et.al, 2020, "Digital Marketing during COVID 19: Consumer's Perspective", Research Gate, Volume 17, P.1-12.
- Mutahhar A. Dar, Bartlomiej Gladysz & et.al, 2021, "Impact of COVID19 on Operational Activities of Manufacturing Organizations-A Case Study and Industry 4.0-Based Survive-Stabilise-Sustainability (3S) Framework", Energies, P.1-28.
- Salima Hamouche, 2021, "Human resource management and the COVID-19 crisis: implications, challenges, opportunities, and future organizational directions", Australian and New Zealand Academy of Management, P.1-16

- Surabhi Verma & Anders Gustafsson, 2020, "Investigating the emerging COVID-19 research trends in the field of business and management: A bibliometric analysis approach", Elsevier Inc., P.1-9.
- Thinh, Van Vu & et.al, 2021, "The COVID-19 pandemic: Workplace safety management practices, job insecurity, and employees' organizational citizenship behavior", Elsevier Ltd., P.1-11.
- 10. https://insights.figlobal.com/new-product-development/new-product -development-COVID-restricted-world.
- 11. https://www.accenture.com/us-en/insights/consulting/coronavirussupply-chain-manufacturing-operations.
- 12. https://www.ama.org/marketing-news/5-marketing-opportunities-in-the-COVID-19-era/.
- 13. https://www.economicsdiscussion.net/marketing-management/whatis-marketing-management/31788.
- 14. https://www.mckinsey.com/business-functions/marketing-and-sales/ our-insights/pricing-in-a-pandemic-navigating-the-COVID-19-crisis.
- 15. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8134531/#:~:text
 =The%20global%20lockdown%20has%20reduced,the%20transport%20industry%2C%20and%20tourism.
- 16. https://www.oecd.org/coronavirus/policy-responses/supporting-people-and-companies-to-deal-with-the-COVID-19-virus-options-for-an-immediate-employment-and-social-policy-response-d33dffe6/.
- https://www.weforum.org/agenda/2020/03/from-perfume-to-hand-sa nitiser-tvs-to-face-masks-how-companies-are-changing-track-to-fig ht-COVID-19/.
- 18. https://www.weforum.org/agenda/2020/04/10-technology-trendscoronavirus-COVID19-pandemic-robotics-telehealth/.



A Review on Bi₂O₃-B₂O₃Glass System with Addition of Different Oxides

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Abstract

In general bismuth borate glass research began as a scientific curiosity and a way to better understand the structure of oxide glasses. As a result of this work, we now have a better knowledge of the structure and characteristics of bismuthborate glasses. Although silicate and borosilicate glasses meet the majority of scientific and commercial requirements but they fall short in several other situations. Furthermore, borate glasses have several benefits over silicate glasses but they are less known and researched. Glasses made of hard metal oxides (atomic weight >100) gained significant concentration due to its attractive optical and physical properties. Specially, bismuth oxide glasses have obtained great attention of researchers due to its non-linear optical assets. In this paper, we have reviewed different bismuth borate (BiBO₃) glasses system doped with different oxides like Bi₂O₃ with Fe₂O₃, Neodymium doped glass prepared by melt-quenching techniques, cadmium oxide, BiBO₃ zinc glass, Lead bismuth alumina borate (LBAB) glasses doped with Tm₂O₃ and Yb₂O₃, Li₂B₄O₇ glasses doped with Minerals.

Keywords: Glasses, Bismuth borate, Doping.

Introduction

Bismuth oxide glasses have obtained great attention from researchers due to its non-linear optical assets, that is essential to advancement with optical data handling technology. Glasses containing Bi_2O_3 have attracted considerable attention due to their wide applications in the field of thermal and mechanical sensors, reflecting windows, or their use as layers for optical and optoelectronic devices, etc. [1–8]. Bismuth oxide glasses are very stable hosts for obtaining an efficient luminescence in rare-earth ions. These applications indicate the need for a basic understanding of the relationship among the electronic polarizability, optical basicity and optical properties of the bismuth oxide glasses. In this paper, the synthesis of bismuth oxide and bismuth oxide-doped glasses has been studied by means of reviewing existing research. In addition to these, also see that the bismuth oxide glasses are very stable hosts for obtaining efficient luminescence in rare-earth ions.

The principle of the glasses are of greater optical nonlinearity and the construction of an optical nonlinearity relation is based on electronic properties that are simply understood and usable [9,10]. Due to its high density & atomic number, lead oxide containing glasses exhibit extremely high-level radioactive resistance. Bismuth glasses can also be utilized to make lead-free high-density radiation shielding (RSW) glasses. Though, the key difficulty of the Bismuth oxide glasses is its concentration and rise of melting temperature because of its deep brown and black color [11]. Table 1 shows a summary of various borate glass system dopped with different oxides.

Studies	Торіс	Methods	Material	Result	Conclusion
Wei Guoa	Characterization &	Bismuth borate	BiBO ₃	The findings have	Strong
et al,	Microstructure of the	zinc glass,	zinc	been displayed.	moistening was
(2016)	interfacial stages	$50Bi_2O_3 - 30B_2O_3 -$	glass,	The ZnAl ₂ O ₄ phase	achieved in
[12].	Sapphire/sapphire joint	20ZnO (mol.	50Bi ₂ O ₃ -	was developed	50Bi ₂ O ₃ -
	bonded with Bi ₂ O ₃ -	percent) is used as	$30B_2O_3-$	because of the	$30B_2O_3-20ZnO.$
	B ₂ O ₃ –ZnO glass.	a brace for use.	20ZnO.	reaction b/w the	sapphire/glass
				sapphire substrate	system, & the
				& the ZnO.	touch angle of
					balance was not
					more than 11.3 in
					respect of T \geq
					700.
K Krishna	Optical Studies of Rare	Impact of rare	$Tm_2O_3\&$	There is a growing	Lead bismuth
Murthy	Earth Doped Lead	earth oxide to	Yb ₂ O ₃	interest in rare	borate alumina
Goud <i>et al</i>	Bismuth Aluminum	composition &		earth doped	glasses doped
(2016)	Borate Glasses.	assets of glass in		glasses.	with Tm3+ and
[13].		lead bismuth was		View of	Yb3+ ions have
		investigated.		spectroscopic	been
		Borate aluminum		properties and	manufactured &

Table 1: Summarization of borate glass system dopped with different oxides

		(LBAB) glasses		technical	described. The
		doped with Tm ₂ O ₃		applications.	FTIRESpectra
		and Yb_2O_3 .			confirms that the
					glass has the units
					BO ₄ , BO ₃ , AlO ₄
					and Bi ₂ O ₃ as the
					local structure.
O. Ravi <i>et</i>	Bismuth borate zinc	The estimated	TCZNB	Energy level	Physical &
al	glass, 50Bi ₂ O ₃ -30B ₂ O ₃ -	complete radiative	$10 \text{TeO}_2 +$	analysis was	optical assets of
(2016)	20ZnO (mol. percent) is	transition	15CaO +	conducted taking	Nd3+ ion doped
[14].	used for brace for use.	possibilities (AT),	5ZnO +	into account the	TCZNB glasses.
		increased an	10 <i>Nb</i> ₂ O ₅	investigational	
		emission	+ (60-	energy situations	
		cross-section (σe)	$x)B_2O_3 +$	of an absorption	
		& gain bandwidth	Nd_2O_3	emission bands.	
		parameter (σe ×	glass.		
		$\Delta\lambda p$) were			
		associated through			
		previous			
		statements.			

Y.S.Alajera	Radiationshieldingproper	melt-quenching	cadmium	The gamma and	The glass with
mia <i>et al</i>	ties of	techniques,Gamma	oxide	neutron beam	the highest
(2014) [15].	bismuthborateglassesdop	ray shielding.	(CdO),	shield in properties	concentration of
	edwith different		B_2O ,	are evaluated	CdO was found
	concentrations of		Bi_2O_{3}	through the	to be good shield
	cadmium oxide.			calculation of	in material for
				several parameters	neutrons
				such as equivalent	compared with
				number, specific	some standard
				gamma ray	shielding
				constant, gamma	materials (water,
				dose rate, specific	graphite, ordinary
				absorbed fraction	concrete and
				of energy and total	hematite
				neutron removal	serpentine
				cross-section.	concrete).
Esra Kavaz	Gamma ray build-up to	Energy	Doped,	Words, an	In this research,
et al	Li ₂ B ₄ O ₇ glasses doped	concentration of	limonite,	existence of	we examined the
(2018)	withMinerals.	gamma rays	barite	Extremely equal	properties of
[16].		&Disclosure	serpentin	atomic number of	spectrum ray
		accumulation	e &	minerals increases	protecting of -,

		component	uncoated	the characteristics	limonite, barite,
		standards for,	LiGlass	of gamma ray	serpentine doped
		uncoated lithium,	borate.	shielding.Glasses	& uncoated
		serpentine-doped,		with lithium	Li ₂ B ₄ O ₇ glasses.
		limonite-doped &		borate. In add-on,	
		barite-dopedBorate		the values of	
		form of glass for		EABF &EBF were	
		incident photon		equated &	
		energy.		addressed.	
Ichoja1 et al	Structural, physical, &	Physical, optical,	(FTIR)	Max Peak	Influence on the
(2018)	optical experiments on	etc.The	spectra of	The transmission	contents of the
[17].	MgB ₄ O ₇ glass	fundamental	glasses	band location was	Dy3+ ions
	Ion Dy.	properties of	demonstr	significantly	change.The
		MgB ₄ O ₇ glasses	ate	shifted with an	fundamental,
		doped by variable	various	increase in the	physical, &
		applications of	bonding	concentration of	optical assets of
		Dy ₂ O ₃ were	patterns.	Dy3+ ions. The	glasses have
		studied.	The	bands were based	determined.
			sensation	on 1412 & 692 cm.	
			s are		
			allocated		

			with		
			various		
			functiona		
			l groups.		
Shaweta	Spectroscopical &	Neodymium doped	CdO,	Borate glasses	Physical &
Mohan <i>et</i>	Optical properties are	Na ₂ [B4O5(OH)4]·	Na ₂ CO ₃ ,	have large range	spectroscopic
al,	doped	8H ₂ O glass with	H ₃ BO ₃	technologies.Appli	assets of Nd3+
(2017)	neodymium.Cadmium-	composition of	and	ances expected to	ions for cad-Mid
[18].	sodium borate glasses.	xCdO-(40-x)	$Nd_2O_{3.}$	its unique features,	Na ₂ [B ₄ O ₅ (OH) ₄]·
		Na ₂ CO ₃ -		that consist of nice	8H ₂ O sodium
		59.5H ₃ BO ₃ -		properties.Rare-	borate glasses
		$0.5Nd_2O_3$; x = 10,		earth ion solubility,	have been
		20 & 30 mol per		high transparency,	examined.
		cent; prepared		& low melting	
		utilizing traditional		point	
		melt-quenching		Elevated thermal	
		techniques.		stability.	

Properties and the structure of thick metal borate glasses have induced an improved interest specific for the electrical property, non-linear optical characteristics and high refractive index that make them promising for different non-linear optical applications.

Such glasses are also activated with temperature devices, an optic & electronic instrument engineering and the development with nanocomposites [19,20]. When alkali-metal oxides are introduced into a borate glass composition, the [BO₃] trigonal planar transform into [BO₄] tetrahedral structural units. However, the quadruple coordinated boron fraction passes through a maximum at the value of N4 not exceeding 0.40-0.45% and the R₂O molar fraction 34-40% as shown in Fig. 1. For high R₂O content, the N4 fraction in glasses drops sharply. Subsequent investigations confirmed the same data repeatedly.



Figure 1: The fraction N₄ of atoms of quadruply coordinated boron in alkali-borateglass[21].

The N4 fraction in the glasses drops sharply with high R_2O content. Consequent studies have confirmed continuously the same information. This study shows that N4 an alkali-borate glasses improves in proportion with the rise to a molar fraction of an ionogenic oxide of glass arrangement precisely standards to m which is not greater than 0.33 [21,22,23].



Figure 2: CLTE of borate glass versus Na20 molar content[25]

The understanding of absorption bands concerning an IR spectrum of glasses systems $BaO-B_2O_3\& ZnO-B_2O_3$ is near to Li borate glasses [24]. A simplified CLTE plot for sodium-borate glasses established on information as of five creators is displayed in Fig. 2 [25].

Related work

A literature survey indicates that many studies are accessible to ternary bismuth borate glasses (please see Table 1 also) [26,27,28,29]. Assets of glasses are strongly connected to the inter-atomic forces & possibilities of the lattice structure. As a result, some alteration of pattern expected to dope may be detected immediately. Copper oxide, Cerium dioxide & Iron oxide, are used as doping agents in bismuth glasses to suppress deep brown pigment and improve its other optical, electrical, and magnetic properties. Similarly, bismo-borate glasses doped with Yb₂O₃ rare earth show amorphous nature of fabricated glasses (Fig.3). Bismuth oxide glasses have been remarkably steady hosts for effective radiance in rare-earth particles.

These applications suggest the necessity for a fundamental knowledge of the connection between electronic polarization, optical basicity & optical properties of bismuth oxide glasses.



Figure 3: XRD spectra for the fabricated glasses (Yb0.0-Y5.0)[29]

Results and Discussion

A review of Bismuth Borate Glasses System dopped with different Oxides was made and observed that:

- Glasses with nominal molar composition 20B₂O₃-(80-x)Bi₂O₃xFe₂O₃ (where x=0-40) prepared by melt-quenching shows partial replacement of Bi₂O₃ by Fe₂O₃ leads to decreasing density, molar volume and a substantial increase in thermal stability, as measured by several parameters, with maximum improvements achieved when x=20B₂O₃-(80-x)Bi₂O₃-xFe₂O₃.
- Neodymium doped cadmium sodium borate glasses having composition xCdO-(40-x) Na₂CO₃-59.5H₃BO₃- 0.5Nd₂O₃; x = 10, 20 and 30 mol% prepared by conventional melt-quenching technique confirmed the amorphous nature of the prepared glasses when analysis through X-ray diffraction.
- 3) The spectroscopic properties of Tellurium Calcium Zinc Niobium Oxide Borate (TCZNB) glasses of composition (in mol%) 10TeO₂+ 15CaO + 5ZnO + 10 Nb₂O₅ + (60-x)B₂O₃ + Nd₂O₃ (x = 0.1, 0.5, 1.0 or 1.5 mol%) was studied and found that the glass system was favorable for the laser emission in the infrared (IR) wavelength.
- 4) Bismuth borate glasses doped with different concentrations of cadmium oxides were studied and found that the prepared glass shows the Gamma and neutron beam shielding properties, valuated through the calculation of several parameters such as equivalent number, specific gamma ray constant, gamma dose rate, specific absorbed fraction of energy and total neutron removal cross-section.
- 5) Lead bismuth alumina borate (LBAB) glasses doped with Tm₂O₃ and Yb₂O₃ show decrease in optical energy gap by increasing the ionic radius of the rare earths, while the width of the localized states is increased.

Conclusion

We reviewed different bismuth borate (BiBO₃) glasses system doped with different oxides like Bi_2O_3 with Fe_2O_3 , $Li_2B_4O_7$ glasses doped with Minerals, Neodymium doped $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$ glass prepared by melt-quenching techniques, cadmium oxide (CdO), B_2O , Bi_2O_3 neodymium Cadmium-sodium borate glasses, BiBO₃ zinc glass, Lead bismuth alumina borate (LBAB) glasses doped with Tm_2O_3 and Yb_2O_3 and optical studies of rare earth doped Lead Bismuth Aluminum Borate Glasses. The prepared glass was more thermally stable, amorphous, and favorable for the laser emission in the IR region. The gamma and neutron beam shielding properties depend upon the doping and the concentration of various dopants.

References

1. Dimitriev, Y., et al. "An X-ray diffraction study of bismuthate glasses." Journal of materials science letters 14.5 (1995): 347-350.

- 2. Borsa, Ferdinando, et al. "Relaxation and fluctuations in glassy fastion conductors: Wide-frequency-range NMR and conductivity measurements." Physical Review B 46.2 (1992): 795.
- Mianxue, W. U., and Zhu Peinan. "Piezoelectricity, pyroelectricity and ferroelectricity in glass ceramics based on PbTiO₃." Journal of Non-Crystalline Solids 84.1-3 (1986): 344-351
- 4. Cheng, Yin, et al. "Structure and crystallization kinetics of Bi₂O₃– B₂O₃ glasses." Thermochemical Acta 444.2 (2006): 173-178
- Zheng, Haixing, and John D. Mackenzie. "Bi 4 Sr 3 Ca 3 Cu 4 O 16 glass and superconducting glass ceramics." Physical Review B 38.10 (1988): 7166.Zheng H, Xu R and Mackenzie J 1989 J. Mater. Res. 4 911
- 6. Hall, D. W., et al. "Nonlinear optical susceptibilities of high-index glasses." Applied Physics Letters 54.14 (1989): 1293-1295.
- Onishi M, Kyoto M and Watanabe M 1991 Japan. J. Appl. Phys. 30 L988 Zhou, S., Jiang, N., Zhu, B., Yang, H., Ye, S., Laksminarayana, G., Hao, J., & Qiu, J. (2008). Multifunctional Bismuth-Doped Nanoporous Silica Glass: From Blue-Green, Orange, Red, and White Light Sources to Ultra-Broadband Infrared Amplifiers. Adv. Funct. Mater., 18, 1407-1413.
- Wang, Y., Dai, S., Chen, F., Xu, T., & Nie, Q. (2009). Physical Properties and Optical Band Gap of New Tellurite Glasses within the TeO₂–Nb₂O₅–Bi₂O₃ System. Mater. Chem. Phys., 113, 407-411.
- Sanz, O., Haro-Poniatowski, E., Gonzalo, J., & Fernández Navarro, J. M. (2006). Influence of the Melting Conditions of Heavy Metal Oxide Glasses Containing Bismuth Oxide on their Optical Absorption. J. Non-Cryst. Solids, 352, 761-768.
- Zhang, Y., Yang, Y., Zheng, J., Hua, W., & Chen, G. (2008). Effects of Oxidizing Additives on Optical Properties of Bi₂O₃-B₂O₃-SiO₂ Glasses. J. Am. Ceram., Soc. 91, 3410-3412.
- Mary, Nicolas, et al. "Enhanced thermal stability of high-bismuth borate glasses by addition of iron." Journal of Non-Crystalline Solids 500 (2018): 149-157.

- Goud, K. Krishna Murthy, M. Chandra Shekhar Reddy, and B. Appa Rao. "Optical studies of rare earths doped lead bismuth alumina borate glasses." Int. J. Inn. Res. Sci. Eng. Tech 5 (2016): 1734-1740.
- Zhou, S., Jiang, N., Zhu, B., Yang, H., Ye, S., Laksminarayana, G., Hao, J., & Qiu, J. (2008). Multifunctional Bismuth-Doped Nanoporous Silica Glass: From Blue-Green, Orange, Red, and White Light Sources to Ultra-Broadband Infrared Amplifiers. Adv. Funct. Mater., 18, 1407-1413.
- 14. Alajerami, Y. S., et al. "Radiation shielding properties of bismuth borate glasses doped with different concentrations of cadmium oxides." Ceramics International 46.8 (2020): 12718-12726.
- 15. Kavaz, Esra, and Nergiz Yıldız Yorgun. "Gamma ray buildup factors of lithium borate glasses doped with minerals." Journal of Alloys and Compounds 752 (2018): 61-67.
- Ichoja, A., et al. "Analysis of the physical, structural and optical characteristics of Dy 3+-doped MgO–SrO–B₂O₃ glass systems." Indian Journal of Physics 93.10 (2019): 1265-1273.
- 17. Mohan, Shaweta, and Kulwant Singh Thind. "Optical and spectroscopic properties of neodymium doped cadmium-sodium borate glasses." Optics & Laser Technology 95 (2017): 36-41.
- S. Bale, S. Rahman, A. M. Awasthi, and V. Sathe, "Role of Bi₂O₃ content on physical, optical and vibrational studies in Bi₂O₃–ZnO–B₂O₃ glasses," J. Alloys Compounds, 460, 699-703 (2008).
- A. V. Egorysheva, V. D. Volodin, and V. M. Skorinov, "Glassformation in the system BaO–Bi₂O₃–B₂O₃," Neorg. Mater., 44(11), 1397-1401 (2008).
- 20. N. M. Bobkova, "Thermal expansion of double borate glasses and their structure," Fiz. Khim. Stekla, 29(5), 625-703 (2003).
- 21. N. M. Bobkova, G. B. Zakharevich, and O. V. Kichkailo, "Lowmelting low-lead glasses based on borate systems," Steklo Keram., No. 1, 15-18 (2010); N. M. Bobkova, G. B. Zakharevich, and O. V. Kichkailo, "Low-melting low-lead glasses based on borate systems," Glass Ceram., 67(1-2), 15-18 (2010).

- 22. F. D. Bréi, Investigation of the Structure of Glass by the Method of Nuclear Magnetic Resonance: The Glassy State [Russian translation], Nauka, Moscow-Leningrad (1965), pp. 237-251.
- A. M. Efimov, B. A. Mikhailov, and T. G. Arkatova, "IR spectra of borate glasses and their structural interpretation," Fiz. Khim. Stekla, 5(6), 692-701 (1979).
- 24. V. A. Kolesova, "Vibrational spectra and the structure of alkaliborate glasses," Fiz. Khim. Stekla, 12(1), 4-13(1986).
- 25. J. Krogh-Moe, "Crystal structure of strontium diborate," Nature, 206(4984), 613 (1965).
- A. V. Egorysheva, A. S. Kanishcheva, Yu. F. Karrin, et al., "Synthesis and crystalline structure of bismuth borate Bi₂B₈O₁₅," Zh. Neorg. Mater., 47(12), 1961-1965 (2002).
- 27. Y. S. Rammah, A. Askin, A. S. Abouhaswa, F. I. El-Agawany, M. I. Sayyed, Synthesis, physical, structural and shielding properties of newly developed B₂O₃ –ZnO–PbO–Fe₂O₃ glasses using Geant4 code and WinXCOM program, Applied Physics A 125 (2019) 523.
- 28. M. Çelikbilek Ersundu, A.E. Ersundu, M.I. Sayyed, G. Lakshminarayana, S. Aydin, Evaluation of physical, structural properties and shielding parameters for K₂O-WO₃ -TeO₂ glasses for gamma ray shielding applications, Journal of Alloys and Compounds 714 (2017) 278-286.
- Rammah, Y. S., et al. "Fabrication, physical, optical characteristics and gamma-ray competence of novel bismo-borate glasses doped with Yb₂O₃ rare earth." Physica B: Condensed Matter 583 (2020): 412055.



A Review on the Strength Aspects of Light Weight Concrete Using Ultra-light Weight Foamed Glass Aggregate

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Abstract

A unique kind of extremely lightweight aggregate called foamed glass can be utilised to improve the qualities of concrete. The waste glass from diverse sources, where the waste glass from industries is dumped at regular intervals, is totally prepared to be used as foamed glass aggregate. Here, in this study, foamed glass was employed to modify and increase the qualities of the regular concrete to make lightweight concrete. It may have replaced natural fine aggregate entirely or in part. By using various sizes of the foamed glass aggregate, this study was advanced by predicting the ideal size as well as the ideal replacement % of the foamed glass aggregate. Glass that was foamed was periodically replaced from 0% to 100%. For the investigation, a total of three sizes of foamed glass were taken into account. To compare the qualities of the lightweight concrete and the regular concrete, several experiments including compressive strength testing, flexural strength testing, water absorption testing, and finally scanning electron microscopy were carried out on the constructed specimen. All of these factors significantly raise the strength and durability of concrete.

Although the idea of lightweight concrete and ultralightweight concrete is not widely used in contemporary aspects, it is nevertheless important to remember since the lighter the concrete, the lower the dead load of the structure will be. Although this notion is only applied to lightweight constructions, the study's size variation shows that it can also be applied to medium-weight structures. Utilizing foamed glass aggregate also reduced the amount of waste glass that was dumped on the planet, which is important from an environmental standpoint.

Keywords: Light Weight Concrete, Compressive Strength, Foamed Glass Aggregate, Ultra-light Weight Aggregate.

Introduction

The world is changing very quickly these days, and every business on earth is calling for sustainable replacements for their basic resources. Every material, whether it is used for production or consumption, has a unique set of features. However, because companies place a strong emphasis on cost containment, the idea of recycling varied raw materials emerges. Every raw material, in both its native and present states, has a replacement range, limiting the amount to which it can be utilised again. There are many materials that can be recycled depending on their texture, shape, size, and other characteristics, but the key is to pick the best and discard the rest. There is a high demand for specific types of waste materials that can replace cement, sand, and natural coarse aggregate in concrete in the civil engineering sector. In a manner similar to this, millions of tonnes of used glass are gathered daily from various sources and either disposed of properly or recycled to meet many other purposes. Environmentally speaking, this glass garbage disposal is extremely risky. Glass is a non-biodegradable substance that, if not disposed of carefully, can have disastrous effects. Globally, the glass industry generates millions of tonnes of waste glass that can be used in a variety of civil engineering projects. It can be used in place of cement, natural river sand, or coarse natural aggregate

because of its cementitious qualities. In order to produce lightweight concrete, leftover glass must first be reduced to the necessary size and then utilised in place of both fine and coarse aggregate. There are a variety of materials that may be used to make lightweight concrete, but waste glass aggregate is particularly effective from the standpoints of strength and cost, and because of its utilisation, the amount of aggregate derived from natural resources can be decreased. Two varieties of lightweight concrete exist: conventionally light weight concrete and ultralightweight concrete. performed over the lightweight concrete in order to assess and contrast the compressive and flexural strengths, respectively. Scanning electron microscopy is also used to compare the microstructure of the concrete.

Literature Review

Zeng, Zhang, Chen, Wang, & Jiang (examined the qualities of discarded glass aggregate before using it to increase concrete's strength. With the exception of one novel idea-that waste glass can replace both fine and coarse aggregate simultaneously-the concept was quite similar to prior research initiatives in that it describes the use of waste resources. Over the concrete, a compression test was conducted. According to this study, glass aggregate should only be used at lower replacement percentages because using it at larger percentages has a negative impact on strength.

Yang, Ling, Cui, & Poon research was done on the performance of glass aggregate concrete at higher temperatures. Due to the fact that concrete constructions deteriorate quickly at higher temperatures due to a variety of factors, the use of glass aggregate in place of natural coarse aggregate to increase the concrete's resistance to high temperatures is raised by this study. It was a novel idea since it claimed that glass aggregate inside of concrete starts to melt at higher temperatures and functions as a binder amongst various other constituent particles of concrete.

Khan, Saha, & Sarker investigated a novel idea for using leftover glass in the creation of concrete. In this work, waste glass powder's cementitious binding ability is carefully examined in such a way that glass powder enhances the overall microstructure of the concrete. Depending on the fineness and particle size, waste glass was employed as a cementitious material as well as a natural fine aggregate. It was discovered that using glass waste in conjunction with natural fine aggregate as a cement replacement boosts concrete's durability characteristic, which is mostly preferred.

Sounthararajan, Rajarajeswari, & Praveen Kumar centred on how discarded glass may be used to create sustainable concrete from an environmental standpoint. To improve the microstructure of the concrete, scrap glass is employed in the study to substitute some of the natural fine aggregate. The best percentage of waste glass powder consumption was calculated by taking into account the M25 grade of concrete. The greatest strength discovered is able to replace waste white glass powder by 30% while also improving the microstructure of the concrete.

Adhikary, Rudžionis, & Vaičiukynienė, 2020 studied the effect of various lightweight, materials over the various properties of lightweight concrete.in this study, three different types of lightweight materials were used as a replacement of the natural aggregate and then the properties of concrete prepared by these materials were capered from the strength point of view .This study uses expanded glass aggregate, plastic bottles and silica aerogel for the preparation of lightweight concrete .The results were not that much satisfactory as the strength decreases rapidly under all circumstances.

Yasar et al.-This experiment is made up of a number of different components. For example, he studied how structural lightweight concrete (SLWC) built of basaltic pumice should be designed as aggregate and fly ash, therefore it obviously has a benefit over weight reduction. Fresh concrete has more compressive and environmentally friendly qualities because of its characteristics like slump and density.

M.N. Haque and H. Al-Khaiat-He aimed to improve early strength and physical characteristics. Additionally, Lytag LWA lightweight

concrete with a slump of around 100 mm, a fresh unit weight of 1800 kg/m3, and a 28-day cube compressive strength. The test also reveals that SLWC's compressive strengths appear to be less sensitive to lack of curing than NWC's.

Khandaker M. Anwar Hossain studied volcanic pumice in his research. Tests were done on concrete after replacing 0% to 100% of the coarse aggregate by volume and 0% to 25% of the cement by weight. Different experiments were done to differentiate the VPC qualities based on the volcanic pumice aggregate (VPA), including workability, strength, drying shrinkage, surface absorption, and water permeability.

T. Parhizkar et.al. tests on the characteristics of lightweight concrete aggregates using volcanic pumice were displayed. In the latter stages, lightweight coarse concrete with natural fine aggregates and lightweight coarse and fine aggregate concrete are primarily used. Numerous findings from the study, including tensile strength and drying shrinkage, indicate that these light-weight concretes satisfy the requirements.

P.C.Taylor-The physical and mechanical qualities of high strength structural light concrete are influenced by mineral admixtures, according to research results cited by a professor at Wuhan University of Technology. Further analysis revealed that the inclusion of fly ashes increases the compressive strength and splitting tensile strength of HSSLC by about 25%, and that the addition of silica fume also increases these properties.

Conclusion

The impact of foamed glass aggregate on the characteristics of concrete is demonstrated in this study. It demonstrates how important size diversity is in increasing the characteristics of concrete. The strength was at its peak when coarse aggregate was replaced with foamed glass aggregate at the highest replacement percentage. Additionally, foamed glass aggregate was employed in three different sizes, with the minimum size yielding the highest strength. This demonstrates how

significantly the aggregate size affects the ultimate strength of the concrete. Greater strength will result from smaller aggregate sizes, and conversely, greater strength will result from larger aggregate sizes. The compressive strength of the concrete is increased to a certain extent by foamed glass, and the maximum strength was attained at the highest percentage replacement. This is because the bond between the binder and the aggregate is strengthened by the smaller size and smooth surface of the foamed glass. Second, it acts as a complete filler for the pores inside the concrete, enhancing the microstructure of the material. It reduces the likelihood of pores forming inside the concrete and increases the density of the material. The concrete is lighter than natural aggregate concrete due to the ultra-lightweight characteristics of the foamed glass aggregate, which lowers the building's overall dead load. From a research perspective, it is advised to investigate the function of foamed glass aggregate in cases of greater temperature variation since, due to foamed glass's higher melting point, it can perform better at higher temperatures.

References

- 1. Adesina, A., & Das, S) .2020 .(Mechanical performance of engineered cementitious composite incorporating glass as aggregates. *Journal of Cleaner Production, 260*, 121113.
- Adhikary, S. K., Rudžionis, Ž., & Vaičiukynienė, D) .2020 Development of flowable ultra-lightweight concrete using expanded glass aggregate, silica aerogel, and prefabricated plastic bubbles. *Journal of Building Engineering*, 31, 101399. doi: https:// doi.org/10.1016/j.jobe.2020.101399.
- Afshinnia, K., & Rangaraju, P.R) .2016 .(Impact of combined use of ground glass powder and crushed glass aggregate on selected properties of Portland cement concrete .*Construction and B*containing discarded beverage glass as fine aggregate . *Construction and Building Materials*, 177, 116-124 .doi:https//: doi.org/10.1016/j.conbuildmat.2018.05.119.
- 4. Bubeník, J., & Zach, J) .2019 .(The use of foam glass-based aggregates for the production of ultra-lightweight porous concrete

for the production of noise barrier wall panels *.Transportation Research Procedia*, 40, 639-646 .doi:https//:doi.org/10.1016/j.trp ro.2019.07.091.

- da Silva Fernandes, F. A., Arcaro, S., Tochtrop Junior, E. F., Valdés Serra, J. C., & Bergmann, C. P) .2019 .(Glass foams produced from soda-lime glass waste and rice husk ash applied as partial substitutes for concrete aggregates *.Process Safety and Environmental Protection*, *128*, 77-84 .doi:https//:doi.org/10.1016/ j.psep.2019.05.044.
- Flores-Alés, V., Alducin-Ochoa, J. M., Martín-del-Río, J. J., Torres-González, M., & Jiménez-Bayarri, V) .2020 .(Physicalmechanical behaviour and transformations at high temperature in a cement mortar with waste glass as aggregate *.Journal of Building Engineering, 29*, 101158 .doi:https//:doi.org/ 10.1016/j.jobe.2019. 101158.
- Gorospe, K., Booya, E., Ghaednia, H., & Das, S) .2019 .(Effect of various glass aggregates on the shrinkage and expansion of cement mortar .*Construction and Building Materials*, 210, 301-311 .doi: https//:doi.org/10.1016/j.conbuildmat.2019.03.192.
- Hajimohammadi, A., Ngo, T., & Kashani, A) .2018a .(Glass waste versus sand as aggregates :The characteristics of the evolving geopolymer binders. *Journal of Cleaner Production*, 193, 593-603. doi:https//:doi.org/10.1016/j.jclepro.2018.05.086.
- Hajimohammadi, A., Ngo, T., & Kashani, A) .2018b .(Sustainable one-part geopolymer foams with glass fines versus sand as aggregates .*Construction and Building Materials*, 171, 223-231. doi:https//:doi.org/10.1016/j.conbuildmat.2018.03.120.
- Pahlevani, F., & Sahajwalla, V) .2019 .(Effect of glass aggregates and coupling agent on the mechanical behaviour of polymeric glass composite *.Journal of Cleaner Production*, 227, 119-129. doi:https//:doi.org/10.1016/j.jclepro.2019.04.152.
- John, S. K., Nadir, Y., Girija, K., & Giriprasad, S) .2019 .(Tensile behaviour of glass fibre textile reinforced mortar with fine aggregate partially replaced by fly ash .*Materials Today* : *Proceedings* .doi:https//:doi.org/10.1016/j.matpr.2019.09.135.





Challenges and Benefits of 7 ways Artificial Intelligence in Education Sector

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Abstract

Numerous industries are undergoing upheaval due to technological innovation. Two interrelated technologies that have an impact on our daily lives are the internet and mobile phones. While there is a lively discussion on how much screen time parents, teachers, and psychologists should allow their children to spend. Another technology that is developing quickly has the potential to significantly alter the way the education industry looks.

The use of artificial intelligence (AI) in education is crucial. This article tries to examine how artificial intelligence has been incorporated into teaching and learning in the digital age.

In this review article, a narrative synthesis and a thorough literature review were both completed. Studies that explicitly defined artificial intelligence in the context of education that were published, written in English, and subjected to peer review all met the inclusion requirements. To summarise and report the findings, five independent reviewers evaluated the quality of the research, retrieved data from the studies, and reviewed search results.

The field of education has already been impacted by artificial intelligence. Artificial intelligence implementation is a crucial and strategic component of educational advancement. Additionally, the usage of artificial intelligence as a digital assistant is growing. In addition to providing students with access to a variety of educational resources based on their individual learning requirements and subject areas, they also support teachers and students in other ways. However, there are also dangers connected to the development of artificial intelligence, including worries about privacy, security, and safety. Artificial intelligence technology consequently have both beneficial and negative effects on the education industry.

Keywords: Artificial Intelligence (AI), Education, Digitalisation, Technology, Review.

Introduction

The use of information technology (IT) as a facilitator for other activities and services in this contemp orary period of the industrial revolution 4.0 permeates nearly all aspects of human life. IT is becomin g a necessary component that must be owned rather than just a tool. Its development has led to a great reliance on information technology, which significantly facilitates human life activities (Rahmatullah et al., 2022). The current generation is also technologically literate since it has a far bigger impact in t he digital age than it did in earlier ones.

Technology in education has expanded as a result of the rise in literacy and current technical breakthr oughs. These are the generations that are currently enrolling in schools, from millennials to GenZ, and they all have distinctive traits that indicate their ages. These generations do not fare well as passive learners and demand to be actively involved in their education.

As a result, technology needs to be welcomed in today's school, and educators must help kidslearn thr ough technology (Hashim, 2018).

Given that performing education in the context of public services requires good governance that ensur es transparency, accountability, efficiency, and effectiveness of education, using IT in the implementa tion of education by a modern educational institution at the level of a world-class university has become a requirement. The seriousness of management underpins the application of information and communication technology (ICT), which is one of the main pillars of the develop ment of human civilisation today, in the implementation of all educational activities. This is because management is aware of the significance of ICT (Rahmatullah et al., 2022). Due to its ability to support learning in a variety of situations, big data and artificial intelligence technologies have rapidly adva need and had a significant impact on all facets of society in recent years. The field of AI in education has exhibited technological advancements in human civilization, including the economics, politics, sc ience, and education, with a variety of applications such as intelligent tutors for content delivery, feed back providing, and progress supervision (Luan et al., 2020). Artificial intelligence (AI), a machine based approach with algorithmic ability for making predictions, diagnoses, suggestions, and judgment s, has emerged as a major force in educational advancements, theoretical innovations, and practical p edagogical influence (Chen et al., 2022). Consequently, a crucial issue is the adoption of artificial inte lligence (AI) in the education sector.

Literature Review

Artificial Intelligence (AI)

The field of artificial intelligence (AI) technology has a long history is dynamic and growing

It emphasises intelligent agents, or machines that can comprehend their environment and make decisions, taking measures to increase their prospects of success (Shabbir & Anwer, 2018). the word "artific ialintelligence" evokes us ideas of supercomputers, which are computers with enormous processing power, adaptive behaviour, including adding sensors and other components that enable them to have co gnitive and functional abilities similar to humans, which enhances the supercomputer's connection wi th people (Chen et al., 2020).

Artificial intelligence is the capacity for learning and thought in computer programmes.

Artificial intelligence refers to everything that includes a computer programme performing atask that most people would consider to require human intelligence (Mitchell, 2019).

The simulation of human intelligence functions by computers, more precisely computer systems, is k nown as artificial intelligence. Because it enables computers to make wise decisions that result in more effective operations, artificial intelligence (AI) transforms nearly every aspect of a nation's econom y and excels at certain activities (Dong et al., 2020; Limna, 2022).

The use of AI is widespread in practical fields. In addition, as computers and robots become more sop histicated, society is being transformed by them. Nearly every facet of people's daily lives now includ es AI (Li et al., 2018). AI also makes it possible for employees to perform more efficiently, which im proves corporate results. However, it also calls for the development of fresh skills and abilities, from t echnological mastery to social and emotional intelligence to creative aptitude (Limna, 2022).

AI offers huge advantages and has the ability to revolutionise any professional field (Makridakis, 2017). As a result, industry 4.0 considers artificial intelligence deployment to be crucial. It has presented countless chances and difficulties to numerous sectors since its inception. AI-powered innovations have the potential to greatly boost the economy by raising standards of living across a variety of industries (Limna et al., 2021).

Artificial Intelligence in Education

The use of AI in education has advanced significantly during the past 25 years (Roll & Wylie, 2016). Since the growth of computing and information processing tools, AI has been extensively applied in education. AI in education opens up new possibilities, difficulties, and opportunities for educational methods (Ouyang & Jiao, 2021). The goal of AI in education is to significantly improve educational methods through field tests and the creation of modular standard prototypes for statistical reasoning, data visualisation, and learning analytics (Alam, 2021).

Giving each student individualised learning assistance or support based on their learning status, prefer ences, or other personal attributes is one of the most significant goals of AI in education (Hwang, 201 4; Hwang et al., 2020).AI in education also aims to use AI to support the instructional process, which is crucial and where instructors' acceptance of AI is crucial (for example, comprehending and support ing computer supported collaborative learning through discourse analysis and achieving performance prediction through educational data mining).But because AI is still a relatively new idea to instructor, they frequently have trouble responding quickly and effectively to insights from AI enabled applications. As a result, they are less willing to adopt AI and are less open to it. Therefore, it is essential to increase teachers' adoption of AI systems (Chen et al., 2022).

To handle the new opportunities and problems posedby the big data boom and AI revolution, academi cs, educators, policymakers, and professionals must collaborate. They must work together to help all students acquire the competences and abilities needed for work in the knowledge based economy of the twenty

first century (Luan et al., 2020). The implementation of AI in education has opened up new possibiliti es for creating learning activities and surroundings that are better utilising technology. AI technology i n education has many crucial components, including

autonomousgrading systems, adaptive learning, distance learning, and more (Hwang et al., 2020; Yufeia et al., 2020). The way that students rate their teachers is through instructor feedback. It is a feedback technique that has been utilised for a long tim e in education.Despite the switch from paper to internet surveys, the feedback process hasn't advance d much. It must be given priority because student feedback on instruction is typically the most useful s ource of data. Modern tools like conversational AI robots, machine learning, and natural language pro cessing present promising potential to raise the calibre of feedback (Holstein et al., 2019; Peters, 2019). An expert Albased computer software called the automatic grading system grades student work in a classroom by simulating the actions of teachers. It assesses students' knowledge, examines their respo nses, offers comments, and develops customised training plans. Many apps for artificial intelligence basedteaching use this programme. During the learning test, the system automatically offers the learn er evaluation score. While students are more aware of their learning accomplishments and level of information mastery, this approach can help teachers better comprehend the learning conditions that their students are in (Yufeia et al., 2020). AI is essential to distance learning as well. The use of artificial intelligence in distant learning aims to investigate how computers might help close the communication gap between students and teachers. Distance learning can be supported by artificial intelligence technology or can be enhanced by other intelligent systems (Kose, 2014).

Benefits and Challenges of Artificial Intelligence in Education

The benefits of AI applications in education are numerous and diverse (Owoc et al., 2019). Several AI applications driven by machine learning are being used in more educational context. Personalized learning systems and other machine learning techniques automate evaluations, social media platforms, and predictive analytics software. These AI programmes have demonstrated promise in aiding educators and students in a number of ways, including viainstruction in classrooms with a variety of a bilities, giving students thorough and immediate feedback writing, relieving teachers of the stress of having to know everything, and providing giving them great er space to support their pupils as they observe, converse, and gatherutilising information in their gro up knowledgebuilding procedures, etc. (Akgun & Miao et al., 2021; Greenhow, 2021). Social networking sites use platforms like Facebook to link up students and teachers. The use of social media in the classroom can encourage students to actively learn, collaborate, and interact with networks outside of the classroom. Due to various AI systems, chat bots can now be found on social media platforms (Kim et al., 2019; Krutka et al., 2019). Individualized learning environments, sometimes referred to as adaptive learning environments or intelligent tutoring environments, are typical and beneficial uses of AI to assist students and teachers. These programmes allow students access to diverse educational resources based on their individual topic areas and learning requirements (Akgun & Greenhow, 2021).

One of the most exciting uses of AI in education is adaptive learning. Traditional classroom instruction is still a one-size-fits-all approach, while AI powered adaptive learning solutions are made to maximise learning effectiveness (Owoc et al., 2019).

Despite these benefits, there are still valid worries. One major issue is privacy.

Critical problems on the table are the violation of privacy and the uncertainty brought by AI. negative effects of ridesharing technology adoption (Cheng et al., 2022). Data organisation, collection, control, storage, use, archival, and destruction are all aspects of data governance. A specialised programme, defined policies and processes, as well as communication from organisational leadership and manage ment, all work together to establish data governance. In general, the regulations must give the tools re quired to uphold the general standards, which include auditability, security, accessibility, availability, completeness, accuracy, integrity, and consistency (Owoc et al., 2019). The application of the charac teristics associated with each technology is crucial for the efficient use of big data analytics and AI. T he person has the knowledge and analytical abilities necessary to use comprehensive data analysis to aid in analysis and decision-making (Tong-n et al., 2022).

7 Ways Artificial Intelligence Is Used in Education

1. Task Automation

Similar to how AI has been used in other industries to automate tasks, it will be useful in the education sector. Professors and teachers usually have to manage the classroom environment alongside numer ous organisational and administrative tasks. According to a report in research paper writing services, t eachers don't just teach. They also spend time grading tests, evaluating homework, filing the necessar y paperwork, making a progress report, organising resources and materials for lectures, managing tea ching materials, etc. There is a lot of work required.

In the end, they spend a lot of time on non-teaching chores, and it overwhelms them. In order to free up more time for teachers to focus on their core duties of teaching, artificial intelligence will automate these tasks.

2. Personalized Learning

AI can ensure that educational software is personalised for individuals. There are already adaptive lea rning software, games, and programmes for students. This use of AI is perhaps one of its most signifi cant in education as learning is more comfortable and smoother and cut through personal knowledge. This system emphasises each student's needs, highlighting specific topics students are weak in and re peating subjects they haven't mastered. This will create custom-tailored education through AI. Teachers will only be there to offer assistance and help when pupils need it.

3. Universal Access

Educational classrooms can become globally available to all students through AI tools, even those that have hearing or visual impairment or speak different languages. With a PowerPoint plugin such as Presentation Translator, students have real-time subtitles for everything the teacher says. This opens up new opportunities for children who need to learn at different levels, who want to learn a subject unavailable in their school, or are unwell and missing from schools. The barriers between conventional grade levels and schools can be broken down by AI.

4. Smart Content Creation

AI can help teachers create smart content that makes teaching and learning more comfortable for them and the students, respectively. According to Paul Barry, lab report writer at assignment writing service, AI can help teachers create different content types.

- Digital lessons
- AI can help generate bite-sized learning, study guides, digital textbooks, all within the framework of digital learning.
- Information visualization
- Simulation, visualization, and web-based study environments are different ways to perceive information that AI can power.
- Learning content updates

Learning content can be generated and updated regularly with AI. This ensures that information is up-to-date.

5. Teaching the Teacher

One thing that is important in education is for the teacher to not rely on their old, residual knowledge. There are more facts that they need to know and teach the students as well. Not to mention the fact that they study and teach within a limited scope and there are many other things that they can still learn. With AI, teachers have extensive information available to them at their fingertips This allows them to keep themselves educated in things that they didn't know or improve on their past knowledge. With this, they will be better rounded and have a more in-depth and broader knowledge base to sea with the 21st century students.

6. Identify classroom weakness

The main concern of implementing AI in an industry is that it will replace the industry's workforce, causing job losses. But that's not totally accurate. In truth, AI is not intended to replace instructors in the classroom. It's intended to go along with them. AI can supplement the teacher's efforts in a classroom to discover some of the shortcomings within the classroom. For example, AI will be able to identify when some students miss specific questions. By warning the teachers, they are made aware that the material needs to be taught again because the students still don't understand it. This will make the teachers more accountable and make them another to the best teaching practises.

7. 24/7 Assistance

It's not just teachers that have access to a whirlwind of knowledge through AI. Students do too. This implies that they can use AI bots at any time of day to get assistance on any subject.

Traditionally, students only get solutions to their problems when they meet with their teachers or professors and have the chance to ask them questions in the classroom. Thankfully, they will not have to wait that long anymore.

Several AI-powered chat bots are specifically built for education as a sector. They work as students' assistants round the clock to provide answers to their queries at any time. So, they don't have to wait to see the prof in their office or the classroom.

Conclusion

Personalization is at the top of the list, as anyone who is knowledgeable about international trends in various industries will know. This is due to the advent of artificial intelligence, which is an advantage for the education sector. AI helps teachers up their game, providing them all the information that they need. It also allows teachers to create content that suits their students best while ensuring personalised learning. It automates tasks, so teachers have more time to do more teaching and impact the students better.

The development of AI technology has a long history and is ongoing. Ouyang and Jiao (2021) indicated that since the advancement of computing and information processing techniques, AI has been used extensively in education as it creates new opportunities, and challenges in educational practises. Owoc et al. (2019) confirmed that AI technologies impact teaching and learning, both positively and negatively, in the education industry. Hwang et al. (2020) and Yufeia et al. (2020) indicated that using AI in education had opened new avenues for developing more effective learning activities and better technology-enhanced learning applications or settings. The use of AI technology requires numerous key components, including education, such as teacher feedback, automatic grading systems, and adaptive learning. Akgun Greenhow (2021) and AI applications provide students with access to a variety of learning resources materials based on the subjects and learning needs they have.

As Kose (2014) noted, AI technology could be used to support distance e improve distance education when combined with other intelligent systems. Also, Owoc et al. (2019) demonstrated that the data governance of AI is interested in the organisation, collection, control, storage, and use of data. archival, and devastation. Additionally, Cheng et al. (2022) came to the conclusion that one major AI concern privacy is technology. Consequently, AI technologies have both good and negative consequences. Therefore, it is crucial to give AI in education top priority and apply suitable techniques to meet the requirements and expectations of teachers and students using AI technologies.

High academic performance will result as a result.

References

- Akgun, S., & Greenhow, C. (2021). Artificial Intelligence in Education: Addressing Ethical Challenges in K-12 Settings. *AI* and Ethics, 1-10.
- Alam, A. (2021). Possibilities and Apprehensions in the Landscape of Artificial Intelligence in Education. In 2021 International Conference on Computational Intelligence and Computing Applications (ICCICA), pp. 1-8. IEEE.
- 3. Chen, L., Chen, P., & Lin, Z. (2020). Artificial Intelligence in Education: A Review. *Ieee Access*, *8*, 75264-75278.
- Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two Decades of Artificial Intelligence in Education: Contributors, Collaborations, Research Topics, Challenges, and Future Directions. *Educational Technology & Society*, 25(1), 28-47.
- Cheng, X., Su, L., Luo, X., Benitez, J., & Cai, S. (2022). The Good, the Bad, and the Ugly: Impact of Analytics and Artificial Intelligence-Enabled Personal Information Collection on Privacy and Participation in Ridesharing. *European Journal of Information Systems*, 31(3), 339-363.
- Dong, Y., Hou, J., Zhang, N., & Zhang, M. (2020). Research on How Human Intelligence, Consciousness, and Cognitive Computing Affect the Development of Artificial Intelligence. *Complexity*, 2020, 1680845, 1-10.
- 7. Hashim, H. (2018). Application of Technology in the Digital Era Education. *International Journal of Research in Counseling and Education*, 2(1), 1-5.
- Holstein, K., McLaren, B. M., & Aleven, V. (2019). Designing for Complementarity: Teacher and Student Needs for Orchestration Support in AI-Enhanced Classrooms. *International Conference on Artificial Intelligence in Education*, 157-171.
- 9. Hwang, G. J. (2014). Definition, Framework and Research Issues of Smart Learning EnvironmentsA Context-Aware Ubiquitous Learning Perspective. *Smart Learning Enviro ments*, *1*(1), No.4, pp. 1-14.

- Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, Challenges, Roles and Research Issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 1, 100001.
- Jaipong, P., Nyen Vui, C., & Siripipatthanakul, S. (2022). A Case Study on Talent Shortage and Talent War of True Corporation, Thailand. *International Journal of Behavioral Analytics*, 2(3), 1-12. Available at SSRN: 4123711.
- Kim, N. Y., Cha, Y., & Kim, H. S. (2019). Future English Learning: Chatbots and Artificial Intelligence. *Multimedia-Assisted Language Learning*, 22(3), 32-53.
- Kose, U. (2014). Artificial Intelligence Applications in Distance Education. IGI Global. Krutka, D., Manca, S., Galvin, S., Greenhow, C., Koehler, M., Askari, E. (2019). Teaching "Against" Social Media: Confronting Problems of Profit in the Curriculum. Teachers College Record 121(14), 1-42.
- 14. Li, J., Cheng, H., Guo, H., & Qiu, S. (2018). Survey on Artificial Intelligence for Vehicles. *Automotive Innovation*, 1(1), 2-14.
- 15. Limna, P. (2022). Artificial Intelligence (AI) in the Hospitality Industry: A Review Article. *International Journal of Computing Sciences Research*, 6.
- Limna, P., Siripipatthanakul, S., & Phayaphrom, B. (2021). The Role of Big Data Analytics in Influencing Artificial Intelligence (AI) Adoption for Coffee Shops in Krabi, Thailand. *International Journal of Behavioral Analytics*, 1(2), 1-17.
- Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S.J., Ogata, H., Baltes, J., Guerra, R., Li, P., & Tsai, CC (2020). Challenges and Future Directions of Big Data and Artificial Intelligence in Education. *Frontiers in Psychology*, 11, 580820.
- Makridakis, S. (2017). The Forthcoming Artificial Intelligence (AI) Revolution: Its Impact on Society and Firms. *Futures*, 90, 46-60.
- 19. Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). *AI and Education: A Guidance for Policymakers*. UNESCO Publishing.

- 20. Mitchell, M. (2019). Artificial Intelligence: A Guide for Thinking Humans. Penguin UK.
- Ouyang, F., & Jiao, P. (2021). Artificial Intelligence in Education: The Three Paradigms.
- 22. Computers and Education: Artificial Intelligence, 2, 100020.Research Papers July 2022
- 23. Owoc, M. L., Sawicka, A., & Weichbroth, P. (2019). Artificial Intelligence Technologies in Education: Benefits, Challenges and Strategies of Implementation. *IFIP International Workshop on Artificial Intelligence for Knowledge Management*, pp. 37-58.
- 24. Peters, M. A. (2020). Roboethics in Education and Society. *Educational Philosophy and Theory*, 52(1), 11-16.
- Rahmatullah, A. S., Mulyasa, E., Syahrani, S., Pongpalilu, F., & Putri, R. E. (2022). Digital Era 4.0: The Contribution to Education and Student Psychology. *Linguistics and Culture Review*, *6*, 89-107.
- 26. Roll, I., & Wylie, R. (2016). Evolution and Revolution in Artificial Intelligence in Education.
- 27. International Journal of Artificial Intelligence in Education, 26(2), 582.
- 28. Siripipatthanakul, S., & Bhandar, M. (2021). A Qualitative Research Factors Affecting Patient Satisfaction and Loyalty: A Case Study of Smile Family Dental Clinic. *International of Trend in Scientific Research and Development*, 5 (5), 877-896.
- 29. Shabbir, J., & Anwer, T. (2018). Artificial Intelligence and Its Role in Near Future. *arXiv preprint arXiv:1804.01396*.
- 30. Tong-On, P., Siripipatthanakul, S., & Phayaphrom, B. (2021). The implementation of business intelligence using data analytics and its effects towards on performance in the hotel industry in Thailand. *International Journal of Behavioral Analytics*, *1*(2), 1-16.
- Yufeia, L., Salehb, S., Jiahuic, H., & Syed, S. M. (2020). Review of the Application of Artificial Intelligence in Education. *Integration (Amsterdam)*, 12(8), 1-15.



Effect of Major Nutrients and Vermicompost on Crop Productivity of Mustard (*B.juncea L.*) Crop

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Abstract

The present investigation entitled, "Effect of major nutrients and vermicompost on crop productivity of Mustard (*B.juncea L.*) Crop." involved field experimentation conducted during Rabi season of year 2015-16 followed by laboratory analysis of the plant and soil sample. All grass have been removed from the plot and on crop productivity of mustard (*B.juncea L.*) plots and soil samples have been taken form each plot at 30 DAS, 60 DAS and at harvesting. Khurpi and auger have been used as sampling tools. Sample were collected in plastic bag.

The experiment was conduct on research plot of Udai Pratap Autonomous College, Varanasi (U.P.) adjoining the department of Agricultural Chemistry and Soil Science. The soils of Varanasi formed on alluvial, deposited by river Ganga have predominance of Illite, quartz, feldspars and Illite minerals are partly inherited from micas which are predominant in the sand and silt fractions. Varanasi is found under sub-tropical climate and situated in eastern U.P, India. The precipitation in this region is normally spread over period of three and four months. i.e form the last week of June to the second week of October is rain season. The distribution of average annual rain fall is 96.65mm of which 80% from June to September, 5.7% from October to December, 3.3% from January to February and 3.0% from march to May.

Treatments of this investigation consisted of integration of N,P,K,S and vermicompost are T₁ Control, T₂ 50% NPKS, T₃ 50% NPKS+10t, Vermicompost/ha, T₄ 100 % NPKS, T₅ 100% NPKS+10t Vermicompost/ha T₆, 150 % NPKS & T₇ 200 % NPKS. Result pertaining the effect of various treatment of different level of NPKS on different growth stages of mustard crop.

The effect of different doses of NPKS+vermicompost different growth stages of mustard crop was found in the $T_5 > T_7 > T_6 > T_3 > T_4 > T_2 > T_1$ and values order were 90 DAS,131.33,129.00, 127.67,118.33,124.65,111.00 under the respective treatment. Similarly higher plant height was recorded with T5 treatment as compared to other treatment at all growth stages. Plant height increased with increasing the levels of NPKS. Similarly higher plant height was recorded with the application of 100% NPKS+10t vermicompost/ha. The grain yield of mustard crop as influenced by various arranged treatment could be in order to $T_5 > T_7 > T_6 > T_3 > T_4 > T_2 > T_1$ and value were 18.12, 17.35, 15.00, 10.20, 12.10, 8 and 6q/ha under the respective treatment.

Keywords: Mustard, Vermicompost, B.juncea L., Major Nutrients, NPKS, Amit Singh N.K Tiwari Ram Prakash.

Introduction

Rapeseed and mustard are grown in 53 countries of the world on 26.09 mha area with a production of 46.84 m tones of this rapeseed accounting for 25.21mha area and 46.12 m tones. Production is thus more important than mustard (FAO Production year book 2004).

Rapeseed and mustard are the third most important oilseed crops of the world after soybean and oil palm. These crop are grown under a wide range of agro-climatic conditions, It accounting for more than 70% of the area under rapeseed mustard. The oil content varies from 37-49%. The seed and oil used as condiment in the preparation of pickles and for flavoring curries and vegetables (Ministry of agriculture).

Total area under RM seed and associated crop in India for the 2013-2014 is 71.30 lakh hectares Production 73.00 lakh tones & average yield 1023kg/hectares (Ministry of agriculture). Generally, these crop require heavy loam soils except taramira which is raised on lighter soils. Soils having pH 6.0-7.5 is ideal for their proper growth and development.

Rapeseed and mustard respond well both to organic and inorganic manures. It available apply 15-20 tonnes/ha of FYM or Compost at the timed field preparation. Nitrogenous fertilizer in the form of ammonium sulphate is beneficial for the crop.

Integrated use of organic manure such as FYM 10-15 tones/ha with 100% recommended NPK fertilizer does not only sustain higher productivity but also maintain the fertility. Improved the quality of food crops particularly of oil seed. More than 99% of S in rapeseed is bound in glucosinolates (Schung *et al. 1990*) there was buildup of available N in soil receiving 100% NPK along with FYM. a significant @10 t/ha over other treatment. The higher available N Content in the 100%. NPK+FYM.@10t/ha treatment may be due to optimal fertilizer input, three year conjoint used of 10t FYM/ha with 100% NPK significantly improved the organic carbon and available N, P & K Contents over the

chemical fertilizer alone significantly higher grain yield of 5.36 t/ha & total N.P.K. uptake by rice with the application of 100% NPK & 10% FYM/ha as compared to grain yield of 4.46 t/ha(Chesti *et al. 2015*).

The information regarding the application of NPKS and vermi compost in Indian Mustard is very less and fragmentary, particularly for eastern region for Uttar Pradesh. Keeping the above fact in view, an attempt has been made to study the effect of NPKS on soil properties and performance of mustard.

Materials and Methods

The present study entitled, "Effect of major nutrients and vermicompost on crop productivity of mustard (B.juncea L.) Crop" Involved field experimentation conducted during Ravi season of year 2015-16 followed by laboratory analysis of the plant and soil samples in the department of agriculture chemistry and soil science, Udai Pratap Autonomous college, Varanasi (U. P). All grasses were removed from the experimental plots and soil samples have been taken from each replication plots at 30 DAT, 60 DAT and at harvesting. Khurpi and auger was used as sampling tools. Samples were collected in clean plastic bags. Soil samples were brought to the laboratory, air dried soil samples were crushed and passed through 2 mm sieve. The representative samples about 500 gm were collected in polythene bags. Samples were analyzed for important physico-chemical properties. Treatments of this investigation consisted of integration of N,P,K,S and vermicompost are T₁ Control, T₂ 50% NPKS, T₃ 50% NPKS+10t, Vermicompost/ha, T₄ 100 % NPKS, T₅ 100% NPKS+10t Vermicompost/ha T₆, 150 % NPKS & T₇ 200 % NPKS. The experiment was laid out in a randomized block design (RBD) with three applications in 2015-16. Field was prepared by cross harrowing followed by planking in all plots. Full care has been taken to level the plots uniformly and grasses were removed from the plots. Around each plot bunds were made to control water in the plot main and sub

irrigation channels were made with help of spade. Mustard seed Varuna was sowing at spacing of 45x15cm.

Nitrogen, phosphorus potassium and sulphur were applied as per treatment through urea, SSP, MOP and elemental sulphur respectively as per treatments. Half dose of nitrogen, full dose of P, K and S were applied at the time of sowing and rest dose of nitrogen in two equal split one at 45 days and second after 60 days after sowing. Vermicompost was applied before 15days after sowing.

Organic carbon was determined by the modified Walkley and Black method (1934) as described by (Jackson 1967). The available soil nitrogen was determined by the alkaline Permanganate method (Subbiah and Asija 1956). The available phosphorus in soil was determined by the Olsens method (Olsen's et al. 1954). The available potassium was determined by ammonium acetate method (Honway and Heidel, 1952). The available sulphur in soil was determined by barium sulphate Turbidimetric method (Chesnin and Yien, 1951). The height of 5 marked plants in all the plots were recorded at different growth stages (30 DAS, 60 DAS and at maturity) form the base of plant to the tip of the upper most fully matured and stretched leaf before emergence of ear and after it emergence. The mustard was harvested at maturity and separate bundles were made for each plot and weight. After one week of harvesting crop were weighed and threshed by hand. After threshing the weight of grain was recorded. The data collected form field and laboratory were analyzed statistically using standard procedure of randomized block design (RBD), (Cochramand cox, 1959). Critical difference (C.D.) and standard error of mean (S.E.M.) were calculated to determine the significance among treatment mean.

Result and Discussion

The present investigation was carried out on "Study on "Effect of major nutrients and vermicompost on crop productivity of mustard (*B.juncea*) *L.)* Crop" during Rabi season of 2015-16 on research plot of Udai Pratap Autonomous College, Varanasi (U.P).

Table-1 Indicated that nutrients uptake by Mustard under different treatments over major nutrients and vermicompost, through which total nutrient uptake.

Plant height

Result pertaining the effect of various treatment of different level of NPKS on different growth stages of mustard crop. The effect of different doses of NPKS+vermicompost different growth stages of mustard crop was found in the order $T_5 > T_7 > T_6 > T_3 > T_4 > T_2 > T_1$ and values were 90 DAS 131.33,129.00,127.67, 118.33,124.65,111.00 under the respective treatment. Similarly higher plant height was recorded with T₅ treatment as compared to other treatment at all growth stages. Plant height increased with increasing the levels of NPKS. Similarly higher plant height was recorded with the application of 100%NPKS+10t vermicompost/ha. Vermicompost also balance nutrition under the favourable enviourment might have helped in increasing chlorophyll content at flowering stage. Further improve the physical and biological properties as a result of addition of vermicompost might have also root expansion and increase the availability of nutrient. The in agreement Reddy and Reddy (1998) and Dhaka et al (2001)

Treatment	Days After Sowing			
	30	60	90	
T ₁	11.00	51.6	96.67	
T ₂	15.50	65.86	111.00	
T ₃	21.50	79.6	124.67	
T ₄	18.67	71.33	118.33	
T ₅	26.00	95.33	127.67	
T ₆	27.50	97.13	129.00	
T ₇	29.03	99.26	131.33	
SEm±	0.843	1.718	0.888	
CD(5%)	2.599	5.295	2.736	

Table 1.Plant height (cm)as influenced by application of various levelsof NPKS and vermicompost under mustard crop

Number of branch

Table-2 Revealed that number of branch/plant as mustard crop a influenced by NPKS and vermicompost addition. The data related to number of branch of mustard crop under various treatments. Data clearly indicated that number of branches per plant increased with day after sowing. It was also recorded that integration of NPKs and vermicompost significantly increased the number of branch as compared to chemical fertilizer alone at all levels of NPK. The number of branch at time of harvesting 1.20, 1.50, 2.10, 1.80, 2.70, 2.20, 2.40 were under T₁, T₂, T₃, T₄, T₅, T₆, T₇ treatments respectively. Application of 100% NPKS + 10t vermicompost/ha significantly increased to other treatments at all growth stage. Significantly higher number of branch was found with application of NPKs and vermicompost might be attracted to higher and continuous supply of NPKS. Similar result were also reported by **Singh** *et al* (2009).

Treatment	Days After Sowing				
	No of siliqua	No of grain /siliqua			
T_1	40	9.26			
T ₂	47.6	10.2			
T ₃	69.2	12.6			
T ₄	56.6	11.26			
T ₅	85.4	13.86			
T ₆	87.4	14.13			
T ₇	89.73	15			
SEm±	0.731	0.764			
CD (5%)	2.253	2.352			

 Table 2.Number of branch/plant as mustard crop a influenced by

 NPKS and vermicompost addition

No of grain /siliqua

Table-3 indicated that Number of siliqua /plant and no of grain/siliqua mustard crop a influenced by NPKS and vermicompost addition. Result pertaining the effect of various treatment of different growth stage of mustard crop. The effect of different dose of NPKS on different treatment level of siluqua found in order $T_5>T_7>T_6>T_3>T_4>T_2>T_1$ and values are varied between 15.00,14.13,13.86,12.6, 11.26, 10.2, 9.26. Similarly higher grain/ siliqua recorded with T_5 treatment as compared to other under respective treatment of vermicompost Inorganic potassium fertilizer increase the no of seed/siliqua. Similarly results were reported by **Channaveerswami** (2005) similarly the hugher grain/siliqua was recorded with application of 100%NPKS+10t vermicompost/ha.

Number of siliqua

The data of the number siliqua of mustard crop under the various treatments has been presented in Significantly higher no of siliqua was recorded with the application of 100%NPKS+10t vermicompost/ha. The number of siliqua per meter row length of mustard under different increased with time and reached the maximum at 60 DAS. The effect

of various treatment on number of siliqua could be arranged in the order of $T_5>T_7>T_6>T_3>T_4>T_2>T_1$ and value varies are 89.73, 87.4, 85.4, 56.6,69.20, 47.6and 40 under the respective treatment. The combination of vermicompost and inorganic potassic fertilizer increase the number of siluqua than use of inorganic fertilizer alone. This may be because combination of inorganic and organic fertilizers improve the soil physical properties, which provide health and favourable soil condition to enhance nutrient efficiency.

Treatment	Days After Sowing	
	60	90
T ₁	1.2	2.4
T ₂	1.5	2.83
T ₃	2.1	3.96
T_4	1.8	3.26
T ₅	2.2	4.46
T ₆	2.4	4.5
T ₇	2.7	4.53
SEm±	0.716	0.548
CD (5%)	2.206	1.688

 Table 3.Number of siliqua /plant and no of grain/siliqua mustard crop
 a influenced by NPKS and vermicompost addition

Grain yield

Table-4 Indicated that, the data related to grain yield,oil content and straw yield of mustard crop under various treatment of NPKS presented.

The grain yield of mustard crop as influenced by various treatment could be arranged in order to $T_5>T_7>T_6>T_3>T_4>T_2>T_1$ and value were18.12, 17.35, 15.00, 10.20, 12.10, 8 and 6q/ha under the respective treatment. **Raj and Karwasra (1994)** reported that the grain yield of toria increased significantly with increased doses of S up to 45mg/kg. **Janzen and bettany (1981)** reported that the higher S application relative to N availability caused excessive accumulation of

sulphur in plant tissue of rapeseed. Vermicompost application coupled with transport of photosynthesis toward reproductive structure might have increased the yield attributes. These results are conformity with those of **Rjkhowa** *et al* (2000) and Singh *et al* (2007). Integration of vermicompost and NPKS recorded significantly higher grain yield over chemical fertilizer alone at all level of at all level of NPKS might be attributed to increased fertility status of soil and more availability of nutrient to the plant **Kumar** *et al* (2014).

Oil content

Result pertaining to effect of various treatment of NPKS and vermicompost on oil content of mustard was found in order $T_5>T_7>T_6>T_3>T_4>T_2>T_1$ and value were 38.60, 37.50, 35.36, 32.35, 33.10, 31.50, 30.20 percent under respective treatment. Application of 100%NPKS +10t vermicompost/ha significantly increase the oil content over the control. Whereas it was remain at par with T_5 (38.60%). Sulphur improve the quality of food crop, particularly of oil seed more than 99% sulphur in rapeseed is bound in glucosinolates (Schung *et al* 1990). Phosphatic fertilization increased the amount of oleic, linolenic and erucic acid with an appreciable decrease in undesirable erucic acid content (singh 1993). Vermocompost application, as it play important role in oil synthesis and protein metabolism similar result were also reported by Aruna and Reddy (1999).

Straw yield

The result obtains in respect of the effect of levels of NPKS and vermicompost on straw yield of mustard. Straw yield of mustard increased with increasing the different level of NPKKS and maximum yield were recorded under 100%NPKS +10t vermicompost/ha application in order to 70.00, 68.53, 67.12, 58.33, 60.25, 53.50, 45 q/ha. The increase the straw yield due to application of 30kg S/ha as SSP was 11.3, 10.1 and 45% over that of elemental S at 30kg/ha 1%,

5.52 and 2% respectively. The results of present investigation are in agreement with finding of **Mishra (2003)**. The straw yield significantly higher with application of SSP as compared to other source of S. Adding vermicompost favour the condition for root growth and increase the growth of areal organ and production of dry material and finally improvement in the biological function of plant **Cavendra** *et al* **(2003)**.

Treatment	Days After Sowing			
	Grain yield q/ha	Straw yield q/ha	Oil content (%)	
T ₁	6	45	30.2	
T ₂	8	53.5	31.5	
T ₃	12.1	60.25	33.1	
T ₄	10.2	58.33	32.35	
T ₅	15	67.12	35.36	
T ₆	17.35	68.53	37.5	
T ₇	18.12	70	38.6	
SEm±	0.744	1.15	0.804	
CD (5%)	2.293	3.542	2.479	

 Table 4.Effect of NPKS and vermicompost on grain yield, straw yield and oil content of mustard crop

Summary and conclusion

Present experiment was conducted at the research plots of department of agriculture chemistry and soil science, Udai Pratap Autonomous College Varanasi with mustard variety varuna-555 as test crop during rabi season (2015-16) to investigate the soil properties and performance of test crop as influence by addition of various levels of NPKS and vremicompost. The treatments were composed of NPKS and vermicompost. The treatment were T_1 (control), T_2 (50NPKS), $T_3(50\% NPKS+$ 10t vermicompost/ha), $T_4(100\% NPKS)$ T₅ (100%NPKS+ 10t vermicompost/ha), T₆(150%NPKS), T₇(200% NPKS). The mustard experiment was laid out in randomized block design (RBD) with three replication. Analysis of various soil properties in term of organic carbon, available nitrogen, available phosphorus,
available potassium ,available sulphur were made at different time interval 30, 60 and 90 DAS.

higher nutrient uptake (NPKS) by mustard crop was recorded with T₅ as compared to rest of the treatments. The effect of various treatment on nutrient uptake by crop was found in order $T_5 > T7_5 T_6 > T_3 > T_4 > T_2 > T_1$.

Higher plant height was recorded withT5 (131.33 cm) treatment as compared to other treatment at all growth stages. The effect of different doses of NPKS+ vermicompost on different growth stages of mustard crop in the order $T_5>T7_5T_6>T_3>T_4>T_2>T_1$.

Higher number of branch (4.56/plant), siliqua (89.75/piant), oil content (38.68Q/ha), straw yield (70q/ha), and grain yield (18.12Q/ha) were recorded under 100%NPKS+10t vermicompost/ha (T_5) applied plots.

The present study thus conducted that the application of NPKS with vermicompost in mustard crop significantly affected the growth, yield N uptake and available NPKS status of soil. The application of 100% NPKS and 10t vermicompost /ha was found to be best treatment regarding growth, yield NPKS uptake and NPKS status in soil.

References

- Rajkhowa, D.S.; Gogoi, A.K.; Kandali, R. and Rajkhowa, K.M. 2000. Effect of vermicompost on green gram nutrition. *J.Indian Soc.Soil Sci*,48 : 207-208.ers. *Haryana. J. Agron*, 23(1/2): 106-108.
- 2. Singh, S.;Mehta, A.K. and Thakral, S.K.(2007). Nutrient content and their uptake in wheat as affected by vermicompost and inorganic fertilizers. *Haryana. J. Agro*, 23(1/2): 106-108.
- 3. Parihar, S.; Kameriya, P.R. and Choudhary, R. 2014. Response of mustard (*Brassica juncea*) to varying levels of sulphur and fortified vermicompost under loamy sandy soil. *Agricultural Research Communication Centre Journals* vol. 34, issue.

- 4. Deo Chandra Khandelwal,R.B. 2009. Effect of P on yield, nutrient uptake and oil content of mustard grown on the gypsum treated sodic soil. *Journal of the Indian Society of Soil Science*, 57(1): 66-70.
- Singh Bikram, Sngh Sayavir, Singh Jagdev, Kumar Anil, Singh Sultan and Tkkoo Abha. 2009. Responce of Indian mustard (*B.juncea L.*) to N and P with and with ought gypsum in sodic soils irrigated within sodic water. *Journal of the Indian Society of Soil Science*, 57(2): 1780182.
- Parihar, S.; Kameriya, P.R. and Choudhary, R. 2014. Response of mustard (*Brassica juncea*) to varying levels of sulphur and fortified vermicompost under loamy sandy soil. *Agricultural Research Communication Centre Journals* vol. 34, issue.





Environmental and Economic Benefits Achieved by Swarf Forging of Alloy Steel an Experimental Study

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Abstract

Now days, it is common to create large amount of swarf (cutchips) during the production of components. This swarfs are then sold at a low price by weight which contains coolant solvents (water and oil). This process is often treated as waste management, giving industry little or no return. This investigation is an example of how the waste fraction can be transferred from waste to a resource that can be used in industrial process. It offers both environmental and economic benefits which make create such collaborations strategically important. The aim of this work is to prepare a product from swarf forging of alloy steel (16MnCr5). Swarf forging gives better control, environmental credits, cost savings an increased margin. Swarf collected from lathe, milling, drill or any other cutting machine is cleaned by degreasing, pickling and acid pickling. Preliminary heat treatment is done to eliminate the work hardening, moisture content and impurity content. Swarf can be continuous, discontinuous or in powder form. This technique also helps to reduce carbon emissions. However, to make bigger products we need very big dies approx. 9-10 times larger than final product. The development also offers

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those companies which currently generate large quantities of steel machining swarf the ability to convert this nuisance material into a highly valuable raw material for other products. It is conceivable that on industrial trading estates in Punjab where several companies are producing steel swarf that a new organization may be established which could collect the swarf and produce alloy steel powder for sale in competition with powder produced by conventional routes.

Keywords: Reuse of Swarf and Turning, Swarf Forging of Alloy Steel, Benefits of Metal scraps Recycling.

Introduction

The new age has added sustainability requirement and the concept of green production as appended criteria of competitiveness [1]. The high standard of living enjoyed in the developed world depends on the use of engineered materials to provide shelter, sanitation, medical equipment, consumer appliances, and communications and transport systems. Steel possessing many properties relevant to such uses and being relatively cheap, are widely used to provide these services [2]. Useful properties of steel include high strength and stiffness and a high melting point. Steel is ductile, making them ideal for structural applications and allowing forming operations to create a range of products [3]. Alloying and postsolidification thermo-mechanical processes can vary the strength and ductility of steel. Their relative cheapness is due to the abundance and concentration of iron oxide in naturally occurring iron ore and as well as our ability to reduce efficiently its oxide to the base metals. Since the development of the Bessemer steel-making process in the 1850s annual steel production has rapidly increased, reaching 1330 MT of steel (WSA, 2009) in 2008, equivalent to 200kg of steel for each person on Earth [4]. Steel is likely to remain widely used as the relatively high cost and embodied carbon of alternatives limits the potential for material substitution [5]. International Energy Agency projections are that steel production will roughly double (IEA, 2008a) between 2006 and 2050, driven largely by demand from developing countries [6]. The of

resources has been applied in diverse realms, including with respect to economics, biology, computer science, land management and human resources and is linked to the concept of competition, sustainability, conservation and stewardship [7]. Resources have three characteristics: utility, limited availability and potential for depletion or consumption. Renewable resources are a part of Earth's natural environment and the largest components of its ecosphere like solar energy, wind energy, hydropower, geothermal energy [8-10].

Experimentation

Swarf was collected from different machines like lath, planner, bend saw etc. After collection of swarf cleaning was done. Grease and oil are common on the surface of machined swarf. To remove that degreasing is done. This is actually carried out by the aid number of special of reacting substance. There are many solvents. Some of them are organic, washing in which dissolves the adherent grease. The first requirement in a degreasing solvent is that it should be low in cost and easily obtainable. It must be capable of efficiently eliminating every form of oil, wax, tar and pickle smut. After cleaning the swarf was put inside the mild steel container for compression. Then compression is done by hydraulic press which applied force of 60 tones. After compaction the swarf was ejected from mild steel tube/cylinder. Through the lower end of the container had a welded joint, the lower end of the container had to be cut to eject the compacted swarf. After this heat treatment was done to 60% of its melting point. The swarf used for all our trials was mild steel. The condition ranges from lathe turning to hack saw cuttings. Usually, the swarf was found to be contaminated with oil and other undesirable lubricants [11]. This factor was found to be detrimental to the flowability and the apparent density. In the second trial the swarf turnings were subjected to milling in a ball mill for 8-10 hours. The entire focus was centered on the two chief characteristics of the swarf namely physiochemical condition and size distribution. The former was altered using pickling treatments while the latter was analyzed using sieve analysis. Since the turning were found to be duly contaminated with oils, dust etc., it was imminent to clean them pickling treatment was applied

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for this purpose. It compromises of washing the swarf first in acid and then in alkaline solution [12]. The acid was used 2-3 sulphuric acids while sodium hydroxide was used as the base. The cleaning was carried out in tube like container in which the required solution was poured. After the cleaning process, Swarf was allowed to dry in order to remove any traces of moisture. The goals of the economic system include increasing the volume of commodities and services produced in the Technosphere, the efficient use of biological, energy, and information flows, and the application of technology to mineral resources and product reprocessing. Equitable allocation of goods and services between the social contract partners at local, national or global; adequate training of all members of society in socio-economic process; creating, using and adapting permanent structures and mechanisms of political, institutional or related to information management systems that provide flexibility and self-regulation of social and economic; correlation systems evolution economic, social and environmental; maintaining cultural diversity to support faster adaptation of chance. Maintaining biodiversity in support of the possibility of adapting the schimbarea conditiilor geo biosphere; compliance mechanisms of self-regulation and the natural cycle times in the biosphere. Specifically, sustainable development ensures fuller knowledge of the function of the natural environment or arranged in relation to man and society (ingluenta positive direct and indirect effects on quality of life) [13, 14]. Doing exercise is beneficial compared directly as comforting landscape, a place of leisure and recreational activities, be substituted by radio, service television and film.



Figure 1.The objectives of sustainable development [14]

Economic welfare - ways of achieving

To achieve its objectives, sustainable development must determine, improve well-being of the present generation without diminishing the welfare of future generations. Best ways to create wealth can be neither sustainable nor survival and sustainable ways may not be optimal, as fairness to future generations is that welfare while never drops. In this context, it highlights three possible ways of achieving wealth over time: Optimal, without being a sustainable way or one of survival. Optimal, which is not a sustainable way though it is one of survival. Necessarily optimal, but a sustainable and survival Ensure that you return to the. Briefly, creating wealth should target economic growth, stabilization of demographic evolution, classical resources of energy dependence and increasing concerns over widespread introduction of renewable resources and clean. In this context, the ways underlying the creation of wealth are based correlations between the components of its organic and consider how human intervention resources circuit. Their definition must consider systemic approach to sustainable development based on utility functions specific to each subsystem and laprecizarea general systems theory according to which large aggregate whole system is more than the mere sum of its parts. Based on the above considerations were made four ways to create wealth.

Results and Discussion

Now days it is common that large amount of swarf (cut-chips) created during the production of components. Then this swarf is sold at a low price by weight which contains coolant solvents (water + oil). This process is unavailable and is often treated as waste management, give companies little or no return. Now there is a better way which gives better control, environmental credits, cost saving and increased profits. This project is a example of how the waste fraction can be transferred from waste to a resource that can be used in industrial process. It offers both environmental and economic beneficial activities that create such collaboration are strategically important.



Figure 2.Sample after forging [7]



Figure 3.Sample after compaction [6]



Figure 4.Microstructure of (a) swarf product (b) cast product [7, 8]

	8 8	1
Sample number	Weight of sample(w)	Height of sample(h)
1	65gm	1.5cm
2	67gm	1.6cm
3	68gm	1.6cm

Table 1.Weight and height after compaction

Table 2.Volume after compaction

Sample Number	Height(h)	Diameter (d)	Volume(cm ³)
1	1.5cm	4 cm	18.84 cm^3
2	1.6cm	4 cm	20.096 cm^3
3	1.6cm	3.95 cm	19.596 cm^3

Sample number	Weight (w)	Volume(v)	Density(d)
1	65 gm	18.84 cm^3	3.45 gm/cm^3
2	67 gm	20.096 cm^3	3.333 gm/cm^3
3	68 gm	19.596 cm^3	3.47 gm/cm^{3}

Table 3.Density After compaction

Conclusion

By this technique we can reduce the waste of metal industries to a large extent but the product made by this technique cannot use for high load applications where we need high strength. This technique also helps to reduce carbon emissions. But to make bigger products we need very big dies approx. 9-10 times larger than final product. If we increase force during compaction then we need bigger dies. Ejection of swarf just after compaction is difficult because sometimes chips attached to the tube/ cylinder during compaction. Hardness comes out was half of cast product which is very... low. The whole world is focusing on environmental conservation and global warming. Today, companies not focused on reducing environmental burdens will not only find their corporate image diminished, but will also find it difficult to manufacture their products efficiently. By this method we can reduce global warming or can reduce the carbon emissions by companies. It can help many industries to reduce their environmental burdens on the environment. But the product made by this technique cannot be used where high strength is required like gears beams etc. This technique also helps in reducing waste of companies.

Very less research is done in this field there is lot more points which need to be explore. This field could change the whole face of metal industries.

References

 Allwood, J., Huang, Y., & Barlow, C. (2005). Recycling scrap aluminium by cold-bonding. In Proceedings of the 8th International Conference on Technology of Plasticity (pp. 1–8).

- Conrad, H., & Rice, L. (1970). The Cohesion of Previously Fractured Fcc Metals in Ultra high Vacuum. Metallurgical Transactions. Vol 1, November 1970-3019.
- Desaguliers, J. (1725). Some experiments concerning the adhesion of lead. Philosophical Transactions of the Royal Society of London, 33:345.
- 4. Inglesfeld, J. (1976). Adhesion between Al Slabs and Mechanical Properties. Journal of Physics, F: Metal Physics, 6(5), 687–701.
- J. Gronostajski, W. Chmura, Z. Gronostajski (2006), Phases created during diffusion bonding of aluminium and aluminium bronze chips, Journal of achievement in materials and manufacturing engineering, vol 19, pp 32-37.
- Kazakov, N. (1985). Diffusion Bonding of Materials (English version). Pergamon Press: Oxford. Stern, M. (1945). Method for treating aluminium or aluminium scrap. US Patent. Patent number: 2358667.
- 7. Stern, M. (1945). Method for treating aluminium or aluminium scrap. US Patent. Patent number: 2358667.
- S Lund, R. (1984). Remanufacturing. Technology review, 87(2), 19– 23.
- S Merstallinger, M., Sales, M., & Semerad, E. (2009). Assessment of Cold Welding between separable contact surfaces due to impact and fretting under vacuum. European Space Agency. available from: http://esmat.esa.int/Publications/Published_papers/STM-279.pdf.
- 10. C Pendrous, R., Bramley, A., & Pollard, G. (1984). Cold Roll and Indent Marking of Some Metals. Metals Technology, 11, 280–289.
- 11. Parks, J. (1953). Recrystallization Welding. Welding Research Supplement, 209–222s.
- 12. Puga, H., Barbosa J, Soares D., Silva F and Ribeiro S., 2009, Journal of Materials Processing Technology, vol.209, pp.5195-5203. (Puga et al., 2009).
- 13. Smith, C. (1988). A History of Metallography (pp. 53–54). The MIT Press. ISBN: 0262691205, 9780262691208.
- Semenov, A. P. (1960). The phenomenon of seizure and its investigation. Institute for the Study of Machines, Academy of Sciences of the U.S.S.R., Moscow (U.S.S.R.), 4.

07



Evalution of the International System

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Abstract

The international system has gone through the two world wars and the cold war and has been affected by many elements until today. The transformation of the international system has generally been in favor of the powerful developed countries. However, it is possible to say that the societies of developed countries have also been affected by the negativities experienced recently. Especially in the international system, where organizations increased after the Cold War, the strong structure of technology and social networks that emerged through the internet after the 2000s draws attention. In addition, the main problems of the world such as economic crisis, environmental crisis, raw material crisis, covid-19 pandemic etc. have begun to be experienced jointly. Although it is known that the dynamics of the global international system always favor strong developed countries, this structure has been shaken a little lately. It is possible to observe this situation partially in the Russia-Ukraine Crisis. Looking at the crisis from one point of view, strong Russia is invading weak Ukraine. From another point of view, the powerful and developed West cannot put an end to the war by imposing any sanctions against Russia.

In this context, the important points in the transformation of the international system, the post-Cold War period, the transformation process of the multipolar international system after the 2000s, the international system dynamics transformed by technological developments, the Covid-19 pandemic process and the Russia-Ukraine Crisis will be examined.

Keywords: International system, cold war, industry 4.0, covid-19 pandemic, Russia-Ukraine Crisis.

Post-Cold War: Cooperation and Organizations

With the end of the Cold War, the fall of the Berlin wall and the dissolution of the Soviet Union (USSR), the world entered a new phase (Ozugurlu, 2005: 1). After the Cold War, international system dynamics generally witnessed organizations on the axis of security. But in the process, economic organization models have become much more than security organization models. In fact, the importance of NGOs in international organizations is increasing day by day.

After the disintegration of the USSR, as the USA remained the sole sovereign power, the concept of the New World Order was brought to the world agenda by the President of the USA at the time. At first glance, it was explained as "New World Order, ensuring international peace, eliminating nuclear and weapons of mass destruction, pluralist democratic regimes, respecting human rights, giving place to high moral values, working for the welfare and happiness of humanity" (Kohen, 1992: 122). But in practice this has not been the case.

Until the 2000s, the USA continued to exist as the sole hegemonic power. In this process, many international organizations such as the UN, NATO and the EU continued their development. The most striking finding in this process is that the majority of international organizations developed on the axis of the developed West.

Transformation of International System Dynamics After 2000s

The unipolar new world order that emerged after the Cold War left its place to a multipolar international system in the 2000s. The main reason for this was the BRIMCS (Brazil, Russia, India, Mexico, China and South Africa Republic) countries and organizations such as the EU, which rose from different parts of the world that showed economic development (Efegil and Musaoglu, 2009: 7-8). The new world order, in which the dynamics of the international system changed in this direction, caused the reaction of the USA, and in this context, the hegemonic power used soft power elements such as NGOs, Hollywood actors/actresses and aid organizations in regions where it could not show its influence economically. When these were not effective, it showed its military presence as a hard power element. E.g; It is possible to observe the efforts of the USA, which was disturbed by the presence of China in Africa in the 2000s, to consolidate its influence in the region, first with soft power elements and then with military power.

Another development is that the dynamics of the international system after the 2000s have diversified with technological developments and the international community has been able to interact more closely with each other. This process will also be examined under the title of Industry 4.0 in the study.

Technological Developments after Industry 4.0 in International Relations

The dynamics that shape and influence the international system have changed and transformed throughout history. International relations have also changed dimensions, especially with the transition from agricultural society to industrial society and technological developments. The rise of technological transformations within the scope of Industry 4.0, that is, the 4th Industrial Revolution, put forward by the Germans in 2011, brought international relations to the cyber environment as well as physical (Boztaş, 2020: 67).

This change has been effective in many issues from security to social communication. Thus, the communication and interaction of the international community in every field from art to food culture, from popular culture to entertainment has crossed the borders between states. So much so that even the reactions to the decisions and practices taken by the states can be effective all over the world with organizations in a short time. For example, Russia's attack on Ukraine brought along protest marches all over the world. In this context, social media and other communication channels have become an important tool that affects international relations. On the other hand, a person in Turkey can buy a product in China with a single click. The dizzying speed of technological developments has become one of the tools of international relations by affecting the international system in every aspect. Because it is an undeniable fact that it has an impact in every field, economically, politically and militarily.

Post 2020: COVID-19 Pandemic

Global crises, according to their nature, are international dynamics that greatly affect, change or transform the international system. One of the crises in question is the pandemics, which are as old as human history and cause very serious economic, political, social and societal effects on the international system. In fact, all pandemics are critical breaking points in the history of globalization and have profoundly affected the foundations, institutions and rules of the international system. The recent crisis is one of the turning points of the twentyfirst century. COVID-19 disease of the new type of corona virus (SARS-CoV-2), which emerged for the first time in December 2019, has also been an epidemic that should be considered in this context and expected to have radical effects on the international system. Although COVID-19, which was declared a pandemic by WHO on March 11, 2020, emerged as a health problem, it quickly turned into a multi-faceted crisis by triggering economic, political, social and social breaking points, and the weakness of the international order against a global risk factor became more severe than ever before. manifested too much. In addition to the immediate effects of the pandemic in question, especially regarding public health and life safety, medium and long-term effects that will shape the national, regional and global order have also been inevitable (Ogurlu, 2020: 793).

As Kenneth Waltz (2001) said, the international system is an anarchic one. In the absence of a central authority, states have to stand up and defend themselves against any threat. Although some structural imperatives and the type of threats faced require cooperation between states (Keohane and Nye, 2012), the existing supply chains in the international system, global distribution wars and the efforts of countries to increase their gains to guarantee their own existence and security before cooperation undermine global cooperation. The current COVID-19 pandemic has also been a striking example of how fragile the foundations of international cooperation, solidarity and global governance are, in support of these arguments. In proportion to the rate of spread of the crisis, the states that turned inward started to struggle for survival by isolating themselves (Ogurlu, 2020: 798). In the course of the crisis, national vaccination studies were started and put into practice in the countries. The international community, whose interaction with each other has increased with technological developments, has withdrawn to its national borders during the covid 19 pandemic process.

Is the 3rd World War Beginning?: The Russia-Ukraine Crisis and the International System

While the COVID 19 pandemic process continues, the Russia-Ukraine crisis that broke out in February 2022, comes to mind, "What more could happen to the international community?" brought the question. In this process, the whole world started to discuss the possibility that the 3rd World War could take place economically. The reason for this is that Russia's main target is not Ukraine, but rather its refusal to accept its role in the new world order, which has been distributed by the West. We reach this finding from Russian President Putin's expression of his reaction to the West's arming of Ukraine and its efforts to include Ukraine in Western blocs such as NATO and the EU.

In this process, the international system and the international community are on the victim side of Ukraine. The main reason for this is that human values are taken into account and Putin prefers to use military force instead of diplomacy.

The international system on the brink of the global financial crisis, while struggling with the economic crisis and the pandemic, is also reluctant to confront Russia by reacting harshly to Russia. Especially the West (USA, Canada, EU countries) are content with only imposing and condemning some economic sanctions against Russia. Maybe they prefer to act this way because they are aware that they are using Ukraine as a pawn or a barrier against Russia.

Conclusion

The international system has been very worn out by the cold war process after the two great world wars. While it was thought that the international community could not bear a new struggle and that international cooperation and organizations would increase with technological developments, it was extremely sad that the covid-19 pandemic started and the global financial crisis and the Russia-Ukraine Crisis emerged while the pandemic was still ongoing.

Therefore, we discussed how the international system has changed and transformed in the light of all these positive and negative developments. In this context, it can be stated that technological developments, while interlocking the international community, also support the development of weapons that threaten security, thus causing the current Russia-Ukraine crisis. Therefore, we can say that after the cold war, the international system changed and transformed with its dynamics. In this process, first of all, positively; With the economic development, the unipolar world left its place to the multipolar world, and then negatively; We should state that the international system had to deal with the covid 19 pandemic, the global financial crisis and the Russia-Ukraine Crisis. In addition, in this process, the importance of technology in the dynamics of the international system is also very great.

References

- BOZTAS, A. (2020). Endüstri 4.0'dan Toplum 5.0'a Uluslararası Toplumda Siber Güvenlik: Siber Alandan-Toplumsal Alana Etkileri. Edit. BOZ, F. et. al., *Endüstri 4.0'dan Toplum 5.0'a Güncel Yaklaşımlar*, Nobel Publication, Ankara, pp. 65-86.
- EFEGIL, E. and MUSAOGLU, N. (2009). A Critique on the Concerns about Structure of International System After the Cold War Era. *Akademik Bakış*, Vol. 2, No. 4, Summer, pp. 1-24.
- 3. KOHEN, S. (1992). Yeni Dünya Düzeninde NATO'nun Değişen Stratejisi ve Türkiye. *Yeni Dünya Düzeni ve Türkiye*. Edit.: Sabahattin Şen, İstanbul, Bağlam Publication, 1992.
- 4. KEOHANE R. O. and Nye, J. S. (2012). Power and Interdependence. Longman.
- OGURLU, E. (2020). Tarih Boyunca Pandemiler ve Uluslararası Sisteme Etkileri. *Turkish Studies*, 15 (4), pp. 791-805, <u>https://dx</u>. doi.org/10.7827/TurkishStudies.44259 (12.03.2022).
- ÖZUGURLU, M. B. (2005). Soğuk Savaş Sonrası Değişen Dünya Koşulları ve Yeni Uluslararası Konjonktürde ABD'nin Yeri. İstanbul Üniversitesi Sosyal Bilimler Enstitüsü Uluslararası İlişkiler Anabilim Dalı, Doktora Tezi, İstanbul.
- 7. WALTZ, K. (2001). Men, the State and War-A Theoretical Analysis. Columbia University Press.





Factors Influenced the Growth of Hospitality Industry

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Abstract

This article is about the factors that influenced the growth of the hospitality industry. The hospitality sector mainly depends upon customer's needs and demands. No doubt, hospitality is booming day by day due to the standardization of the product as well as services and facilities which is provided by the customer. Hospitality Industry is a labor Intensive Industry. This industry depends upon the work force. This industry also known as high rate of turn over. In the hospitality sector Human Resource department plays a vital role for Planning, Organizing, Leading, Motivation, Training as well as recruited the new staff. There are various factors which increases the productivity of the hospitality industry such as Demographic Factor, Political, Technological as well as Economical. This essay also based upon the both internal as well as external factor of the hospitality industry which is rectified its importance and characteristics.

Keywords: Hospitality, Growth, Economic.

Introduction

Hospitality is derived from the Latin Word Hospitare which means "to receive as a guest" (Dittmer, 2002, p. 5). Hospitality industry is that industry in which is prepared to meet a guest basic requirement such as traditionally, food, beverages, lodging and shelter. On the other hand in the broad sense of term this industry provides services primarily to travellers as well as local residents. The principle segments of the

industry depends upon the Food and Beverage and Lodging segment. The main elements of the Lodging segments are Services, Accommodation, Décor, Rate, Target Clientele. But the two main key which arise the hospitality industry are Travel and Tourism. Tour Operators and Travel agents is one of the best who sells travel services in a travel agency but the most travel agencies selling packages do not put the packages together. Tourism is travel for recreational, leisure, or business purposes. The World Tourism Organization defines tourists as people "traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes "Hence the vast majority of international travel arrangement are made by the travel agents. This essay will highlight all the details of the growth of the hospitality industry. (Dittmer, 2002)

Characteristics of Hospitality Industry

- 1. Inseparability
- 2. Perish ability
- 3. Labor-intensive
- 4. Repetitive
- 5. Intangibility

Factors influenced the growth of the hospitality industry:

Demographic Factor: Demographic factor plays an important role for the growth of the hospitality industry. Under this factor location, age distribution of population, language, education as well as value and behaviour of the customer is the main points which helps to determine the growth of the organisation. Hotel is that place where travellers can receive food and shelter and provided is in fit condition to receive. Hotel is the tourist attraction. If the hotel is situated within the heart of the city or near the residential area then it is easy for the guests to find our dream destination. The service and facilities which are provide by the hotel to the guest is also the main factor due to which customer attracts and visit again and again. Some special services due to which guests attracts are

1. Gym facility

- 2. Spa facility
- 3. Luxurious room facilities
- 4. Indoor gaming facility
- 5. Complimentary service facility

Baby boomers as well as Echo boomers are the factors which influenced the growth of the hospitality industry. The baby boomers consist the one third of total population in 2000. Echo Baby boomers are the future travellers who are likely to invest in the hospitality industry. (Lashley & Morrison, 2000)

Economic Factor- Consumer demand, cost of factor of production, availability of labour of production like labour are the potential influence of the economic growth. When people are on a budget they have to be cautious in relation to where they spend their money. On the other hand when the eco. Climate is good, people have more money to spend on luxury items such as restaurant meals or trips away from home. This affects the services and facilities that are offered in the hospitality and tourism industries. on other words when the economy is good, that is people have money, they are more likely to go on holiday and eat out at restaurants. but when the economy is bad, people have less money, they aren't about to go spend money they don't have. It also has lot to do with the exchange rates.

Consumer demand is the large impact of the economic growth. High interest rates constrain the strategic flexibility whereas low interest rate increase strategic flexibility. Foreign exchange rate are another major source of the growth. Chain hotel sometimes earn a profit in a foreign country. (Harrison & Enz, 2005)

Technological Factor

Technology assists the growth of hospitality industry in the recent age. With domestic and international hotel establishments working overtime to tap into the power of internet, in order to catalyse their sales and to improve customer relations, it is only evident how internet is playing a key role in development of hotel industry today. Social networking websites like Facebook, Twitter, Google, Yahoo etc. are increasingly plays an important role in strategies of hotels. Customer feedbacks and reviews on such websites play a huge role in popularizing the services of hotels by word of mouth. Other one of the most prominent of hospitality is sea travel. Specially the cruise lines which are the perfect showcase of hospitality and provide all luxury travel to their passengers.

These all advancement in the transportation sector helps to shape up and growth of hospitality industry Further, it also becomes easier to keep in touch with and maintain relationships with ex-customers by making use of online tools. In the large hotel there is a one system which is fully based upon the technological factor like Fully Computerised. Fully computerised system also represented as Energy Management System. Hotel provides such kind of facility due to which guest attracts like provide laptops, compact disc and players as well as cellular telephonic in the guest rooms. (Vallen & Vallen, 2009)

For the safety reasons many large hotels provide fully computerised door locking system in the guest rooms for which the guest satisfied the services and facilities which they awail in the hotel. The hospitality industry has challenge of selecting appropriate technologies for consumers, whether they be in-room internet connections or teleconferencing.

A computer reservations system or central reservation system (CRS) is a computerized system used to store and retrieve information and conduct transactions related to air travel and hotels. It is designed and operated by the hotels as well as airlines industry. This system is very useful during the Check-in or check-out of the guest. This process is very time consuming and it helps to maintain the sequence of the services. (Harrison & Enz, 2005)

Political Factor

Globalisation has a huge impact of the growth of the industry. Some implication of the political factor are:

- 1. News Laws
- 2. New regulations
- 3. Current administrative policies
- 4. Government Stability wars
- 5. International Impact and Treaties

Government can encourage new business formation through tax incentives and subsidies, or direct intervention. (Harrison & Enz, 2005) Transport infrastructure consists of the fixed installations necessary for transport, including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, warehouses and seaports. Terminals may be used both for interchange of passengers and cargo and for maintenance. Vehicles traveling on these networks may include automobiles, bicycles, buses, trains ,trucks, people, helicopters and aircraft.

Conclusion

The overall outcomes of this essay also increases the revenue for the tourism sector. The essay describes the factors and their impact on the hospitality industry and how these factors plays a role. The room revenue and the other revenue generating departments are playing a vital role in the tourism sector and are helping to meet the requirements of the customers. The hospitality sector is growing industry

Incredible profits in the international market. With the total rooms inventory available already falling short, the Rev-Par has started climbing from 10% to 28% and would result to about 60% raise at the end of the current year. Such an increase in market performance of various hotels and hotel chains evidently means that the industry will be investing more and more in order to meet the needs resulting into many new companies and hotel chains coming up and building their empires there by running short of hospitality professionals.

All the factors discussed over all very crucial to the growth of hospitality industry, as these all factors are shaping up the hospitality industry &

have major impact on present scenario of hospitality industry. Executives are also required to be trained on a different front to acquire some special skills required to be successful in hospitality workplace which is characterized with high attrition rate and low job satisfaction among employees. Computers can be used as an efficient and low cost medium of providing training to employees of a café. However, there is a need to install suitable equipment as per the designed training program so as to make the whole system affordable even for a small scale service oriented company.

References

- 1. Dittmer, P. R. (2002). *Dimensions of the Hospitality Industry*. New York: John Wiley & Sons, Inc.
- Harrison, J. S., & Enz, C. A. (2005). *Hospitaliity Strategic Management Concepts and Cases*. New Jersey: John Wiley & Sons, Inc.
- 3. Lashley, C., & Morroison, A. (Eds.). (2000). *In search of Hospitality*. Butter worth-Heinemann.
- 4. Vallen, G. K., & Vallen, J. J. (2009). Check-In Check-out Managing Hotel Operation. New Jersey: Pearson Prentice Hall.





How does AI fit into the Management of Human Resources?

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Summary

After being implemented in other industries, artificial intelligence has only lately been adopted by the human resources sector. How exactly do things stand right now? The technology seems to have major limitations when it comes to HR, despite the abundance of brilliant advancements that have been made (particularly by start-ups). I can think of three potential hazards relating to the data used, the risk of making AI into a gimmick, and algorithmic governance based on a poll conducted among HR managers and digitization project managers working in significant firms.

Objective

Purpose of the study is to understand

- ➢ How do AI and HR integrates?
- > AI implementation in HR
- > The difficulties of AI in human resource management:

Similar to how AI itself is polymorphic; the phrase "artificial intelligence" is polysemous. There are many different approaches hidden beneath the jargon of AI, including algorithms, conversational AI, decisional AI, machine learning, deep learning, natural language processing, chat bots, voice bots, and semantic analysis. The number of real-world applications is also growing quickly. Additionally, there are two types of artificial intelligence: strong AI, also known as "general

artificial intelligence," and weak AI, also known as "non-sensitive intelligence" (a machine that can apply intelligence to any problem rather than to a specific problem). "As AI now stands, I don't believe there is much intelligence, and very little of it is artificial.

Given that it has a direct bearing on the lives of the people who work for firm, human resources (HR) is one of the fundamental components of any business. For the workers to be effective and productive there has to be good communication and a healthy work environment.

In order for employees to perform at their best, HR must ensure that they feel comfortable, are receiving the assistance they need, and have the freedom to use their creativity, intelligence, and empathy.

One of today's most cutting-edge and developing technologies, artificial intelligence, has significantly improved the HR division. The majority of low-value HR duties are automated and finished by AI, allowing more attention to be paid to the strategic scope of work.

By analyzing vast volumes of data fast and reliably, AI has the potential to change employee experiences in a number of areas, from talent management to recruiting.

Methodology

As there was no primary research done, the study mostly relied on secondary data. The study's research methodology is descriptive research design. The secondary data was gathered from research papers, books, websites, blogs on human resources, and survey reports released by various research groups.

How do AI and HR integrates?

Artificial intelligence uses coherent computing techniques and preprogrammed algorithms to make judgments in real time. The human resources department will be impacted by artificial intelligence. Because of the panoptic human element of human resources and the intelligence of technology, businesses will see an improved and evolved state for their candidates and employees. Additionally, HR AI will support the marketing of the importance of delivering better and quicker results.

AI's uses in human resources

The hiring and training of new staff is a tiresome task for the department of human resources. Artificial intelligence has several uses that can help employees who work in human resources with their physical labor.

Talent Acquisition and Recruitment

The hiring of bright people into the group will likely result in the company's prospective expansion, making talent acquisition a crucial responsibility for the HR department. The most prevalent application of artificial intelligence in HR may be in the hiring process.

AI shortens the time and effort needed to execute tedious tasks including candidate screening, database maintenance, interview scheduling, and answering and resolving contestant questions.

The recruiting procedure and time are greatly shortened, allowing the HR team to concentrate on more important jobs like sourcing, personnel management, recruitment marketing, and other beneficial operations.

The selection of a candidate who mostly satisfies the company's criteria will be made easier with the help of AI-assisted recruiting. As a consequence, the screening process is easy, efficient, and fair. Through chat bots, the applicants with the most potential are located and contacted. The newly hired workers are managed by these automated chat bots, which provide them, jobs and positions in accordance with their job profiles. It will select the most qualified candidate who best fits the job description. The top applicants will thereafter be scheduled for job interviews.

Orientation of Newer Recruits

AI-based integrated systems will introduce newly hired workers to business knowledge and rules on the day following the recruitment of qualified candidates. All relevant information, including details on their job description, company policies, task assignments, team members, and so forth, will be provided to new employees via a mobile application or structured data on their laptop. This process is known as on boarding. In order to increase the HR team's ability to recall and work effectively, on boarding is a crucial step. Candidates that experience a smooth and educational on boarding process are more likely to stick with the company over the long term. The AI for HR can answer all of the questions that potential candidates may ask, saving the personnel from having to do it manually.

HR procedures may be tailored to the needs of the workers and their related tasks thanks to artificial intelligence. Additionally, AI keeps track of all of the company's crucial contact information and other crucial tasks like the validation of legal documents, etc.

Training the Recruits

With the use of AI development services, workers will be able to research and educate themselves on the proper duties and requirements. By offering knowledge on the most recent developments in software and technology, it will also help them keep up to date. The AI will automatically understand and provide the employee the right training by analyzing the papers and examinations.

For better advancement, pertinent skill set information will be given depending on their work description. Data analysis performed by AI in HR technology may notify the HR staff of the need for employee training. This smart method will improve workers' productivity and intelligence while also allowing for quicker and more efficient teaching.

They can impart specific programmers and teaching techniques so that employees can educate themselves and perform in accordance with the needs of the business.

Enhancement of employee experience

Because of the high level of automation and strong emphasis on customer experience in the environment, employees anticipate a beneficial and constructive experience when they join personalized engagement.

Consumer technology is currently shaping employee experiences, and employees are looking for options for how they want to be engaged and supported. A tailored employee experience may be achieved by effectively integrating AI throughout the whole employee lifecycle, from hiring and on boarding to providing HR services and career planning.

With specialized feedback forms and employee appreciation programmers, human resources departments can now access employee engagement and job satisfaction with greater accuracy than ever before.

This is especially helpful considering how important it is to comprehend employees' general needs, but there are many other important organizational advantages to possessing this information as well.

Leadership

Because AI will help and grow students, it will also enhance the working methods of project managers and trainers in a company. By asking team members questions, the AI will assess the structure of the leader's qualities and then provide them with the skills they are lacking or the traits they need to change.

The dashboard also allows leaders to assess their own performance and adapt their skill sets to the needs of the workplace.

AI implementation in HR

The use of AI requires prudence, just like the use of any other technology. When using artificial intelligence in human resources, the following criteria, according to Cuter, must be taken into account:

- Accurate and current data is essential for good AI outputs. In order to ensure that the output-driven aim is clear, it is imperative to first gather the proper data.
- Every other IT ecosystem is distinct from the AI ecosystem. Certain skills and methods are required for implementation. The HR personnel must be meticulous when selecting the appropriate data sources and when cleaning and crating them.
- It is crucial to comprehend and be aware of the insights to be driven. As a result, there should be guidance and instructions on how to identify the appropriate patterns to research and utilize.
- Artificial intelligence (AI) may deliver reliable and unbiased outcomes depending on the algorithms and logics fed into the system. The organization needs to make sure the data is accurate, and it's important to keep in mind that AI can only carry out user requests; it is unable to make judgments on its own.

The difficulties of AI in human resource management

Although it is certain that artificial intelligence will continue to have a positive influence on the human resources management industry in the next years, HR professionals should be aware of the possible issues.

- Making AI more accessible and secure to use is the issue that bothers HR executives the most. The most common reason why people are reluctant to adopt AI at work is really security and privacy concerns.
- In the workplace, 31% of respondents to an Oracle study stated they would rather interact with a human than a machine. By staying up to date with trends and technologies as they emerge and change, HR professionals may be better prepared to tackle these problems.
- When using technology to collect information about their employees, businesses are expected to secure such information and get their permission first. On the other side, organizations want to feel secure against data breaches, thus for HR professionals, this requires a leap of faith.

Maintaining AI is another difficulty. Artificial intelligence requires frequent assessments and updates, which makes upkeep timeconsuming. Data availability is limited as a result of the shift to SAAS (Software as a Service), making it more difficult to fully integrate HR operations with technology.

Conclusion

AI-based HR solutions increase employee productivity. While focusing on the needs and results of employees, it may analyze, foresee, diagnose, and develop into a more competent resource. Businesses should implement AI solutions that fit their needs and are consistent with their corporate culture, and they should also construct the appropriate digital maps.

In the future, AI will have a range of effects on employees, and they will be able to offer a speedy and accurate client experience. As a result, it's crucial to focus on employee needs and be conscious of the potential consequences. Privacy, a lack of qualified workers, maintenance, integration capabilities, and the absence of tested applications are some of the problems.

However, exercising caution when deploying AI services will avoid unnecessary issue.

References

- Archer, N. & Yuan, Y. F. (2000) Managing business-to-business relationships throughout the e-commerce procurement life cycle. Internet Research-Electronic Net
- 2. Aswathapa, K. (2008), Human Resource Management, 5th ed., Tata McGraw Hill.
- Bloem J, Van Doorn M, Duivestein S, Excoffier D, Maas R, Van Ommeren E (2014) The Fourth Industrial Revolution. Things Tighten. Ghaswalla, N.A. (2020). How Artificial Intelligence transforming employee experience. Retrieved from https://www.the

hindubusinessline.com/infotech/how-artificial-intelligence-transform ingemployee-experience/article30607509.ece#

- 4. Dipak Kumar Bhattacharyya, Human Resource Management, Excel Books.
- 5. French, W.L. (1990), Human Resource Management, 4th ed., Houghton Miffin, Boston.
- 6. H.J. Bernardin, Human Resource Management, Tata McGraw Hill, New Delhi, 2004.
- 7. Ivancevich, J. M. (2008), Human Resource Management, Tata McGraw Hill.
- 8. Madhurima Lall and Sakina Qasim Zaidi, Human Resource Management, Excel
- Meade, J. (2017).Is Your Business Ready for Artificial Intelligence (AI)? Retrieved from https://towardsdatascience.com/is-yourbusinessready-for-artificial-intelligence-ai-51efefb11d97
- Manager, W. (2018). 7 Ways to Use Artificial Intelligence in HR. Retrieved from https://www.newgenapps.com/blog/growing-roleofartificial-intelligence-in-hr
- Manyika, J., Chui, M., Miremadi, M., Bughin, J.; George, K., Willmott, P., &. Dewhurst, M. (2017, January). "A Future that Works: Automation, Employment, and Productivity." McKinsey & Co. Retrieved from https://www.gita.org.in/Attachments/Reports/ MG I-A-future-that-works-Full-report.pdf.
- 12. Park SC (2017) The Fourth Industrial Revolution and implications for innovative cluster policies. AI & Society 33(3). pp 433-45.
- Patel, K. (2018). Artificial Intelligence in Finance. Retrieved from https://www.researchgate.net/publication/335109 921_Artificial_ Intelligence_In_Finance.
- 14. Rao P.S. (2008), Essentials of Human Resource Management and Industrial.
- 15. Relations, Text cases and Games, Himalaya Publication.
- 16. http://en.wikipedia.org/wiki/Job_evaluation.
- 17. http://www.jenss.com/Job%20Evaluation.pdf.
- 18. http://www.managementstudyguide.com/job-evaluation.htm.
- 19. http://www.haygroup.com/in/services/index.aspx?id=11698.

10



Identification and Comparison of Accidents on Dam and Highway Construction

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Abstract

In the current research, "NTPC Koldam" and "Kiratpur-Nerchowk Highway" construction sites have been considered for identifying accidents that have occurred on-site in the past. The data collection of accidents has been done through questionnaire forms which include 20 questions based on the most expected accidents. Questionnaire forms have been filled out by various site-engineers, engineers, labourers, and safety managers. 50 questionnaire replies were received from the dam site and each highway. The GUI was used to synthesise questionnaire forms in order to group the numerous accidents into four categories: minor, reportable, major, and deadly. While highway construction accidents due to single or repeated contact with chemicals and other substances, accidents without higher or concerned authorities were classified as minor, accidents due to using defective equipment or disc cupping were classified as reportable in dam construction accidents due to access scaffolding, body stressing due to muscular stressing while lifting, carrying objects, accidents in absence of proper personnel protective

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equipment. Fuzzy logic was used to classify accidents into fatal, major, reportable, and minor ones. The results showed that on both dam and highway building sites, incidents that occurred without personnel protective equipment were the most serious. A greater number of accidents occur at highway sites, according to a comparison of dam and highway locations.

Keywords: Dam, Highway, Personnel protective equipment, Fuzzy logic, Synthesis.

Introduction

Accidents of the workers at the construction site can be marked at the top of the list in regard to other firms than construction. As more work is related at different places so workers keep migrating from one work to another which results in increasing chances for accidents [1]. Accidents in construction process cannot be guessed and they usually affect the planned construction process of the management. Accidents cause large disturbances to working schedules, equipment and workers of a company so it is necessary to find them and recertify the individual one from the root. To avoid accidents as construction site various safety measures can be followed such as safety plans, safety trainings and meetings, proper assessable first aid and medical facilities, proper management roles [2].

To find the most occurring accidents on the site is foundation of construction safety management Total safety tool has been used in order to rectify hazards more progressively by the engineers. For hazard identification it's important to cross two steps first knowledge and information step and second is process and procedure step. Both steps have been completed by total safety tool. The accidents which cannot be rectified or are not rectified become the reason for occurrence of accidents. The report of construction firm in terms of safety has always been worst [3].

Accident not just befalls they effectuate due to many incidences or we can say unsafe acts or unsafe conditions. One reason for accidents is also addition of cause to unsafe act or unsafe condition. To reduce the accidents, it is important to find the most basic accident. Some of the basic causes for accidents are unsafe method, unsafe equipment, human element, working conditions etc. [4]. PRA priori probabilistic risk assessment witticisms significant duty to exemplify the reasons of incidents which can lead to accident[5]. Accidents can be categorized as minor, reportable, major fatal. Causes of accidents can be further divided into primary and secondary causes [6]. It is important to relate the reportable accidents to number of construction project in a particular year this will help in getting the absolute rate of accidents. The incidences, fatal accidents reduced but there was an increase in permanent disability accident [7]. There are some main causes for bad safety practices followed in a construction organization such as inability of PPE (personnel protective equipment), carelessness of workers in wearing PPE, no safety officer appointed at the site, lack of safety practices at site, no training and drill sessions for the employees by the management, no safety to the workers working at heights etc. [8]. There has been no decrease in the top position of construction industry for accidents due to large number of injuries, illness, fatalities in as in relation to the other industries it is important to have safety check at each and every point of the construction to evaluate the performance of safety for a particular organization. No concern was given about the instinctive and it is possible to get instinctive through questionnaire or other data collection tools [9]. As the construction firm include consultants, clients, managers, engineers, and communication between all the firms is important to for completion of work. Accidents have a great impact on the on the project by affecting the estimated cost or increasing the time limit [10]. The fuzzy logic has also been used to identify the sources of risk and their preventive measures in order to not affect the performance of project. But the problem with this research is that it is not accepted by the many business professionals as many alterations have to be done in field of planning as well as in the financial terms [11].

Accidents during Construction

As construction involves many complexes works the accidents during construction can take place at any point. There are majorly three kinds of accidents with percentage chance of occurrence which are as follows;

- \blacktriangleright Due to falls (22.2%)
- Stepping or waking on objects (18.2%)
- Struck or bang by falling objects (17.1%)

Other accidents are due to exposure to /or contact with electric current. This type of accident is result of incorrect usage of electric sockets, damaged insulation of electric wires/cables or faulty electric tools. The struggle or tough movement will cause tiredness to the human body and/or unbalance body manoeuvre, caught in between objects, in connection with harmful materials, in connection with extreme temperatures and other type which cannot be taken lightly. Hamid et al. [4] found that maximum accidents were due to improper maintenance and improper use of machines or equipment. An accident due to improper use or maintenance of equipment was found to be the most occurring accident on the sites and followed by falls, being struck, accidents due to collapse of structure, vehicles error, fire, loading and unloading, collapse, flood, explosion, gaseous vapours and fumes, improper storage of material, nervous shocks. These are some of the main causes of accidents which are determined from the statistical and court cases. Identification of the root causes of accidents can help in spreading awareness about the accidents to the particular organization. But the court cases available are limited due to which the research has also been confined and it is also important to investigate the statistical data due the modernization of the technologies and methods used for completion of the construction work[7].

Identification Methods for Accidents

For identification of accidents a sample of 450 questionnaire forms from 30 Chinese construction enterprises has been analysed. Those construction enterprises are typically of three types and are termed as;
- State-owned enterprise
- Private enterprise
- Sino-foreign joint venture

These enterprises were selected to take samples in order to measure the level of safety performance and accidents on construction sites. Questionnaire forms made it possible to collect data at various levels and large data was gathered. Through questionnaire form it was possible for all the workers to fill the data individually rather than in a group, questionnaire form is a laborious process and requires lot of time but provides a great accuracy of the accidents occurring on the construction sites it is possible to collect data in form of group discussion system. Also inhabiting or improving the skill would help in improving safety risk, applying safety tool and creating a safe working environment for the entire working staff of constructional site. It was found that self-awareness, visioning re some of the skills required to create a safe working environment.

Wu et al. [12] identified the accidents through collection of two data first is statistical data and data of court cases. In case of statistical data, the data on three bases were established as bar graph in respect to accidents on basis of gender, death cases by gender, and permanent cases of disability. Chong et al. [7] reviewed the importance to check or maintain the relation between management and safety and for this purpose 16 construction sites were taken into consideration a checklist based upon safety was made to be measure the recent safety proposal followed on the site. The checklist included the basic reasons which could directly or indirectly lead to the occurrences of accidents on various construction sites. The checklist included only the limited factors with no provision for addition. Through the research it was concluded that the supervisors mainly focus upon the completion and proper execution of the work instead of paying attention upon the safety sets or rules to be prepared for workers. The results mainly focused upon the communication of supervisors with the workers [13].

Synthesis of Data

For synthesis of data presented a SEM (Systematic structure equation modelling) method for evaluating PSPE (Prospective Safety Performance Evaluation) on construction projects. The data is collected by interacting the workers or the employees on the construction sites. As per the sample of 450 valid questionnaire surveys taken from 30 number of Chinese construction enterprises, 'SEM' model along with 26 objects integrated for PSPE in the context of Chinese construction projects has been recognized and then established through test. The KAP of civil and structure in order to know the improvement for the further research [12]. The authors analyzed that there is a lack of 'KAP' in the management of construction and also helps to give the necessary information for the future utilization of KAP architecture. The responses of the questionnaire form were collected from various C & S (civil and structure) engineers. For analyzing the quality level, a questionnaire has been prepared, which is responded by the 43 number of C & S (civil and structure) engineers. To know the effectiveness of the DFS model it's necessary to study the contractual arrangements. It is also important to find the incidents or the near misses in order to prevent the occurrence of accident in future. This research deals with the relationship between the human errors as well as the errors due to machinery or equipment [14]. The main collection of near misses was only given the prime importance in this research. Quantitative evaluations of combined incident reports can help construction firms by generating their overall safety level as expressed by the reports. This system can also use as a tool for assessing not only the construction company but also each individual section (such as a regional unit) within the firm in purpose to promote a competitive system for evaluating safety-related achievements. Total solution is determined by individually addressing each section of the query, as demonstrated by the decision matrices at the different structure levels of the hierarchy. Other organizations, such as authority institutions, can also gain insights related to the firm safety, provided they have exposure to safety incidents as required [16].

Fuzzy logic

Investigateda probabilistic assessment approach for protection risk investigation for metro construction in difficult project. A confidence index for the estimation of basic events in order to ensure the flexibility of the gathered data during the investigation of experts. Also, the defuzzification method has been designed which is depends upon the representation theorem that overcome the disadvantages of fuzzy linear approximation. Due to lack of adequate data, it is quite difficult to identify the probability of the accidents. It may be possible to have a sufficient data but the risk involved is higher in coal mines, nuclear power plants. To determine the factors that are responsible for the top event failure have been evaluated by using the importance index and calculating the fuzzy importance. For decision analysis a step-by-step procedure have followed;

Step-1: Firstly, the identification of the hazards or problem is done, then possible risks are calculated further they are divided as top events and sub events.

Step-2: Secondly plotting of top event is done, failure points are determined and by taking the idea from basic events the fault tree is constructed.

Step-3: A skilful investigation is than carried out to detect the possible probability of events, gathering data, the conversion of linguistic and fuzzy utterance into fuzzy numerals after this the calculation of fuzzy probability based upon the basic events is done.

Step-4: Defuzzification is done after the fuzzification of the data takes places, it calculates the failures involved in the fuzzy probability, converts the fuzzy probability into crisp value and then calculation of results is done.

Step-5: In last the most critical sensitivity factor is being determined which are related to the risk analysis output, and adequate control, measures are proposed against hazards and resolving the monitoring reviewing of the process is done.

Step-6: Examined the consideration of all the body injuries internal or external. The risk with respect to particular body injury has been

calculated using fuzzy logical reasoning system and fuzzy analytic process. The risk has been calculated for overall inspected sites.

This research is beneficial in getting both quality and quantity benefits by determining actual and probabilistic risk of injuries. These researches have been proved beneficial to the safety managers in achieving more safety and better productivity of the workers at the construction site. In this research a case study has been done which shows the various types of body injuries that occurred on the site to workers for last 10 years [17]. Investigated the grading of risk meltdown has been established to find the risk assessment. A bond amongst risk factor, risk is considered and checked. Figure4 it shows the membership function which is used in fuzzy logic system to determine and to establish the relation between fuzzified and fusilier. Fuzzy set hypo synthesis is launched to sanction combined risk evaluation descriptions to be modelled mathematically. Risk is identified in terms of time, cost, quality and safety changes [18]. Figure 3 represents the triangular membership function from low, low to medium, medium, medium to high and high. As the points to be involved for fuzzy logic were mainly dependent on three factors so triangular membership function was recommended [19, 20]. Carr et al. has conducted studied on the importance of potential hazard and potential planning for reducing the occurrences of accidents on construction sites [11]. The data gathering has been done from previous research, advice of experts and various studies. As a resultant the fuzzy logic was used to reduce accidents. Fuzzy logic helps in determining the probability of accidents which can or may occur in the future whereas the previous model discovered were only capable of finding the accidents that have been occurred in the past and then finding the solution for only those accidents [21, 22]. The data collection was done and data received was for analyzed for hazard identification. The results obtained were than applied fuzzification, inference and defuzzification in order to determine hazard level. As it is known as construction causes a huge movability so it is important to check the construction process at each level. Fuzzy logic system is one of the best techniques to keep a

check the safety at various platforms. It can be found that maximum accidents occur due to fall off workers from a height [1].

Methods and Materials

A step-by-step procedure was followed in methodology in which first step was to get a review of research which has already been performed in the field of accidents on construction sites. After going through literature review the accidents on dam and highway sites were identified using questionnaire method. Data received from questionnaire forms was than computed by using graphic user interface in order to classify the accidents as minor, reportable, major, and fatal. Fuzzy logic was then applied on the classified accidents for comparison of sites and to find the most critical accident on both the sites. At last, the results obtained were discussed and conclusion was derived.

Material

For finding the accidental details two sites have been taken into considerations which are as follows:

- Dam construction (NTPC KOLDAM)
- Highway construction (Kirtpur-Nerchowk18.88Kms stretch)

Latitude 31.385528° Longitude 76.893127°Latitude 31.535260° Longitude 76.881480°

As shown in Figure 1 (a) the dam is located at a distance of 119kms from JUIT (Jaypee University of Informationand Technology) and Figure 1 (b) shows that the highway site is located at a distance of 134kms from JUIT. Dam construction (NTPC KOLDAM) is generally known as Koldam which is situated on the Satluj River. It is situated in Barmana, district Bilaspur, Himachal Pradesh. The major goal of Koldam is to generate hydroelectric power of 800 MW and was constructed by the National thermal power cooperation. As shown in table 1 the questionnaire form filled at the Dam site were 50 in number which includes 8 samples filled by engineer, 8 samples filled by the site engineer, 8 samples filled by the safety manager, medium used for all three was English. Whereas 26 samples were filled by labourers for them medium of language was Hindi.



Figure 1.Distance between (a) Jaypee University of Information and Technology (JUIT) and dam site route (b) JUIT and highway site route [23, 24].

The answers filled in questionnaire form were based upon particular individuals' perspective about the accidents which took place in past Total samples filled at dam site are 50.

Medium of	Designation	Number of
questionnaire form		samples
English	Engineer	8
English	Site engineer	8
English	Safety manager	8
Hindi	Labour	26
TOTAL		50

Table 1. Respondents of dam site

The questions included in the questionnaire form are based upon the most the most occurring accidents that are assumed to be occurring at any construction site. Highway construction (KIRATPUR-NERCHOWK 18.88 Kms stretch) is a four-lane project, executed by India's NHAI "National Highway Authority", which is two years behind schedule, costs Rs. 188.447 billion and is expected to be operational by December 2018. Table 2 shows details about the questionnaire form filled at the highway site which includes 8 samples filled by engineer, 8 samples filled by the site engineer, 8 samples filled by the safety manager, medium used for all three was English. Whereas 26 samples were filled by labourers for them medium of language was Hindi. Total samples filled at dam site are 50.

Medium of questionnaire form	Designation	Number of samples
English	Engineer	8
English	Site engineer	8
English	Safety manager	8
Hindi	Labour	26
TOTAL		50

Table 2. Respondents of highway site

Methods

Two methods were used in order to accomplish the desired objectives which were synthesis of data through GUI to classify the accidents and fuzzy logic in order to find the most critical accident and for comparative analysis.

Implementation of synthesis Once the questionnaire form was filled at both highway and construction site it was important to classify the accidents into minor accidents, major accidents, reportable accidents and fatal accidents. As there were 50 respondents on dam site 50 respondents on highway site as well each one has different opinions or responses against a particular question so it was important to find the maximum answer or probability of maximum answer for a particular question to compute the results of 50 questionnaires and to classify the accidents into 4 classes the synthesis of data using GUI graphic user interface has been done. All the questions included in questionnaire form were classified using synthesis of the responses filled by laborers, safety managers, site engineers, and engineer. For better data collection the questionnaire has been made in two medium English and Hindi. The Hindi medium was generally used and filled by the labourers. The synthesis process was done using GUI (graphic user interface) it can also be done manually but GUI is more time consuming and when the result was checked for the manual and GUI it was same. The framework of the work is mainly divided into two parts such as the accidents takes place during the construction of NTPC koldam hydro based power project and the accidents type during the construction of DAM. There are two sheets in the project. The first sheet is all the questions which have been asked from different people. The second sheet is answers which is stored in form of 0 and 1.1 for yes and 0 for no. Therefore, the people who have marked on any one of the 4 options have been considered as 1 and for those questions which have not be occurred are mentioned as 0. So, two sheets have been made one in form of tick and cross and other in 0 and 1 form.

The algorithm for the synthesis procedure has been given below:

- Read sheet data for all questions which is in form of 0 and 1 where 0 represents no and 1.
- Bifurcate sheet of questions or questionnaire form for dam and highway construction sites individually.
- > Display them into the GUI in different segments for two sites.
- For each question in each type, there are four answers that are minor, reportable, major, fatal.
- Identify the question selected at the GUI and search the question in question sheet loaded at step 1
- Extract all answers for that section particularly concentrating at the number of opinions which agree on yes and the once that agree on no.
- Find all 1's in the answer sheet filled by laborers, safety managers, site engineers and engineers.
- For each 1 identify at which option 1 has been selected for minor, reportable, major or fatal.
- ➢ For all answers, find maximum 1 neglecting 0.

Some examples for illustrating the synthesis process as follows;

- 1. Consider a question from questionnaire form.
- 2. Accidents due to mental stress (exposure to a traumatic event, occupational violence, work pressure, suicide, attempt to suicide, workplace bullying)
- 3. Suppose the option count comes to be;
 - ➢ 3 respondents agreeing on this accident to be minor
 - ➢ 5 respondents agreeing on this accident to be reportable
 - ➢ 6 respondents agreeing on this accident to be major
 - > 11 respondents agreeing on this accident to be fatal
- 4. The maximum value is for option 4 for question (Accidents due to mental stress (exposure to a traumatic event, occupational violence, work pressure, suicide, attempt to suicide, workplace bullying).
- 5. Hence the value would be FATAL and fatal option would be incremented by 1.
- 6. In such a manner for each question there would be an increment in the answer options.

Implementations of Fuzzy Logic System Once the accidents have been classified into minor, reportable, major & fatal category of accidents than this classification is used by fuzzy logic to determine the most critical accidents on both sites and also for the comparison of overall accidents on dam as well as highway sites. Fuzzy Logic (FL) is a reasoning method similar to human reasoning. Fuzzy logic system also makes it possible to take input as alphabetic or in number form and to give the outputs in form of numeric as well as alphabetic form. The FL approach mimics human decision-making, involving all intermediate possibilities between the numeric values YES and NO. A fuzzy logic system is a nonlinear mapping of input data set to a scalar output data. Fuzzy logic not only takes data in form of binary numbers but also in other languages. Fuzzy logic system helps in determining the intermediate values for examples the in between values between 0 and 1.Fuzzy logic is used in this research for identifying the most critical factor for accidents amongst the all 20 accidents on both highway and dam construction which are concerned with finding the in between factor. The comparative analysis of two things or sites is also possible to determine through fuzzy logic system. The fuzzy logic implements on the possibilities level of input for achieving the desired output.



Figure 2.Framework of fuzzy logic

A Fuzzy logic system is generally used to derive the intermediate values in between 0 and 1 or 5 and 6 or in between any two numbers for GUI it

is not possible to determine the intermediate values, it also helps in determining the probability for something.

Figure 2 shows the architecture of fuzzy logic system or framework of fuzzy logic system. First step includes a crisp set of input data are taken and converted to a fuzzy set using fuzzy linguistic variables, fuzzy linguistic terms and membership functions. The data is firstly defuzzied and the required data is extracted here. Once the data has been extracted the processing of the received data is done and it passed on to fuzzifier to attain the results or output on which fuzzy logic is applied. This tread is known as fuzzification. Later on, an inference is made based on a set of rules. Lastly, the resulting fuzzy output is mapped to a crisp output using the membership functions, in the defuzzification step. Various elements used in fuzzy logic system are linguistic variables, membership functions, fuzzy rules and defuzzification. The Linguistic variables are the input and output variables of the system input included the data of questionnaire form and output is the outcome for finding the critical accident whose values are taken as words and sentences from a particular language, in place of numerical values. Linguistic variable makes it possible to take data as numbers or alphabets A linguistic variable is generally breakup into a set of linguistic terms. However, the membership functions are comprehended in the fuzzification and defuzzification steps of a Fuzzy logic system, to map the non-fuzzy input values to fuzzy linguistic terms and conversely, in conversely. A membership function can also help in measuring a linguistic term. The membership functions for the linguistic terms' variable can be shown as a combined plan. The most common types of membership functions are triangular, trapezoidal, and Gaussian shapes. As only three factors minor, reportable, major was used for the present proposed work so triangular membership function has been used in this research. If the factors are on which fuzzy logic is to be applied are more than four or is more complex at those places it is recommendable to use piecewise linear or Gaussian type of membership function. Various forms of membership functions are triangular, trapezoidal, piecewise linear, gaussian and singleton as shown in Figure 3.



Figure 3. Various forms of membership functions

In the fuzzy logic system, a rule base is plotted to restrict the production variable. A fuzzy rule is a simple IF-THEN rule with a prohibition and an interpretation. Fuzzy Set Operations the assessment of the fuzzy rules and the togetherness of the results of the individual rules are committed using fuzzy set operations. The current work, the rule sets used are as "if (current lead is low) and (lead threshold is high) then(optimized lead is high)", "if (current lead is high) and (lead threshold is low) then (optimized is mf1)", and "if (current lead is high) and (lead threshold is high) and (lead threshold is high) then (optimized lead is high) then (optimized lead is mf1)" as shown in Figure 4.



Figure 4.Rule editor [25]

As shown in Figure 5 shows that if the current lead is low and lead threshold is high that results obtained will be high, if current lead is high and lead threshold is low that results obtained will be low, and if current lead is high and lead thresh hold is also high that results obtained will be low. Figure 6 represents the whole process of research work from the starting to the end. The input which is the current load value and the load threshold value is adjusted with the help of the red line. When the value of current load and lead threshold is 0.5 the output which is named as optimized lead is equal to 0.188 which is useful in obtaining the most critical accident of both the dam and highway site and the find the number of accidental rates on both sites.



Figure 5.Rule viewer [25]



Figure 6.Surface viewer[25]

Figure 6 represents the surface viewer of the proposed work for the two inputs named as current lead and lead threshold. Here blue colour

represents the current lead and lead threshold values whereas yellow and green colour represents the optimized values. Lastly, in defuzzification ulteriorly the inference step, the comprehensive conclusion is a fuzzy value. This conclusion should be defuzzied to draw end crisp output. The algorithm for fuzzy logic is listed below;

- Input is taken as data, threshold of data & Rule set. The data which is in the form of minor, reportable, major and fatal form obtained after synthesis is entered in to the rule set including the entire data.
- > Describe linguistic variables with the terms.
- > Develop membership functions as triangular for the rule set.
- Create a knowledge base of rules.
- Change crisp data into fuzzy data sets by utilizing membership functions. (Fuzzification occurs)
- Calculate rules in the rule base. (Using Inference Engine)
- > Integrate outcome from every rule. (Using Inference Engine)
- Change the output data in non-fuzzy values. (Finally, Defuzzification occurs)
- Output is received as optimized data defining the graph showing the most critical accident on site and also the number of accidents on site.

Results

Categorization of accidents on dam site:on basis of percentages derived from the data collection through questionnaire form was used for categorization of a particular accident as minor, reportable, major, and fatal on dam site. Table 3 shows the maximum accidents according to the questionnaire form filled by engineer, site engineer, safety managers and laborers were minor and very few of them were minor which include accidents due to single or long-term contact with chemical and other substances person, accidents in absence of higher or concerned authorities, Accidents due to confined spaces (lack of oxygen drowning were minor accidents. Accidents due to access scaffolding, Body stressing due to muscular stressing while lifting, carrying objects, repetitive moments, low muscle loading, Accidents in absence of proper personnel protective equipment were classified as reportable with no major and fatal accidents.

Sr. No.	Questions	Dam
1	Accidents in absence of higher or concerned	Minor
	authorities.	
2	Accidents in absence of proper personnel	Reportable
	protective equipment	
3	Accidents due to using defective equipment or	Minor
	disc cutters.	
4	Accidents due to improper loading or stacking	Minor
5	and poor lifting techniques.	M
2	Accidents due to improper guarding and	Minor
6	A agidents due to access scoffelding	Donortabla
7	Accidents due to falling of rataining walls	Minor
/ 8	Accidents une to failing of fetalling wans.	Minor
0	drugs and alcohol	
9	Accidents due to falls, trips and slips of person	Minor
-	from height or same level.	WINDI
10	Hitting stationary or moving objects with part	Minor
-	of body.	
11	Accidents due to sound and pressure.	Minor
12	Body stressing due to muscular stressing while	Reportable
	lifting, carrying objects, repetitive moments,	-
	low muscle loading.	
13	Accidents due to contact with heat and	Minor
	electricity.	
14	Accidents due to environmental factors.	Minor
15	Accidents due to single or long-term contact	Minor
1.6	with chemical and other substances.	
16	Accidents due to exposure or contact with	Minor
17	biological factors.	N4:
1/	Accidents due to mental stress (exposure to a	Minor
	traumatic event, occupational violence, work	
	bullying)	
	ounying).	

Table 3. Classification of dam accidents

18	Accidents due to vehicles (vehicles overturning,	Minor
	vehicles falling in excavation, person falling	
	from vehicle).	
19	Accidents due to confined spaces (lack of	Minor
	oxygen drowning).	
20	Accidents due to collapse of excavation,	Minor
	flooding of excavation.	

Categorization of Accidents on Highway Site On basis of percentages derived from the data collection through questionnaire form was used for categorization of a particular accident as minor, reportable, major, and fatal on dam site. Table 4 shows the maximum accidents according to questionnaire form filled by engineer, site engineer, safety manager and labourers. Accidents such as due to single or long-term contact with chemical and other substances, accidents in absence of higher or concerned authorities, Accidents due to improper guarding and warning system were classified as minor, accidents such as accidents due to using defective equipment or disc cutters, accidents due to sound and pressure were classified as reportable.

Results of Fuzzy Logic As discussed before in methodology the fuzzy logic is applied on the classified accidents on both sites to find the most critical accident and for comparative analysis.

Results of Fuzzy Logic for Dam Site Figure 8 represents the dam optimization graph obtained after clicking on evaluate final button. From the above figure it is clear that for 1^{st} , 3^{rd} , 4^{th} up to 7^{th} questions stored into the database the user count or the accident count is near about 1. The user count obtained for 2^{nd} question is approximately 2.3. Here x-axis represents the questions whereas y –axis represents the User count. It is clear from the results of the optimization of dam that maximum accidents are due to accidents in absence of proper personnel protective equipment (PPE). This can be due to negligence of the workers or may be due to the rules followed by the management in a particular firm or organization. Also, accidents on the dam highway are less only up to question number 7 occurred on the site whereas other questions after 7^{th} number can be ignored or considered negligible as these types of

accidents have not been occurred on the dam construction site based upon the reposes filled.

Sr. No.	Questions	Highway
1	Accidents in absence of higher or concerned	Minor
	authorities.	
2	Accidents in absence of proper personnel	Reportable
	protective equipment	
3	Accidents due to using defective equipment	Reportable
	or disc cutters.	
4	Accidents due to improper loading or	Minor
	stacking and poor lifting techniques.	
5	Accidents due to improper guarding and	Minor
	warning system.	
6	Accidents due to access scaffolding.	Reportable
7	Accidents due to falling of retaining walls.	Minor
8	Accidents where workers are under influence	Minor
	of drugs and alcohol.	
9	Accidents due to falls, trips and slips of	Reportable
	person from height or same level.	
10	Hitting stationary or moving objects with part	Reportable
	of body.	
11	Accidents due to sound and pressure.	Reportable
12	Body stressing due to muscular stressing	Reportable
	while lifting, carrying objects, repetitive	
	moments, low muscle loading.	1
13	Accidents due to contact with heat and	Minor
	electricity.	
14	Accidents due to environmental factors.	Major
15	Accidents due to single or long-term contact	Minor
	with chemical and other substances.	2.51
16	Accidents due to exposure or contact with	Minor
1.7	biological factors.	
17	Accidents due to mental stress (exposure to a	Minor
	traumatic event, occupational violence, work	
	pressure, suicide, attempt to suicide,	
1.0	workplace bullying).	-
18	Accidents due to vehicles (vehicles	Reportable

 Table 4.Classification of highway accidents

	overturning, vehicles falling in excavation, person falling from vehicle).	
19	Accidents due to confined spaces (lack of oxygen drowning).	Reportable
20	Accidents due to collapse of excavation, flooding of excavation.	Reportable



Figure 7.Most critical accident on Dam site (Accident vs. Respondents)

Figure 8 represents a pie chart for dam optimization which represents the various accidents which took place at highway site which include 20 sections each for one particular section. Maximum accidents occurring on the dam site are minor; the brown portion represents the accidents n absence of PPE (personnel protective equipment).



Figure 8.Pie chart for dam accidents

Results of Fuzzy Logic for Highway Site Figure 9displays the accidents on highway construction for the 20 questions collected from the highway construction site (kiratpur to nerchowk highway). Here x-axis represents the questions whereas y-axis represents the User count. From the above figure it is clear that the user count for the second question (Accidents in absence of proper personnel protective equipment) is high. Whereas for 1st, 3rd, 4th, 5th and 6th questions the user cunt is one. Above 6th questions the user count is very small near to zero. It is clear from the results of the optimization of dam that maximum accidents are in absence of proper personnel protective equipment.



Figure 9.Most critical accident on highway site (Accident vs. Respondents).

The occurrence of accidents on the highway construction is more as compared to the highway site as some accidents are negligible in dam construction whereas the accident on the highway construction is greater to 0 so they cannot be ignored. The occurrence of accidents is more in highway construction as shown in the pie chart and bar graph for the various questions. By implementing procedures for personnel protective equipment at sites cost and time of project can directly be controlled. As indirect cost involved in the treatment of labourers can be deducted and time delay can also be avoided by taking measures to avoid accidents in absence of PPE.



Figure 10.Pie chart for highway accidents.

Figure 10represents a pie chart for highway construction site which shows the various accidents which took place at highway site which include 20 sections each for one particular question. This pie chart is made upon the approximate identification from the fuzzy logic system. The accidents occurring on highway site are more so the pie chart include 20 sections each one for a particular question. The accidents in absence of PPE are more.

Conclusions

From the results obtained using Questionnaire method, its data synthesis and optimization using Fuzzy logic, following conclusions can be derived:

- From questionnaire form most occurring accidents on the highway and dam site were due to improper supervision, faulty equipment and due to environmental factors.
- It can be concluded from the questionnaire method that at both dam & highway sites the affect of environmental factors is classified as the major category of accidents also accidents due to defective

equipment& failure of construction equipment& unsupervised construction activities are minor reason of accidents. Moreover, accidents in absence of personnel protective equipment, falls, trips& slips of individuals at construction sites & due to vehicle accidents are treated as reportable accidents.

- From fuzzy logic applied to the accidents as fatal, major, reportable, minor it can be concluded that on both dam & highway construction sites, accidents in absence of personnel protective equipment are found to be the most critical accident.
- The comparison of dam and highway sites further reveals occurrences of greater number of accidents at highway site. However, PPE was found as the most critical accident on both sites.
- Moreover, it can also be inferred that identification & rectification of the most critical factor accident that is in absence of personnel protective equipment will help in reducing the indirect cost of the project thus rendering it economical.
- Further, a remedial measure to rectify PPE (personnel protective equipment) can be done by doing a hazard assessment on the site, appointing a safety manager who keeps a check about regular training and maintenance about PPE to the workers and the entire construction staff.

References

- 1. Winanda, Lila Ayu Ratna, Trijoko Wahyu Adi, Nadjadji Anwar, and Febriana Santi Wahyuni. "Construction safety monitoring based on the project's characteristic with fuzzy logic approach." In AIP Conference Proceedings, vol. 1903, no. 1, p. 070009. AIP Publishing LLC, 2017.
- S., & Priyadarshini K. "Safety management and hazard control measures in construction" *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X. PP 97-101.*
- 3. Carter G., Smith S. D. (2006). Safety hazard identification on construction projects. *Journal of construction engineering and management*, 132(2), 197-205.

- 4. Hamid A. R. A., Majid M. Z. A., & Singh B. (2008). Causes of accidents at construction sites. *Malaysian journal of civil engineering*, 20(2), 242-259.
- Zhang L., Skibniewski M. J., Wu X., Chen Y., & Deng Q. (2014). A probabilistic approach for safety risk analysis in metro construction. *Safety science*, 63, 8-17.
- Holt A. S. J. (2008). *Principles of construction safety*. John Wiley & Sons. No. pp. 9.
- 7. Chong H. Y., & Low T. S. (2014). Accidents in Malaysian construction industry: statistical data and court cases. *International journal of occupational safety and ergonomics*, 20(3), 503-513.
- 8. Kumar S. & Joshi D.A. (2016). Risk Management in BOT. *International Journal of Scientific Research and Management*, 4(9).
- 9. Awolusi I. G. & Marks E. D. (2016). Safety activity analysis framework to evaluate safety performance in construction. *Journal of Construction Engineering and Management*, *143*(3), 05016022.
- Shivam P., & Kumar M. (Nov-2015). "To study risk management in construction management for developing countries" volume-4, *issue-11, ISSN No. 2277-8160*
- Carr V. &Tah J. H. M. (2001). A fuzzy approach to construction project risk assessment and analysis: construction project risk management system. *Advances in engineering software*, 32(10-11), 847-857.
- Wu X., Liu Q., Zhang L., Skibniewski M. J. & Wang Y. (2015). Prospective safety performance evaluation on construction sites. *Accident Analysis & Prevention*, 78, 58-72.
- Mattila, M., Hyttinen, M., & Rantanen, E. (1994). Effective supervisory behaviour and safety at the building site. International Journal of Industrial Ergonomics, 13(2), 85-93.
- Goh, Y. M., & Chua, S. (2016). Knowledge, attitude and practices for design for safety: A study on civil & structural engineers. Accident Analysis & Prevention, 93, 260-266.
- 15. Alinaitwe, Henry J. Mwakali & Bengt Hansson, "Analysis of accidents on building construction sites reported in Uganda during

2001–2005." CIB World Building Congress, Construction for Development. 2007.

- Google.image."https://www.google.co.in/maps/dir/Jaypee+Univer sity+of+Information+Technology,+Waknaghat,+Himachal+Prade sh+173234/NTPC+KOLDAM,+Chamyon,+Himachal+Pradesh+1 74013" (2005).
- 17. Ghaderi R. &Kasirossafar M. (2011). Construction safety in design process. In *AEI 2011: Building Integration Solutions* (pp. 464-471).
- Zou P. X. & Sunindijo R. Y. (2013). Skills for managing safety risk, implementing safety task, and developing positive safety climate in construction project. *Automation in Construction*, 34, 92-100.
- 19. Majumder D., Debnath J. & Biswas A. (2013). Risk analysis in construction sites using fuzzy reasoning and fuzzy analytic hierarchy process. *Procedia Technology*, *10*, 604-614.
- 20. Graydon P. J. & Holloway C. M. (2017). An investigation of proposed techniques for quantifying confidence in assurance arguments. *Safety science*, *92*, 53-65.
- 21. Asanka W. A. & Ranasinghe M. (2015). Study on the impact of accidents on construction projects. In 6th International Conference on Structural Engineering and Construction Management, Kandy, Sri Lanka, 11th-13th December.
- 22. Raviv G., Shapira A. & Fishbain B. (2017). AHP-based analysis of the risk potential of safety incidents: Case study of cranes in the construction industry. *Safety science*, *91*, 298-309.
- 23. Google.Image."<https://www.google.co.in/maps/dir/Jaypee+Univers ity+of+Information+Technology,+Waknaghat,+Himachal+Pradesh+ 173234/sundernagar"(2005)
- 24. Google.Image.https://www.google.com/search?tbm=isch&q=accide nts+at+dam+construction+site&chips=q:accidents+at+dam+constru ction+site,online_chips (2007)
- 25. *MATLAB* version 6.5.1, (2017), (computer software), The Math works Inc., Natick, Massachusetts.

11



Influence of Gender on Entrepreneurship

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Abstract

Previously, women were confined to the four walls of their home, where they served the men members of the family and performed household chores. As time passed, women's roles began to shift, and she made her mark in every field formerly dominated by men. Entrepreneurship was once thought to be a sector dominated by men. Women have begun to establish their own businesses in recent years. Despite the fact that women's entrepreneurship and women-owned company networks are on the rise, there are still many inequalities. The stereotypical gender orientation played by men in society is the fundamental explanation for this.

When it comes to raising finance for a firm, gender discrimination is most prevalent. Women's risk-taking abilities, as well as their ability to do business, are questioned by the government and financial institutions. Women are thought to be far more emotional than men, so their decision-making abilities are typically viewed as more emotionally biased, which isn't ideal in the workplace. When a woman wishes to become an entrepreneur, her family's support is equally vital.

The study looked at the perspectives of female entrepreneurs in order to examine the impact of gender on entrepreneurship. Financial help, risk involved, family support, high competitiveness, and government backing are only some of the elements that have been considered for the study. These analyses provide insight into the key reasons of gender prejudice in entrepreneurship.

Introduction

Entrepreneurship is the process of starting, launching, and operating a new firm that sells or rents a product, process, or service. It entails creating a company plan, accumulating financial and material assets, hiring personnel, offering advice, and taking responsibility for the organization's success or failure.

Entrepreneurship is a critical component of economic development. It also aids in the development of entrepreneurs' managerial skills, the formation of new businesses, the creation of jobs, and the improvement of living standards.

Entrepreneurship can vary from single individual to big-scale endeavors including a team and generating a significant number of jobs.

An entrepreneur is an individual who owns and operates a firm, accepting full responsibility for its success and failures. In the industry, he or she is very essential. As an innovator, he/she introduces new ideas, products, or services. They also contribute to the country's gross domestic product by creating new job possibilities.

Women's entrepreneurship refers to the establishment of a business by a woman or a group of women. The government of India defines a woman entrepreneur as a business owned and controlled by a woman with a minimum financial interest of 51% of the capital and at least 51% of the employment produced by the business.

Affluent entrepreneurs are the daughters and wives of wealthy businessmen; pull factors are educated women with no work experience who start a business with the help of commercial banks and financial institutions; push factors are women who start a business to overcome financial difficulties; and self-employed entrepreneurs are uneducated women who live below the poverty line.

Service (consulting, training, bookkeeping, crèche, etc.), manufacturing, agricultural and allied sectors, blogging, handicrafts, fashion design, beauty parlor, interior design, jewellery making, photography, web design, and other businesses are developed by women entrepreneurs.

Many Indian cultures think that a woman's responsibility is to be a homemaker who takes care of the household's concerns, such as child care, cleaning, cooking, and fetching water. Due to economic progress, globalization, and societal regulation, the status of women in India has shifted over time. Women's roles have evolved from that of a homemaker to that of a qualified and experienced professional as a result of increased awareness and education. Entrepreneurship is seen as a male-dominated industry in India.

Women are attempting to enter the sphere of business, but they are up against numerous challenges. Restricted access to funding, combining work and family life, societal support, gender discrimination, and high competition are just a few of the challenges. In India, just a few women have succeeded as entrepreneurs.

Kiran Mazumdar Shaw, Indra Nooyi, Vandana Luthra, Naina Lal Kidwai, Ekta Kapoor, Richa Kar, and Shahnaz Hussian are some of India's prominent female entrepreneurs.

Annapurna Scheme, Stree Shakti Package, Bharatiya Mahila Bank Business Loan, Dena Shakti Scheme, Udyogini Scheme, Cent Kalyani Scheme, Mudra Yojana Scheme, Mahila Udyam Nidhi Scheme, and Mahila Udyam Nidhi Scheme are some of the current government and financial institution schemes that support women entrepreneurs. These programs assist women in getting finances and launching their own business.

The National Resource Centre for Women (NRCW), which was established by the Indian government to promote women's entrepreneurship, is one of the organizations that support women's entrepreneurship in India. It brings together professionals from a variety of fields, including health and nutrition, gender rights, communication, economic empowerment, and economic base violence, among others. WIT (Women's India Trust) is a humanitarian organization that provides training to underprivileged and unskilled women in order to enable them earn a regular income.

The major goal of the Kerala State Women Development Corporation (KSWDC) is to eliminate the problems and restraints that prevent women from growing and progressing. AWAKE (Association of Women Entrepreneurs of Karnataka) is a non- profit organization that assists women in improving their economic situation.

Working Women's Forum (WWF) - It assists women in south India improve their living conditions by offering microcredit, training, and health care and SEVA (Self- Employed Women's Association) is a group of women who work for themselves. It's a union for low-wage, self-employed women.

Objective of the Study

The majority of women owned enterprises are small and marginal, hence they are typically regarded as underachieving. The authors claim that such performance profiles mirror the confined output of most small businesses; in this work, they suggest that such performance profiles reflect the restricted performance of many of these small businesses. The claim that women-owned businesses do poorly implies a gendered bias in the entrepreneurial language, in which femininity and lack are seen as synonymous. Furthermore, given perceptions of female inferiority in the framework of male normativity and supremacy, women- owned businesses are projected to underperform. As a result, the purpose of this study is to critically assess the relationship between gender and company performance, with the suggestion that this critique has ramifications for the broader evolution of our understanding of entrepreneurial behavior.

Review of Literature

- 1. Susan Marlow, Maura McAdam (2013), Women-owned businesses are frequently described as under-performing in that the majority remain small and marginal. The authors dispute this description; within this paper, it is argued that such performance profiles reflect the constrained performance of most small firms. The assertion that women owned firms under-perform reflects a gendered bias within the entrepreneurial discourse where femininity and deficit are deemed coterminous. In addition, women-owned firms are expected to under-perform given expectations of female weakness in the context of male normativity and superiority. Accordingly, the aim of this paper is to critically evaluate the association between gender and business performance suggesting that this critique has implications for the broader development of our understanding of entrepreneuring behaviors.
- 2. VishnuPrasad Nagadevra, (2009), No country can achieve its potential without adequately investing in and developing the capabilities of women. In the interest of long-term development of the economy, it is necessary to facilitate their empowerment of women. Given the multiple roles that a woman is expected to play in her family and society, Micro and Small Enterprises do provide a critical opportunity for women empowerment. This paper analyses the differences between Women Enterprises (enterprises owned by women) and Other Enterprises. It uses a large database of SSIs and SSSBEs to evaluate the effectiveness and efficiency of the units owned by women and also identifies areas where women owned units perform better based on selected performance criteria.
- 3. M.P.Bavya and Raghunandan M.V (2018), Women's participation in every sector is undoubtedly high and women employees constitute one third part of the BPO sector but there are various difficulties faced by them. Women who work in BPOs generally have an issue in balancing between three jobs i.e. of ice, household and child care. It is also felt that they aren't given equal opportunities and the evaluation of performance isn't fair. This study aims at

understanding the difficulties faced by women while working in BPOs. The aim of the study is also to identify the various attributes that adds to a women's safety and security. The objectives of the study are to analyze the problems faced by women in BPO sector and to understand the influence of education on women working in BPO sector. The study was conducted in Mysore city and data was collected by giving the respondents, structured questionnaires. The sample size of the study was 50 and the tool used is reliability test, factor analysis and one way anova test. The result obtained from the study says that hesitation is the problem that stands with women.

4. Bilsen BİLGİLİ, Burcu CANDAN, Emrah ÖZKUL, Tayfun GÜVEN (2016), In Turkey, men establish more businesses than women do and women play a different role in establishing a business and entrepreneurship. According to studies carried out, the businesses women establish focus on a limited number of sectors (Aslesen, 1998; Spilling and Jordfald, 1996, Sovsal, 2010), are relatively small-scale and have a slight tendency to grow. On the other hand, male entrepreneurs operate in a wide range of sectors (Spilling and Jordfald, 1996; Özen Kutanis, 2009, Soysal, 2010b). Along with the developments in technology and cultural expectations after 1980s, the status of entrepreneurs improved in society. In relation to these developments, it has also been observed that the number of female entrepreneurs have increased rapidly (Ljunggren and Kolvereid, 1996, Morcin, 2013). Along with this, the number of female entrepreneurs creating successful brands in various sectors also increased. There are four different components in forming consumer based brand equity. These are brand awareness, brand association, perceived quality and brand loyalty (Aaker, 1991). While entrepreneurs are creating the brand equity of their own business, which of these components they focus on more can vary. In this study, whether the male and female entrepreneurs who achieved to be a brand in various sectors differ from each other in terms of the importance they attach to consumer based brand equity dimensions in creating the brand equity of their own businesses is aimed to be determined.

- 5. Anil Boz, Azize Ergeneli (2014), The purpose of the study is to clarify the profile of women entrepreneurs by investigating their personality characteristics and parents' parenting styles as motivating factors. In this study 104 women entrepreneurs and 108 women who work in the public sector filled out the questionnaires. Their personality characteristics were identified by "Big Five Inventory" while their perceptions about their mothers' and fathers' parenting styles were evaluated by "Perceived Parenting Styles Questionnaire". The results of this study revealed some differences in personality characteristics between the women entrepreneurs and nonentrepreneurs while stressing the importance of father parenting styles of women entrepreneurs.
- 6. Fuzirah Hashim, Zaini Amir, Norizan Abd Razak (2011), this paper is written to report on the impact study of '1nita' project, a Malaysian government initiative that provides a platform for women entrepreneurs to build strong businesses through the use of information technology and the internet. Both qualitative and quantitative data was gathered for this study. Results have revealed that the 1nita portal has given good impact to some, but not all the businesses. Recommendations have been given to ensure that the women entrepreneurs will become competitive at a global level through the exposure to technology-based learning.
- 7. Kogilah Narayanasamy, Devinaga Rasiah, C J Jacobs (2011), the paper examines the difference between male and female entrepreneurs and how those differences can be used towards the future development of entrepreneurship. There is sufficient evidence to indicate that characteristic differences were major factors found in the root of gender differences. Further, family background and social background were contributory factors in determining the differences of male and female entrepreneurs. Education level of both sexes also influenced the quality of entrepreneurs. Subsequently, Government policies also contributed towards gender differences in the entrepreneurship world. The different capabilities of male and female entrepreneur had significant impact on the entrepreneurship fraternity. Clearly, country and social roles too determine the

success of entrepreneurial women.

8. Rupavataram Sunita Ramam (2014), The sign of a thriving economy of any country is the entrepreneurial performance of that country. Biological gender is seen as one of the critical factors impacting entrepreneurship behavior. A need for inclusive development has been extensively focused on in order to promote entrepreneurship in women. However, rather than biological gender, it is the 'gender role behavior' which is more relevant for finally expressed behavior. Androgyny is a balanced psychological identity that combines the social behaviors of both genders. Androgynous behavior increases the flexibility and adaptability of individuals as they have access to both behavior patterns based on situational necessity rather than being confined to socially dictated gender stereotypical behavior. This flexibility is imperative for entrepreneurs who have to constantly keep adjusting to environmental challenges.

Research Methodology

The convenience sample approach was used to conduct the questionnaire survey. It is a sampling approach in which data is obtained from members who are readily available for the researcher to do the research.

Analysis and Findings

The study uses a sample of 300 female entrepreneurs. The convenience sample approach was used to conduct the questionnaire survey. It is a sampling approach in which data is obtained from members who are readily available for the researcher to do the research. Here, data is gathered from a variety of female entrepreneurs who live in the area. Family support, government support, gender discrimination, risk involved, and competition are among the aspects examined in the data. The purpose of the research was to gather information from small and medium-sized female entrepreneurs.



Figure 1 shows that 20% of women work in beauty salons, 16.7% in jewellery manufacturing, 16.7% in the service sector, and the remaining 46.6 percent work in manufacturing, agriculture and related activities, handicrafts, interior design, fashion design, photography, web design, tailoring, and boutiques. 53.3 percent of the women were employed prior to starting their own firm, while the rest started their own business right away.



Figure 2

In Figure 2, 36.7 percent of women use their revenue to maintain their families, 36.7 percent to pursue their dreams, and the remaining 26.7 percent to become self-sufficient.



Figure 3

Figure 3 depicts the various characteristics that distinguish a female entrepreneur from a male entrepreneur, with 66.70 percent believing that women are hardworking and better at interacting with customers, 60 percent believing that women are in-depth thinkers, 53.30 percent believing that women are more likely to seek and listen to advice, 46.70 percent believing that women are rational, 33.30 percent believing that women are emotional, and 26.60 percent believing that women are emotional.



In Figure 4, 60 percent of female entrepreneurs believe that the government favors women entrepreneurs over males. 50 percent of female entrepreneurs believe the government prefers female entrepreneurs over male entrepreneurs because they are more committed and self-sufficient, followed by 45 percent who believe the government prefers to promote women entrepreneurs, 30 percent who believe the government prefers to reduce discrimination, and 15 percent who believe the government prefers to balance the society.



Figure 5

Figure 5 shows the challenges faced by female entrepreneurs at the time

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of business start-up, with 66.70 percent of women citing a lack of funds and the risk involved in beginning a new business. 53.30 percent of women said they didn't have enough information about the business, 30% said they didn't have the self-confidence to take the risks associated in business, 10% said they didn't have enough family support, and 6.60 percent said they had other issues.



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Figure 6 shows Currently, 48.30 percent of women are experiencing liquidity and financial problems, 41.40 percent have no time for training or upgrading skills, 37.90 percent are having difficulty balancing family and work life, 24.10 percent do not have enough budget for product research and marketing activities, 20.70 percent face gender discrimination, and another 20.70 percent do not face any obstacles.



Figure 7

Figure 7 shows 69 percent of women got information from consumers, family, and friends, 66.70 percent from market research, 24.10 percent from the media, 20.70 percent from professional advice, and 13.80 percent from employees.



Figure 8 shows 70 percent of women confront competitive stress, 50 percent face financial stress, 40 percent face customer or client demand stress, 26.70 percent face family strain, 23.30 percent encounter supplier concerns, and 3.30 percent face employee conflict.
Limitations and Conclusions

The survey looked at 300 female entrepreneurs, 20% of them work in the beauty industry, 20% in the service industry, and 16.67% in the jewellery industry. 36.70 percent of women went into company to supplement their family's income and to realize their aspirations, while 26.60 percent went into business to become self- sufficient. According to the poll, 66.70 percent of women claim they are hardworking and better at interacting with people, 60 percent say they are better at in-depth thinking, and 53.30 percent say they are more likely to seek and listen to advice than males. Women believe that the government should favor female entrepreneurs over male entrepreneurs as they're more committed to making them self-sufficient, promoting female entrepreneurs, and reducing prejudice.

During the start-up stage of their business, the majority of women entrepreneurs rely heavily on personal funds. Bank loans and grants are only used in a few instances. Most women find it tough to balance job and family life since they do not have enough time to spend with their loved ones. Business is always conducted in a tumultuous environment. Profit and loss are both possibilities.

Women entrepreneurs are frequently hesitant to take significant risks in their businesses. Women have a hard time surviving in this cutthroat environment. In India, entrepreneurship is still regarded a maledominated sector. Women are subjected to numerous forms of discrimination as a result of their gender. The drawback is that data is collected using convenience sampling, which excludes women entrepreneurs from all around India.

References

- https://www.emerald.com/insight/content/doi/10.1108/13552551311 299 288/full/html.
- https://repository.iimb.ac.in/bitstream/2074/12092/1/Nagadevara_JI BE_2 009_Vol.9_Iss.1.pdf.
- 3. https://iaeme.com/MasterAdmin/Journal_uploads/IJMET/VOLUME

_9_ISSU E_1/IJMET_09_01_043.pdf.

- BİLGİLİ Bilsen, CANDAN Burcu, ÖZKUL Emrah, GÜVEN Tayfun (2016), The Differences Between the Attitudes of Male and Female Entrepreneurs in Forming Consumer Based Brand Equity, International Journal of Global Business, Vol. 9(2), pp. 1-19.
- Boz Anıl and Ergeneli Azize (2014), Women entrepreneurs' personality characteristics and parents' parenting style profile in Turkey, Procedia-Social and Behavioral Sciences Vol. 109, pp. 92-97.
- Hashima Fuzirah, Amirb, Zaini, Razakc Abd Norizan (2011), Empowering rural women entrepreneurs with ICT skills: an impact study, Procedia Social and Behavioral Sciences, Vol. 15, pp. 3369-3373.
- Kogilah Narayanasamy (2011), An Empirical Study of Factors Influencing Gender Differences in Entrepreneurship, International Business & Economics Research Journal, Vol. 10(10).
- Sunita Ramam Rupavataram (2014), An exploration of androgyny in Indian women entrepreneurs, Procedia-Social and Behavioral Sciences, Vol. 133, pp. 304-309.
- 9. https://acadpubl.eu/hub/2018-119-17/2/154.pdf.



Innovation Techniques used by Food and Beverage Industry on Social Media for Sustainable Development

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Abstract

Sustainable development, in specific terms is development that reaches the requirement of the present without accommodating the ability of future generations to reach their own needs.

The phenomenon of sustainable development has occurred in food and beverage industry on social media. Innovation techniques is examined as a vital source of economic growth that can assist rural areas develop and become more viable. The aim of the study is to analyse the entire research about innovation techniques used by food and beverage industry on social media for sustainable development and the factors that influence the food and beverage industry on social media. A sample of 130 respondents is taken and is analysed. A well designed questionnaire was prepared and is analysed with the help of pie charts, and bar diagrams. This study suggests that the main motive of innovation techniques is to develop the new technologies that focuses on the growth of productivity and produce greater output.

Keywords: Sustainable Development, Social Media, Innovative Techniques, Food andBeverage Industry.

Introduction

Sustainable Development has become a contentious topic in today's world. Sustainable development is the systematic process for achieving the human development goals.

Sustainable development plays an important role in enhancing and conserving the resources. Sustainability is a continuous process that acknowledges that the natural systems are necessary to provide economic needs. Sustainable development is essential for protecting and managing the natural resources. Also, sustainable development helps us in integrating the economic development, social development and environmental protection. The need for sustainable development focuses more on production and consumption. Sustainable development also plays a major role in the business corporation as it helps into decision making process that leads to significant financial advantages.

Sustainable development aims to define the different strategies merging the economic, social and environmental features of human activity. Sustainable development is all about prolonged preservations of energy and resources rather than absorbing them for short term period. Sustainability encourages us to preserve and intensify the resources by enhancing the new technologies. The concept of the sustainable development focuses on the role of the environment as an asset, if enervated, then it cannot be replaced.

India is one of the largest producers of food and dairy products. Food and Beverage sector come up with an appreciable deal to the profit in conviviality industry. The main motive of the food and beverage industry is to prepare, present and serve to the customer.

Innovation is the necessary part of the food and beverage industry. Food innovation is the evolution and commercialisation of new food products, process and services. Innovations are a vital source for enhancing the profitability and productivity of industries. Food and beverage industry is all about processing of raw food materials, packaging and distributing them. Sustainable development in the food industry can be a positive affect for the decline of food resources. The food and beverage industry is vital to human health and life.

Sustainability is explained by food and beverage market as "the business implementation and plan of action that encourages the deep rooted welfare of the environment, society, and crux". In contradistinction, "green" enterprises are only to mark the environmental effects of processand products.

The food market executive vigorous work to enhance the consumers understanding through their assistance. These industries are providing helping hand to the customers by delivering of food and beverage as their preferred location or at the customers intended premises.

Innovation has become the new buzzword across the world. Innovation is described as the initiation of a brand new scheme into the market place in the configuration of fresh product, legacy or facility or development in the firm and procedures.

Also, social media plays an important role in enhancing the innovative techniques. By using social media people are getting to know more about the innovative techniques which are used by these industries. Also, people are more keen to know about the impact of these innovativetechniques on the quality of food.

Innovations plays an important role in the process of economic growth as it provides us with new technologies and ideas. Innovative techniques also helps organisations to stay pertinent in the competitive market. Also, innovations are the basic reason for the modern existence.

Innovation is also necessary for the elevation of society because it operates many social problems and encourage enhancement to society's capacities. Innovation is an important tool for the development of the economy. Innovative technologies is considered as a utmost source for the growth of the economy. The main purpose of innovative techniques is to develop new ideas and technologies that increases the productivity of the economy. Therefore, innovative techniques is examined as a vital source of economic growth that can assist rural areas to develop and become moreviable.

Literature Review

Gabriella Arcesa, Serena Flammini, Maria Caludia Lucchetti and Olimpa Martucci(2014): The main objective of this research is that the food industry is facing a persistent increase of competitiveness. The aim of this research is to evaluate the open sustainability approach. This paper focuses on the enlargement of attention towards the environmental and social economic issues. The sustainable development samples offers a rational image of a company with its business partners and customers. The food system has a powerful influence on the climatic changes, agricultural process, retailing, food preparations and wastes. This study states that the integration of open innovation and sustainability for food sector represents the vital challenges.

Juan Gabriel Martinez Navalon, Vera Gelashvili, and Felipe Debasa (2019): The basic purpose of this research is to analyse the sustainability in food and beverage companies in Spain on social media marketing. This paper was analysed to determine the variables, like acceptance, assurance, grasped and continence purpose to influence the environmental sustainability. This paper focuses on the relationship between the sustainable marketing and social media. This study aims at the pertinent of environmental sustainability for both the society and the companies. This study states that food and beverage sector are attainable to alltypes of the users.

Francesco Cappa, Fansto Del Sette, Daren Hayes, and Federica Rosso (2016): This research analyses that social media can assist sustainability as a vital tool. The aim of this study is to develop and deliver more sustainable development and to provide opportunities towards the open sustainable innovation. The demand for sustainable marketable products has been increased because of the dynamic needs of the customers towards the new laws. The main objective of this paper was to analysed the actual evidence for the economic attainability, increased sustainability and the technical applicability. Therefore, this research aims at the opportunity to furnish the market with the cheaper products.

Marian Garcia Martinez, Valentina Lazzarotti and Raffaella Manzini, Mercedes Sanchez Garcia (2014): The main purpose of this paper is to allure the attention of the academic world into innovation business. The aim of this paper is towards the innovation association for the benefits of open innovation. The main purpose of this study is to investigate the antecedent of openness and the influence innovation performance on open behaviours. The utmost considered perspective is the direction of openness. This study furnish the necessary managerial suggestions as they furnish a guide towards greater openness.

Suraya Hamid, Mohamad Taha Ijab, Hidayah Sulaiman, Rina Md Anwar (2017): This research was analysed to identify the role of social media for environmental sustainability in higher education. This study proved that environmental sustainability perception is one of the essential element for the environmental inclination and detectable changes in the natural environment. The diversity of social media accessible in the technology furnish the options for higher education. The study aims to provide a healthier quality life message constant to the benefit of social media. The main objective of this research is to discover the use of social media for generating awareness in the ambience of higher education. This suggest that higher education needs to be entirely anchorage the pervasiveness of social media to extend sustainability. Therefore, there is a huge potential on regarding the social media to be perfectly anchorage to satisfaction of the environmental sustainability.

Yulin Chen (2019): The aim of this research is to analysed the sustainability on social media. The paper states that sustainability is growing rapidly. The study concluded that the content of social media is mainly gathered from different websites and social media platforms. The main purpose of this paper is to recognised the image of culture-creativity in a manner to make the depiction alluring to people. Also, this study mainly focuses on the content of sustainable development on social media for their brands.

Dr. M. Arockia G. Ruban (2014): This study focuses on the education system. Innovative methods have become important for education system. The main objective of this paper is not only to become literate but also to add rationality, analytical, understanding and self confidence. This paper aims not only at educational institutions but also to entitle people to achieve the human development goals. The main objective of this paper is to assess the various traditional methods of teaching.

Significance

Significance of sustainable development is essential, not only in India but in the whole world. The study was conducted to analyse the impact of innovative techniques used for food and beverage industries. Sustainable development in the food industry can be a positive affect for the decline of food resources in whole world. The food and beverage industry is vital to human health and life, because it plays an important role in enlarging the economic opportunities. This study adds to the understanding of the innovative techniques as it involves connections, exploration, and perceiving opportunities. The importance of innovation techniques is that it is, in essence about creating changes that add value to one's life.

This study contributes to the development of the food and beverage industry. This shows that how social media can affect the sustainable development and what impact does social media have on food and beverage industry.

Objectives of the Study

The objective of this research is to uncover some facts about the innovative techniques used for food and beverage industry on social media for sustainable development. This study depends upon the following objectives:

- To study the relevance of social media for sustainable development.
- > To study the innovative techniques utilized by food and beverage industry forsustainable development.
- To study the goals of sustainable development with the COVID effect.

Research Methodology

Scope of The Study

This study aims to get the furnished understanding about the innovative techniques used by food and beverages industry on social media for sustainable development.

Data Types

Primary Data

Primary research involves the data which is gathered for the first time. A well designed questionnaire was draft which was filled by the respondents to collect the primary data. A survey of 130 respondents was taken.

Secondary Data

Secondary research involves the data which has been gathered by somebody else already. The data which is collected by somebody else is known as the "past data" that is attainable from various online and offline sources, past researchers and government records. In distinct to primary data, secondary research is easy. In secondary research the researcher are not involved with collecting the data by their own. Also, secondary research involves re- examining, elucidating, and evaluating the past data.

Although, secondary data also provides one with a sustainable span of professionally accumulated data. This type of data is incredibly to be easily relevant to you.

The research methodology acquired and used in the paper is using both primary and secondary data. The research states the positive impact of the methodology used and giving a better understanding of the food and beverage industry through social media and sustainable development.

Analytical Overview

The survey was conducted among different age groups of people. A sample of 130 respondents is taken and is analysed.



1. Names of social media people are using



Table 1.1: Awareness of Social Media App



Figure 2

Interpretation: A survey of 130 respondents was undertaken, where they were asked to tick the social media app they use. According to analysis, it is clear that majority of respondents use **Instagram** (41.5% consumers).

2. Source from where consumers get information about food and beverages.





Source: Primary Data

Figure 3

Interpretation: The data represents in Table 1.2 represents the information source from where the consumers get the information about food and beverages. The analysis shows that majority of the

Innovation Techniques used by Food and Beverage Industry on Social Media for Sustainable Development consumers knows about a Brand through the Advertisements.

3. Effect of innovative techniques on COVID



Table 1.3: Different Media Approach



4. Contribution of technology in sustainable development.

Table 1.4: Consumers Satisfaction Disclosure



Interpretation: Information given in FIGURE 5 shows that, the majority of consumers thinks that may be technology contributes to the sustainable development. It helps people to get aware about certain innovations that aims to precursor sustainable development

5. Brands which consumers are using.



Table 1.5: Users of Different Brands



Interpretation: The information in Table 1.5 shows that among different brands which brand majority of the consumers are using. From the analysis it is clear that majority of consumers are using **AMUL** followed by **HALDIRAM** and **NESTLE INDIA**.

6. Satisfaction of consumers with the brand they are using.

Table 1.6: Consumer's Satisfaction



Figure 7

Innovation Techniques used by Food and Beverage Industry on Social Media for Sustainable Development **Interpretation:** Information given above clearly shows that **99.2%** of the consumers are satisfied with the brand they are using. Only **0.8%** consumers are not satisfied with the brandthey are using.

7. Attributes that attract the consumers to purchase the particular product.



Table 1.7: Consumers Satisfaction Disclosure



Interpretation: From the above analyses it is clearly seen that the attribute that attract the consumers is **QUALITY**. Accordingly, **QUALITY** is the main attribute that consumers lookfor.

8. Influence of social media on buying food and beverage products.

Table 1.8: Customers Revelation



Interpretation: From the above given analyses, it is shown that social media has an influence on the buying decision of customers for food and beverage products. From the analyses **63.8%** consumers decision rely on social media.

9. Can COVID 19 spread through food and beverages product.



Table 1.9: Different Analyses

Figure 10

Interpretation: Many of us have this question does **COVID** can be spread through food and beverages products. So, from the above analysis **COVID** can be spread through food andbeverages.

10. Can social media affect sustainability

Table 1.10: Customers Disclosure



Innovation Techniques used by Food and Beverage Industry on Social Media for Sustainable Development **Interpretation:** According to the analysis, yes social media affects the sustainability as social media plays a major role in the development of sustainability.

Recommendation

People can be more aware of the companies they can use for food and beverages through social media and can make use of innovative techniques given to them. Also, the food industry should be situated proficiency, proven strategy, reprocessing and intense consideration of market and the challenges.

Sustainability encourages us to preserve and intensify the resources by changing the ways to develop and utilise the technologies. The major focus of food and beverages companies should not only on the alluring, attainability, exhilarating, and idiosyncratic but also on feasibility.

Considering the findings of the current study, it can be suggested that innovation techniques plays a major role for the development of food and beverage industry.

Conclusion of the Study

This study ceased that sustainable development is all about people, their happiness, comfort and valuation in their relationships with each other. Social media plays an important role in the reduction of poverty by mobilizing the ability of facts to raise public awareness and relationships.

The social media plays a pivotal role in training and making solitary, association and society responsive about sustainable development. The need for sustainable patterns focuses more on production and consumption, and stimulating them to take precautionary actions directed towards the change and for more sustainable future. This study suggests that the main motive of innovation techniques is to develop the new technologies that focuses on the growth of productivity and produce greater output.

The expansion of food and beverage industry are enhancing to the intramural idea of development by chasing an "open innovation" approach. Innovative techniques are necessary for the survival and for enhancement of the productivity. Innovation plays a significant role in the profitability of food and beverage industry. Therefore, innovative techniques are considered as an origin of the new ideas which generates the nation's economic growth.

The findings of the study will help the researcher and academicians in understanding the impact of food and beverage industry on social media by innovative techniques.

References

- Martinez, M. G., Lazzarotti, V., Manzini, R., & García, M. S. (2014). Open innovation strategies in the food and drink industry: Determinants and impact on innovation performance. International Journal of Technology Management, 66(2/3), 212. https://doi.org/10.1504/IJTM.2014.064588
- Arcese, G., Flammini, S., Lucchetti, M. C., & Martucci, O. (2014). Open Sustainable Innovation in the Food Industry. Proceedings of The 4th World Sustainability Forum, g001. https://doi.org/10.3390/wsf-4-g001.
- Martínez-Navalón, J. G., Gelashvili, V., & Debasa, F. (2019). The Impact of Restaurant Social Media on Environmental Sustainability: An Empirical Study. Sustainability, 11(21), 6105. https://doi.org/10.3390/su11216105.
- Hamid, S., Ijab, M. T., Sulaiman, H., Md. Anwar, R., & Norman, A. A. (2017). Social media for environmental sustainability awareness in higher education. International Journal of Sustainability in Higher Education, 18(4), 474-491. https://doi. org/10.1108/IJSHE-01-2015-0010.
- 5. Chen, Y. (2019). The Sustainable Development of Social Media Contents: An Analysis of Concrete and Abstract Information on

Cultural and Creative Institutions with "Artist" and "Ordinary People" Positioning. Sustainability, 11(15), 4131. https://doi.org/ 10.3390/su11154131.

- Cappa, F., Del Sette, F., Hayes, D., & Rosso, F. (2016). How to Deliver Open Sustainable Innovation: An Integrated Approach for a Sustainable Marketable Product. Sustainability, 8(12), 1341. https://doi.org/10.3390/su8121341.
- 7. Dr.M. Arockia G. Ruban (2015), A Study on Innovative Teaching Learning Practices in Colleges in Palayamkottai, Tirunelveli District, Tamil Nadu.



Review on COVID Disease

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Abstract

With the introduction and spread of 2019 novel coronavirus (2019-nCoV), also known as the severe acute respiratory syndrome coronavirus 2, there is a new public health crisis that threatens the entire world (SARS-CoV-2). In December 2019, the virus spread from bats to people via unidentified intermediate species in Wuhan, Hubei Province, China. As of today there have been more than about 96,000 confirmed cases of the coronavirus disease 2019 (COVID-2019) and 3300 confirmed fatalities. The disease has an incubation period of 2 to 14 days and is spread by inhalation or contact with infectious droplets. Common symptoms include a fever, cough, sore throat, shortness of breath, exhaustion, and malaise. Most persons with the disease have a moderate case; however, certain people (typically the elderly and those with concomitant conditions) may develop pneumonia, acute respiratory distress syndrome (ARDS), and multi-organ failure. Many people are asymptomatic. The case fatality rate is estimated to range from 2 to 3%. Diagnosis is by demonstration of the virus in respiratory secretions by special molecular tests. Common laboratory findings include normal/ low white cell counts with elevated C-reactive protein (CRP). The computerized tomographic chest scan is usually abnormal even in those with no symptoms or mild disease. Treatment is essentially supportive; role of antiviral agents is yet to be established. Prevention entails home isolation of suspected cases and those with mild illnesses and strict infection control measures at hospitals that include contact and droplet

precautions. The virus spreads faster than its two ancestors the SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV), but has lower fatality. The global impact of this new epidemic is yet uncertain.

Introduction

The World Health Organization describes Corona virus disease as an infectious illness brought on by a recently identified corona virus. Coronavirus is a severe acute respiratory syndrome known as SARS-CoV-2. It is well known that the Huanan Seafood Market played a role in the earliest instances of COVID-19-related infection that were initially reported in Wuhan, Hubei Province of China in December 2019¹. Since then, 216 countries and territories have contracted the illness. The World Health Organization (WHO) designated COVID-19 to be a pandemic on March 6, 2020, after notifying the public that it had achieved pandemic status on January 30, 2020²⁻³. Since then, it has been described as "the most significant global health catastrophe of the century and the greatest challenge that humankind has faced since the Second World War⁴. There were over 80,500,000 verified COVID-19 cases, 1,700,000 deaths associated with those illnesses, and a 2.2% case fatality rate as of 26 December 2020. The case fatality rate varies between nations, with estimates ranging from 0 to over 20%. Many nations have already seen a second wave of COVID-19 infections, which may be attributable to the early relaxation of international lockdown regulations. A new increase in daily cases higher than the initial wave in March 2020 has been observed in a number of nations. In December 2019, pneumonia brought on by an infection with the SARS-CoV-2 coronavirus first appeared in Wuhan City, Hubei Province, China. The World Health Organization (WHO) will formally refer to the illness brought on by SARS-CoV-2 infection as coronavirus disease by February 11, 2020. (COVID-19). Fever, a dry cough, and exhaustion are the most common clinical symptoms of COVID-19, and pulmonary involvement is frequently evident. Being extremely infectious, SARS-CoV-2 can infect the majority of people in the general population. Currently, the major sources of the illness, which is spread by

respiratory droplets and direct contact, are infected individuals and wild animal hosts. Since the outbreak, the Chinese government and scientific community have moved swiftly to determine the responsible party and quickly revealed the viral DNA sequence⁵.

History

The name "coronavirus" comes from the fact that coronaviruses are enclosed positive sense RNA viruses with spike-like projections on their surface that give them a crown-like look under an electron microscope. Their diameters range from 60 nm to 140 nm. HKU1, NL63, 229E, and OC43 are the four corona viruses that are known to cause mild respiratory illness in people.

In two instances over the past 20 years, human infection with animal betacoronaviruses has led to serious illness. The first such incident occurred in the Guangdong province of China in 2002–2003 when a novel coronavirus of the genus and with origins in bats infected humans via the intermediary host of palm civet cats. Before it was contained, the severe acute respiratory syndrome coronavirus, which mostly afflicted 8422 people in China and Hong Kong, caused 916 fatalities (mortality rate 11% of cases). Nearly ten years later, in 2012, the Middle East respiratory syndrome coronavirus (MERS-CoV), which is similarly of bat origin, appeared in Saudi Arabia using dromedary camels as the intermediate host, inflicting 2494 cases of illness and 858 fatalities⁶.

Genesis And Spread

Adults in Wuhan, the provincial capital of Hubei and a significant Chinese transportation hub, began presenting to the local hospitals in December 2019 with severe pneumonia of unknown origin. The Huanan wholesale seafood market, which also dealt in live animals, was a source of exposure for many of the earliest cases. In order to conduct etiologic studies, the surveillance system (installed following the SARS outbreak) was activated and patient respiratory samples were transmitted to reference labs. The Huanan Sea Food Market was shut down on January 1st after China informed the World Health Organization of the epidemic on December 31st, 2019. The virus was determined on January 7 to be a coronavirus with >95% homology to the bat coronavirus and >70%similarity to the SARS-CoV. A positive test result for the virus was also obtained from environmental samples taken from the Huanan sea food market⁷. There was an exponential rise in the number of cases, some of which had no contact with the live animal market, pointing to the possibility of transmission from person to person. On January 11th, 2020, the first fatal case was reported. The massive migration of Chinese during the Chinese New Year fuelled the epidemic. Cases in other provinces of China, other countries (Thailand, Japan and South Korea in quick succession) were reported in people who were returning from Wuhan. Transmission to healthcare workers caring for patients was described on 20th Jan, 2020. By 23rd January, the 11 million population of Wuhan was placed under lock down with restrictions of entry and exit from the region. Soon this lock down was extended to other cities of Hubei province. Cases of COVID-19 in countries outside China were reported in those with no history of travel to China suggesting that local human-to-human transmission was occurring in these countries⁸.

Airports in many nations, including India, have screening procedures in place to identify symptomatic individuals returning from China, isolate them, and test them for COVID-19. It soon became clear that the infection might spread from asymptomatic individuals as well as before the onset of symptoms. Therefore, all individuals with symptoms or not in isolation for 14 days were tested for the virus in countries like India that evacuated their residents from Wuhan through special aircraft or had travellers returning from China.

Cases kept growing exponentially, and modelling studies indicated that the epidemic would double in size in 1.8 days⁹. In reality, China revised its definition of confirmed cases on February 12th to include patients with negative/pending genetic testing but with clinical, radiologic, and epidemiologic markers of COVID-19, which caused a 15,000% rise in cases in a single day. As of 05/03/2020, there have been 96,000 cases reported across the globe (80% in China), 87 other nations, and 1 international conveyance (696 in the cruise liner Diamond Princess,

which is berthed off the coast of Japan) [2]. It is crucial to remember that while the number of new cases has recently decreased in China, they have drastically surged in other nations such as South Korea, Italy, and Iran. 20% of those infected are in serious condition, 25% have made a full recovery, and 3310 have passed away (3013 in China and 297 in other nations). India, which had only reported 3 cases up until February 3, 2020, has also experienced a significant increase of cases. 29 instances had been reported as of 5/3/2020, the majority affecting Italian visitors and their contacts in Delhi, Jaipur, and Agra. One incident included an Indian who returned from Vienna and exposed numerous schoolchildren at a birthday party held at a hotel in the city. A large number of these cases' contacts have been placed in quarantine.

Due to limitations in surveillance and testing, these figures may be an undercount of the sick and deceased. Although the SARS-CoV-2 was first found in bats, it is unknown whether species served as the SARS-intermediary CoV-2's in its transition to humans⁹.

Pathogenisis

Beta-coronavirus has great species specificity, like the majority of other coronaviruses, yet minute genetic alterations can significantly modify their tissue tropism, host range, and toxicity. SARS-CoV and MERS-CoV, respectively, have bats as the natural reservoir and humans as the terminal host, while palm civet and dromedary camel functioned as the intermediate hosts. Since they can promote greater contact between a virus and a new host and allow for further modification needed for an efficient replication in the new host, intermediate hosts unquestionably play a crucial role in cross-species transmission. SARS-CoV-2 has the potential to spread globally, making thorough surveillance crucial to track its potential host adaptation, viral evolution, infectivity, transmissibility, and pathogenicity.Numerous molecular interactions, including receptor interaction, control a virus's host range. Despite amino acid differences at certain crucial positions, the envelope spike (S) protein receptor binding domain of SARS-CoV-2 was shown to be structurally comparable to that of SARS-CoV. Additional in-depth structural analysis strongly supports that SARS-CoV-2 may enter cells via the host receptor angiotensin-converting enzyme 2 (ACE2).Alveolar type 2 (AT2) pneumocytes, pulmonary cells that synthesise pulmonary surfactant, and the airway epithelium can both be infected by SARS-CoV thanks to the same receptor. The coronavirus spike protein is typically classified into the S1 and S2 domains, where the S1 domain is in charge of receptor binding and the S2 domain is in charge of cell membrane fusion. While the majority of the bat-derived viruses displayed greater variance, the S1 domain of SARS-CoV and SARS-CoV-2 share about 50 conserved amino acids¹⁰.

Additional evidence that SARS-CoV-2 has developed the ability to spread from person to person comes from the discovery of three critical residues (Gln493 and Asn501) that govern the binding of the SARS-CoV-2 receptor binding domain with ACE2. SARS-CoV-2 is more closely linked to bat-SL-CoVZC45 and bat-SL-CoVZXC2 at the whole genome level, despite the fact that the spike protein sequence of receptor-binding SARS-CoV-2 is more comparable to that of SARS-CoV.However, there are other factors that contribute to species specificity besides receptor recognition. SARS-CoV-2 enters host cells right after attaching to their receptor, where they are met by the innate immune response. It is necessary for SARS-CoV-2 to be able to suppress or avoid host innate immune signalling in order to successfully infect the new host. The mechanism by which SARS-CoV-2 circumvents the immune system and promotes pathogenesis, however, remains largely unknown. SARS-CoV-2 may have a similar pathogenesis mechanism to SARS-CoV given that COVID-19 and SARS have many of the same clinical characteristics. The type I interferon (IFN) system stimulates the production of IFN-stimulated genes (ISGs) to prevent viral replication in response to SARS-CoV infections. SARS-CoV encodes at least 8 viral antagonists that control the generation of IFN and cytokines and circumvent ISG effector function in order to counteract this antiviral action. To prevent viral replication and spread, the host immune system must react to viral infection by mediating inflammation and cellular antiviral activity. However, pathogenesis is brought on by overzealous

immune reactions and lytic effects of the virus on host cells. According to studies, individuals with severe pneumonia frequently present with fever and a dry cough at the beginning of their illness. Acute Respiratory Stress Syndrome (ARDS) and septic shock caused some patients to deteriorate quickly. This was finally followed by multiple organ failure, and roughly 10% of patients died. Further evidence that ACE2 might be a point of entry for the SARS-CoV-2 is the progression of ARDS and the extensive lung damage in COVID-19. ACE2 is known to be abundantly present on ciliated cells of the airway epithelium and alveolar type II (cells), which are pulmonary cells that synthesise pulmonary surfactant in humans. Inflammatory damage patterns in SARS and COVID-19 patients are comparable¹¹. Proinflammatory cytokines (e.g., interleukin (IL)-1, IL-6, IL-12, interferon gamma (IFN), IFN-induced protein 10 (IP10), macrophage inflammatory proteins 1A (MIP1A), and monocyte chemoattractant protein-1 (MCP1)) with pulmonary inflammation and severe lung damage are found in higher concentrations in serum from SARS patients. Similar to SARS-CoV-2 patients, healthy persons are found to have lower plasma levels of proinflammatory cytokines like IL1, IL-2, IL7, TNF-, GSCF, and MCP1.Importantly, patients in the intensive care unit (ICU) have much greater levels of GSCF, IP10, MCP1, and TNF- than do patients who are not in the ICU, which raises the possibility that a cytokine storm is the root cause of the severity of the condition. Unexpectedly, antiinflammatory cytokines including IL10 and IL4 were also elevated in those patients, which was an unusual occurrence for a viral infection in the acute phase. As previously mentioned, another intriguing finding was that SARS-CoV-2 has been found to predominately infect older adult males, with very few cases being reported in minors. The same pattern was shown in SARS-CoV primate models, where it was discovered that older Cynomolgus macaques were more susceptible to infection than young individuals. To determine the SARS-CoV-2 virulence factors and host genes that enable the virus to pass the speciesspecific barrier and cause fatal disease in humans, more research is required¹².

Treatment

Antiviral medicines have been approved by the FDA to treat mild to moderate COVID-19 in those who are more likely to get seriously ill. Antiviral medications target particular virus components to prevent them from proliferating in the body and causing serious sickness or death. Healthcare professionals can use the COVID-19 Treatment Guidelines from the National Institutes of Health (NIH) to collaborate with their patients and choose the most appropriate course of action. You should be aware that some therapies may cause negative effects or interact with other medications you're taking. Identify the best COVID-19 treatments for you by consulting a medical professional¹³.

Clinical Plasma a medication known as convalescent plasma may be helpful for some COVID-19 patients who are immunocompromised or receiving immunosuppressive therapy. Whether this treatment is appropriate for you can be decided in consultation with your healthcare professional. therapy for COVID-19 symptoms. The majority of COVID-19 patients have a mild sickness and can recover at home. In order to relieve your symptoms and make you feel better, you can use over-the-counter medications like acetaminophen (Tylenol) or ibuprofen (Motrin, Advil). The hunt for medications and vaccinations to treat or prevent COVID-19 got underway rapidly, but there is a chance that the trials may lack statistical rigour because to the large number of smallscale, independently conducted investigations. In order to compare four (remdesivir, potential therapies lopinavir/ritonavir, lopinavir/ ritonavir/interferon beta-1a, and chloroquine or hydroxychloroquine) to standard of care in 18 nations throughout the world, WHO has started a non-blinded clinical trial called SOLIDARITY. The Discovery study, which will include 3200 patients from Belgium, France, Germany, Luxembourg, the Netherlands, Spain, Sweden, and the United Kingdom, will compare the same medications with routine therapy. Results will be evaluated after 15 days in a non-blinded, randomised study. A experiment that purported to demonstrate effectiveness with azithromycin and hydroxychloroquine gained much publicity in the lay media. This study's findings have been contested and it has significant

methodological faults. In addition, there is a higher risk of QT prolongation with this combination. The combination lopinavir/ritonavir viral protease inhibitor formulation was shown in a controlled study to be unsuccessful¹⁴.

Conclusion

The economic, medical, and public health infrastructure in China as well as, to some extent, in other nations, particularly its neighbours, has been put to the test by this recent viral outbreak. How the virus will affect our life here in India will only become clear with time. Furthermore, zoonotic virus and disease outbreaks are expected to persist in the future. Therefore, in addition to containing current outbreak, efforts should be undertaken to develop comprehensive strategies to avert outbreaks of zoonotic origin in the future.

References

- 1. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan China. Lancet. 2020;395(10223):497-506.
- WHO. Coronavirus disease (COVID-19) pandemic. [Cited 2021 March 19]. Available from: https://www.who.int/emergencies/ diseases/novel-coronavirus-2019.
- Mahase ECOVID-19. WHO declares pandemic because of "alarming levels" of spread, severity and inaction. BMJ. 2020; 368:M1036.
- Xinhua. China's CDC detects a large number of new coronaviruses in the South China seafood market in Wuhan. Available at: https://www.xinhuanet.com/2020-01/27/c_1125504355.htm. Accessed 20 Feb 2020.
- Rothe Camilla, Schunk Mirjam, Sothmann Peter, Bretzel Gisela, Froeschl Guenter, Wallrauch Claudia, Zimmer Thorbjörn, Thiel Verena, Janke Christian, Guggemos Wolfgang, Seilmaier Michael, Drosten Christian, Vollmar Patrick, Zwirglmaier Katrin, Zange Sabine, Wölfel Roman, Hoelscher Michael. Transmission of 2019-

nCoV Infection from an Asymptomatic Contact in Germany. *New England Journal of Medicine*. 2020; 382(10):970-971.

- Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med. 2020.
- Worldometer COVID-19 Coronavirus Pandemic. [Cited 2021 March 19]. Available from: https://www.worldometers.info/coronavirus/ [Google Scholar]
- CDC. 2019 Novel Coronavirus, Wuhan, China. CDC. [Cited 2021 March 19]. Available from: https://www.cdc.gov/coronavirus/2019ncov/about/index.html.
- 9. Sorci G, Faivre B, Morand S. Explaining among-country variation in COVID-19 case fatality rate. Sci Rep. 2020;10(1):18909.
- Yan-Rong G, Qing-Dong C, Zhong-Si H, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak-an update on the status. Mil Med Res. 2020; 7:11.
- 11. Middle East Respiratory Syndrome Coronavirus. Available at: https://www.who.int/emergencies/mers-cov/en/.
- 12. 1056/NEJMoa2001316.
- WHO. WHO Director-General's opening remarks at the media briefing on COVID19. [Cited 2021 March 19]. Available from: https://www.euro.who.int/en/health-topics/health-emergencies/ coronavirus-covid-19/news/news/2020/3/who-announces-covid-19outbreak-a-pandemic.
- World Health Organization. Situation reports. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-20 19/situation-reports/. Accessed 22 Feb 2020.



Soil Stabilization with Bitumen Emulsion and Cement

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Abstract

Structural stability of the constructed buildings on earth surface is governed by the structural integrity associated with the sand and stone framework, by the silt capability of the pore filling and significantly, by the clay binding qualities that are actually dependent upon the wet content of the soil. An engineer in geotechnical field, can work with soil, that carries with it the complete thickness of the earth's crust. Clay may be a reasonably cohesive soil, that is incredibly weak, and further decrease in its strength can occur by the water content within the soil or influence of climate. On the other hand, an organic clay is the clay soil which contains a required quantity of organic matter to have an effect on its engineering properties. Strength or load bearing capability of any organic clay is less due to presence of high organic matter. This can be due to presence of harmful materials like humid substance and humates in organic matter. Various materials having cementitious properties like Bitumen Emulsion (B.E.) have proved to be potential modifier/stabilizer for the improvement

and stabilization of soils. B.E. is made within the oven throughout the assembly of cement clinker. B.E. disposal is associated with major environmental drawbacks. It's better to use B.E. with its reincorporation within the production. It requires the control of concentrations of alkalis and chloride. The employment of this material has received increasing attention as it additionally provides another stabilizing agent to be used. To insure a clean and hazard free environment, the responsible management of industrial by-product and waste materials is required. Dramatic advancements have been targeted over the past several years in the production, management and usage of B.E., so as to reduce its dependence on disposal in landfills. The cornerstone of the cement industry is Sustainability that must be not only in its process of manufacturing, but also in the products that use it. it will find lasting solution to the failure of road due to weak sub-base and base arising from substandard construction materials used by encouraging the use of Bitumen Emulsion for soil improvement without incurring excessive cost in the construction industry, hence justifying the reason for this research.

Introduction

Earth surface has been continuous in use for construction since long time ago across the globe with span of various climate regions and cultures. Actually, Earth may be a multi-component system typically comprising of stones, clay, sand, silt, water and organic humus close to the bottom. Structural stability of the constructed buildings on earth surface is governed by the structural integrity associated with the sand and stone framework, by the silt capability of the pore filling and significantly, by the clay binding qualities that are actually dependent upon the wet content of the soil. In comparison to some materials used for construction, earth or earthy soil are often thought of to possess some drawbacks-it's comparatively low compressive strength, lastingness and resistance to abrasion. It should additionally lessen loads of its rigidness within the availability of moisture. However, it's the bottom, terribly wide obtainable, environmentally friendly, powerfully coupled with skilled construction practices, will contribute considerably to the aesthetics of buildings and comfort felt by users. Smart quality and sturdy earth buildings are often engineered if due precautions are considered. The required precautions can rely upon native conditions and structural needs, however will generally be of four types [1-5]:

- Selection of soil: Completely different soils will exhibit terribly different characteristics. The building standard of a soil for is associated with distribution of grain size and therefore the humus exclusion.
- Preparation of Soil and methods of construction: Builders ought to be acquainted with pulverizing, mixing, proportioning, maturing and masonry methods.
- Style of Building: The design ought to realize the material properties by applicable distribution of load and dimensions of the structures, and by incorporation of the protecting components from rain, dampness, abrasion and impact force. Protection can be achieved by addition of additional sturdy materials at places like the base of wall, roof overhanging portion say by treatment with renders and plasters.
- Improvement of the quality of the raw material: Addition of some particular additives, conjointly referred to as stabilization, will alter the soil properties to regulate their shrink and swell characteristics and then result in improvement of the clay binding ability within the soil.

Generally, the issues faced by geotechnical engineers at the site are that the raw material properties generally cannot achieve the specified requirements. The issues are unremarkably enquired by soft soil like organic clay. Nature of soil is complicated and has varying composition in terms of material and ordinarily soil is incompatible to the construction needs either in whole or partly. Generally, clays possess high compressibility and low strength. Several areas may be sensitive, in terms of reduction in mechanical strength. Thus, the development over clay soil could result in failure of bearing capability attributed to its less shear strength. Hence, clay soil must be improved before carrying out any construction works. The necessity of a decision arises under consideration whether or not to make use of the desired design and actual material present at the site to spare by its actual quality or; to interchange the positioning material by substitution with the superior one or; produce a replacement site material suiting the quality demand by altering the existing material properties that is referred to as stabilization of soil. The undesired soil replacement by appropriate foreign filling materials is one in all the standard options. But this technique is of course terribly pricey particularly once a thick layer is encountered [6-9].

Materials & Methodology

The effect of addition of B.E. in sand mixture will be considered in this study using the following variables:

- ▶ Percentage of B.E. as ratio to sand used (10%, 15% and 20%).
- ▶ Percentage of Cement as ratio to B.E. used (2.5%).
- > Testing period of mixtures (0, 7, 14, and 28 day).

Three mixes (Mix (1), Mix (2) and Mix (3)) with three different types of B.E. (10%, 15% and 20% by weight of sand) will be used in this study for single additive as follows:

- 1. Mix. (1) sand: 10% B.E. (10% of sand weight)
- 2. Mix. (2) sand: 15% B.E. (15% of sand weight)
- 3. Mix. (3) sand: 20% B.E. (20% of sand weight)

The other mixes will be prepared for double additive as indicated below:

- Mix. (4) sand: 10% B.E. (10% of sand weight): 2.5% Cement (2.5% of B.E. weight)
- 2. Mix. (5) sand: 15% B.E. (15% of sand weight): 2.5% Cement (2.5% of B.E. weight)
- Mix. (6) sand: 20% B.E. (20% of sand weight): 2.5% Cement (2.5% of B.E. weight)

The soil will be tested for the parameters discussed ahead.

Result and discussion

Atterberg Limit

The amount of content water added in soil at limiting soil behavior is called Atterberg limit [10]. The Atterberg limit tests results are shown in table below. Liquid limit (LL) of the organic soil was found to be 53.5% as represented in Figure 1.

Sample No.	Penetration (Average) (mm)	Mass of container and wet soil (gms)	Mass of container and dry soil (gms)	Container mass (gms)	Moisture mass (gms)	Dry soil mass (gms)	Moisture content (%)
1	21.29	21.96	19.8	10.88	4.16	8.04	51.98
2	23.12	27.66	23.06	17.02	3.13	6.92	49.68
3	23.66	39.34	33.21	25.49	4.29	8.95	52.25
4	17.73	16.17	12.01	6.87	3.01	5.84	48.39

Table 1.Liquid Limit results

Moisture content (Average) = 53.5%



Figure 1.Liquid Limit Test

Sample no.	Mass of container and wet soil (gms)	Mass of container and dry soil (gms)	Container Mass (gms)	Moisture Mass (gms)	Dry soil Mass (gms)	Moisture Content (%)
1	11.58	11.18	10.58	2.75	1.56	33.27
2	11.07	10.66	9.12	1.35	1.27	40.36
3	11.27	10.84	9.02	1.63	1.23	37.96
4	11.07	10.51	8.88	1.32	1.01	34.61

Table 2.Plastic Limit Test

Average Plastic Limit = **36.5%**

The plastic limit (PL) results from oven-dried sample were obtained as 36.5%, these results show the moisture content at which soil changes its plastic state to its brittle state. The amount of water content at which the soil is at plastic state is called the Plasticity index (PI). The difference between the liquid limit and the plastic limit is the plasticity Index of the soil. PI is given by PI = LL – PL which is numerically calculated and found as 17.0%.

The soil needs to be stabilized with stabilizing agent as the value of PI comes out to be more than 10. In this study the clay is stabilized with Bitumen Emulsion or/and in presence of Cement.

Specific Gravity

The weight-volume relationship can be effectively determined by the average specific gravity test. The specific gravity is the ratio between the water and unit masses of soil particles [11-13]. The specific gravity average value was found to be 2.39. The specific gravities of other samples were also calculated by the same process and the results obtained are as follows.

Sr. no.	Sample Type	Specific	
		Gravity	
1	Soil Only	2.39	
2	1sand : 10% B.E. (10% of sand weight)	2.94	
3	1sand : 15% B.E. (15% of sand weight)	2.96	
4	1sand : 20% B.E. (20% of sand weight)	2.7	
5	1sand : 10% B.E. (10% of sand weight) :	2.72	
	2.5% Cement (2.5% of B.E. weight)		
6	1sand : 15% B.E. (10% of sand weight) :	2.78	
	2.5% Cement (2.5% of B.E. weight)		
7	1sand : 20% B.E. (10% of sand weight) :	3.15	
	2.5% Cement (2.5% of B.E. weight)		

Table 3.Soil Specific Gravity

Particle Size Distribution

Based on the wet sieving analysis, the soil used in this research consists of 5.71% sand and 78.29% of fines (57.51% of silt and 20.78% of clay). Therefore, this soil is suitable to be stabilized with Bitumen Emulsion as it is categorized as fine-grained soil [14]. Furthermore, the percentage of clay is more than 10%, thus meet the requirements for cement kiln stabilization.

Sieve size (mm)	Mass retained (g)	Percentage retained (%)	Cumulative % passing
5	0	0	100
3.35	0	0	100
2	0.289	4.4	95.6
1.18	0.453	6.31	89.29
0.6	0.662	2.1	87.19
0.425	0.328	3.19	84
0.3	0.28	0.51	83.49
0.212	0.208	0.24	83.25
0.15	0.163	0.45	82.8
0.063	0.678	0.11	82.69
0.063	0.145	4.4	78.29

 Table 4.Sieve analysis of soil

Sieve size (mm)	Mass percentage (%)	Classification
2	95.6	Sand = 5.71
0.425	84	Silt/Clay =78.29
0.063	78.29	Silt = 57.51
0.002	20.78	Clay = 20.78

Table 5. Classification of soil on the basis of sieve analysis

Standard Proctor Compaction Test

Table 4.6 shows a result of compaction test performed on clay soil, cement kiln stabilized clay soil, and cement kiln stabilized clay with addition of 2.5% Cement [15]. The calculation and compaction curves for all of the samples tested are as shown in tables 4.6-4.12 & figure 4.2-4.8 ahead.

Table 6.Proctor Compaction test results for clay sample only

Description	Sample number	Mass of compacted specimen and mould with base = m ₂ (gms)	Mass of empty mould along with base = m ₁ (gms)	Mass of soil compacted sample = m2-m1 (gms)	Bulk Density of the specimen p=m2-m1 / v (mg/m3)	Moisture Mass = w (%)	Dry Density of specimen p _d = 100p / 100 + w (mg/m3)
Particle	1	5.34	4.07	1.27	1.28	23.86	1.04
density =	2	5.38	3.44	1.94	1.96	27.61	1.54
2.42	3	4.85	2.94	1.9	1.92	39.27	1.38
	4	5.39	3.37	2.02	2.04	32.92	1.54
	5	5.02	3.59	1.43	1.45	45.1	1


Figure 2.Moisture content v/s dry density results for clay sample only

Table	7.Proctor	Compaction	test results	for clav+	- 10% B.E.
				•/	

Description	unit	Particle density = 2.42					
Sample number		1	2	3	4	5	
Mass of compacted	gms	4.95	5.29	5.33	5.39	5.02	
specimen and mould							
with base $=$ m2							
Mass of empty mould	gms	3.74	3.44	3.40	3.37	3.59	
along with base = m_1							
Mass of soil	gms	1.21	1.85	1.93	2.02	1.43	
compacted sample =							
m ₂ -m ₁							
Bulk Density of the	mg/	1.22	1.86	1.94	2.04	1.45	
specimen $\rho = m_2 - m_1 / v$	m^3						
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10	
Dry Density of	mg/	0.98	1.46	1.40	1.54	1.00	
specimen ρ_d = 100 ρ /	m^3						
100 + w							



Figure 3. Moisture content v/s dry density results for clay + 10% B.E.

Description	Unit	Particle density = 2.42					
Sample number		1	2	3	4	5	
Mass of compacted	Gms	4.65	4.7	4.75	4.9	4.56	
specimen and mould							
with base $= m2$							
Mass of empty mould	Gms	3.52	2.98	2.94	2.91	3.1	
along with base = m_1							
Mass of soil	Gms	1.13	1.72	1.81	1.99	1.46	
compacted sample =							
m ₂ -m ₁							
Bulk Density of the	mg/m ³	1.14	1.74	1.83	2.01	1.47	
specimen $\rho = m_2 - m_1 / v$							
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10	
Dry Density of	mg/m ³	0.92	1.36	1.31	1.51	1.02	
specimen ρ_d = 100 ρ /							
100 + w							

Table 8. Proctor Compaction test results for clay and 15% B.E.



Figure	4.Moisture	content	v/s dry	v densitv	results	for cla	v + 3	15%	B.E.
					1 0 0 01 00				

Description	Unit	Particle density = 2.42					
Sample number		1	2	3	4	5	
Mass of compacted	Gms	5.14	5.19	5.23	5.29	4.24	
specimen and mould							
with base $=$ m2							
Mass of empty mould	Gms	4.07	3.44	3.4	3.37	3.01	
along with base = m_1							
Mass of soil	Gms	1.07	1.75	1.83	1.92	1.23	
compacted sample =							
m ₂ -m ₁							
Bulk Density of the	mg/m ³	1.08	1.77	1.85	1.94	1.24	
specimen $\rho = m_2 - m_1 / v$							
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10	
Dry Density of	mg/m ³	0.87	1.39	1.33	1.46	0.86	
specimen ρ_d = 100 ρ /							
100 + w							

Table 9. Proctor Compaction test results for clay and 20% B.E.





Table 10.Proctor Compaction test results for clay	and	10%	B.E.	and
2.5% Cement				

Description unit Particle density = 2.42						
Sample number		1	2	3	4	5
Mass of compacted	gms	5.24	5.29	5.33	5.29	3.94
specimen and mould						
with base $= m2$						
Mass of empty mould	gms	4.07	3.44	3.4	3.37	2.92
along with base = m_1						
Mass of soil	gms	1.17	1.85	1.93	1.92	1.02
compacted sample =						
m ₂ -m ₁						
Bulk Density of the	mg/	1.18	1.87	1.95	1.94	1.03
specimen $\rho = m_2 - m_1 / v$	m^3					
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10
Dry Density of	mg/	0.95	1.46	1.40	1.46	0.71
specimen ρ_d = 100 ρ /	m^3					
100 + w						





Table 11.Proctor	Compaction test results	for clay,	15%	B.E.	and
	2.5% Cement				

Description	unit	Particle density = 2.42						
Sample number		1	2	3	4	5		
Mass of compacted	gms	5.24	5.29	5.33	5.29	4.84		
specimen and mould								
with base $=$ m2								
Mass of empty mould	gms	4.07	3.44	3.40	3.37	3.49		
along with base = m_1								
Mass of soil	gms	1.17	1.85	1.93	1.93	1.34		
compacted sample =								
m ₂ -m ₁								
Bulk Density of the	mg/	1.18	1.86	1.94	1.94	1.36		
specimen $\rho=m_2-m_1 / v$	m^3							
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10		
Dry Density of	mg/	0.96	1.46	1.40	1.46	0.94		
specimen ρ_d = 100 ρ /	m^3							
100 + w								



Figure 7.Moisture content v/s dry density results for clay, 15% B.E. and 2.5% Cement

2.5% Cement								
Description	unit	Partic	le densi	ty = 2.42	2			
Sample number		1	2	3	4	5		
Mass of compacted	gms	4.85	4.90	4.85	4.80	4.50		
specimen and mould								
with base $=$ m2								
Mass of empty mould	gms	3.52	2.98	2.94	2.91	3.39		
along with base = m_1								
Mass of soil	gms	1.33	1.92	1.90	1.89	1.11		
compacted sample =								
m ₂ -m ₁								
Bulk Density of the	mg/	1.34	1.94	1.92	1.91	1.12		
specimen $\rho = m_2 - m_1 / v$	m^3							
Moisture Mass = w	%	23.86	27.61	39.27	32.92	45.10		
Dry Density of	mg/m	1.08	1.52	1.38	1.44	0.77		
specimen ρ_d = 100 ρ /	3							
100 + w								

Table 12.Proctor Compaction test results for clay and 20% B.E. and2.5% Cement



Figure 8.Moisture content v/s dry density results for clay + 10% B.E. +2.5% Cement

The result indicates that on further addition of Bitumen Emulsion to the soil, a decrease in the dry density may take place and it may also result in increase of the moisture content of the soil mixture. However, upon addition of Cement to the Bitumen Emulsion stabilized clay, different result were obtained. On the basis of the obtained results, it can be seen that the amount of B.E. and Cement added did not cause significant changes in the maximum dry density as well as optimum moisture content. However, determination of the optimum moisture content is very important in order to ensure a fully saturated condition for stabilization [16].

Conclusion

- The plastic limit (PL) represents the content of moisture at which soil changes from plastic to brittle state. Its value has been determined equal to 36.5% from oven-dried sample.
- The value of PI is more than 10. It means that the soil sample qualifies the requirement for stabilization with stabilizing agent. In this study the clay is stabilized with Bitumen Emulsion or/and in presence of Cement.

- The average value of specific gravity of the soil is 2.39 indicating the soil is light and weak and need to be stabilized with certain additives. The specific gravity was found to increase with addition of B.E. and increases further with addition of Cement.
- On the basis of soil classification test, the soil can be classified as fine-grained soil consisting of 78.29% of fine materials (57.51% of silt and 20.78% of clay).
- The clay content amounts more than 10%, it means that the soil is suitable for stabilization with B.E.
- The amount of organic material as 14.41% result in the obstruction in usage of B.E. and can also reduce the B.E. stabilization effectiveness. Thus, stabilization is considered as having both of Cement used as an additive in Bitumen Emulsion stabilized organic soils.
- The Standard Proctor Compaction Test results inferred that the increase in optimum moisture content and the decrease in maximum dry density on addition of B.E. to the soil.

References

- Al-hassani, A. M. J., Kadhim, S. M., and Fattah, A. A. (2015). Characteristics of Cohesive Soils Stabilized by Bitumen Emulsion. *IJSER* 6, 2032–2038.
- Al-Malack, M. H., Abdullah, G. M., Al-Amoudi, O. S. B., and Bukhari, A. A. (2014). Stabilization of indigenous Saudi Arabian soils using fuel oil flyash. *J. King Saud Univ.-Eng. Sci.* doi:10. 1016/j.jksues.2014.04.005.
- Albusoda, B. S., and Salem, L. A. K. (2012). Stabilization of dune sand by using Bitumen Emulsion (B.E.). *J. earth Sci. Geotech. Eng.* 2, 131-143.
- Amadi, A. A., and Eberemu, A. O. (2013). Potential Application of Lateritic Soil Stabilized with Bitumen Emulsion (B.E.) as Liner in Waste Containment Structures. *Geotech. Geol. Eng.* 31, 1221–1230. doi:10.1007/s10706-013-9645-3.
- 5. Baghdadi, Z. A. (1990). Utilization of Kiln Dust in Clay Stabilization. *JKAU Eng. Sci.* 2, 153–163.

- Baghdadi, Z. A., Fatani, M. N., and Sabban, N. A. (1995). Soil Modifiction by Bitumen Emulsion. *J. Mater. Civ. Eng.* 7, 218–222. doi:10.1017/CBO9781107415324.004.
- Colangelo, F., and Cioffi, R. (2013). Use of Bitumen Emulsion, blast furnace slag and marble sludge in the manufacture of sustainable artificial aggregates by means of cold bonding pelletization. *Materials (Basel)*. 6, 3139-3159. doi:10.3390/ma6083139.
- Ebrahimi, A., Edil, T. B., and Son, Y.-H. (2012). Effectiveness of Bitumen Emulsion in Stabilizing Recycled Base Materials. *J. Mater. Civ. Eng.* 24, 1059-1066. doi:10.1061/(asce)mt.1943-5533.0000472.
- 9. Heeralal, M., and Praveen, G. V (2004). A Study on Effect of Fiber on Bitumen Emulsion (B.E.) Stabilized Soil. *JERS* II, 173-177.
- Iorliam, A. Y., Agbede, I. O., and Joel, M. (2012). Effect of Bitumen Emulsion (B.E.) on some geotechnical properties of Black Cotton Soil (BCS). *Electron. J. Geotech. Eng.* 17, 967-977.
- Ismaiel, H. A. H. (2013). Bitumen Emulsion Chemical Stabilization of Expansive Soil Exposed at El-Kawther Quarter, Sohag Region, Egypt. 2013, 1416–1424. doi:10.5923/j.geo.20130303.02.
- Ismail, A. I. M., and Belal, Z. L. (2015). Use of Bitumen Emulsion on the Engineering Modification of Soil Materials, Nile Delta, Egypt. *Geotech. Geol. Eng.* 34, 463-469. doi:10.1007/s10706-015-9957-6.
- 13. Kumar, B., and Puri, N. (2013). Stabilization of weak pavement subgrades using bitumen emulsion. *IJCIET* 4, 26-37.
- 14. Langalia, A. V., and Wala, M. (2015). Study of stabilization of black cotton soil. *IJAERD* 2, 939-942.
- Moses, G. K., and Saminu, A. (2012). Bitumen Emulsion stabilization of compacted black cotton soil. *Electron. J. Geotech. Eng.* 17, 825-836.
- Oza, J. B., and Gundaliya, P. J. (2013). Study of black cotton soil characteristics with cement waste dust and li0me. *Procedia Eng.* 51, 110–118. doi:10.1016/j.proeng.2013.01.017.





Strategic Decision Making & Problem Solving

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Summary

Strategic decision making takes into description in several key factors which take into deliberation both in long-term goals and short-term goals. For business owners and managers.

What strategic management do to understand both of the goal long term and short term of strategic decision making?

Introduction

A strategic decision is frequently connected with a 'big' decision. Bigness is not only focusing on decision making it is also taking decision to change the results. In the connection of decision making it concept is to change the size Bray brooke and Lindblom(1963).To suggest they come to close that Distinction between the small and large change is the different between structure changes and changes within the given structure. (Braybrooke and Lindblom, 1963, p. 63), and also they highlighted in the field of incremental and non-incremental. Sometime it is important concept to use distinguished strategic.

Decision taking is a commitment to take action and it is important that strategies of taking action are the resources of committed. Mintzberg Raisinghaniand Theoret(1976,)p.246) In the firm three categories of principal decision has been defined by Ansoff Administrative, strategic and operating decisions.

Strategic decision making is to selecting the greatest route for success. For example: if you are going to start new business first you have to understand the targeted market, its cost and time. To reach the ideal solution how you will categories the decision? To bring up short business into big picture strategic decision making help you to describe the plan of action. According the management viewpoint whatever you make every day, strategic decision making is different from the routine choice. As a manager, you have to distribute the responsibilities and to communicate the task to your team members. What decision you will take it will not only affect to you it also effect to whole organization. It is a good practice to encourage decision making capability and free unfairness and preconception.

Decision-Making Strategies

Strategic decision making takes into description in several key factors which take into deliberation both in long-term goals and short-term goals. For business owners and managers.

What strategic management do to understand both of the goal long term and short term of strategic decision making?

Long-Term Goals

For long term goal if you are trying to make no plastic then it has become your responsibility to change that product from the market and to remove the plastic. And to develop sustainable development .here your objective is to promote eco-friendly and to save the environment. As plastic is harmful for our environment and earth.In the case your objective is for long term goal to save environment.

Short-Term Goals

Immediate action has been taken and you start first from your house, you change your habit not to use single plastic material .first your step to save the environment. That is short term goal which you have achieved immediately. Where every think goes according plan that is ideal

decision making, but it not happens every time. Sometime some circumstance fails your plan and effect on your ability and thing go wrong it seem unsuccessful in that situation you have to face and try to stay on your goal and strategic should be elastic and impartial

Steps of the Decision-Making Process

Following are the seven steps of decision making process.

- Identify the decision.
- Gather relevant info.
- Identify the alternatives.
- Weigh the evidence.
- Choose among the alternatives.
- Take action.
- Review your decision.

When you are making a decision related business you don't know what will the result. According to Robert Frost there is two roads which departed we need to choose one and travel and it will make different which we don't know. Your success is depending on your right decision and to learn from wrong decision may be you had prepared a huge team or small team.



To make more profitable decision company need to use decision making process steps. In a place when formal decision making process has been put then you will be able to avoid quick decision making even you will take educated decisions.

Decision-Making Process Overview

Describing the business decision-making process

Decision making process is professional process step by step. To solve problems by considering evidence, examining alternatives and to select the way from, at the end this process provide an opportunity to analysis that the decision is right or wrong.

Seven steps of decision-making process

Variations of decision making frame work is floating through internet in business textbook. Most commonly professionally uses these seven steps, many minor disparities of decision making agenda is moving from place to place on the internet, in business textbook and in the leadership presentation.

1. Identify the decision

Before taking decision first you must no the problem what you have to solve or what is the question which you have to answer. Clearly you have to describe your decision. before understanding the problem if you will try to solve the problem it result will be bad and you will out of system and your decision will be fail.

If you want to achieve the target and reached to the destination it is necessary to understand the task and take to decision at the right time.

2. Gather relevant information

To gather relevant information you have to take decision after that it's time to collect applicable to the choice. According your decision you have to analyse that where your organization had been succeed and in which area has failed with your decision. And also need to evaluate from paid consultants, get information's from external source from market research some cases and also including studies.by too much information you can be easily bogged down only complicated process facts and statistics seems applicable in that situation.

3. Identify the alternatives

It is on your fingertips to find the solution of problem with the relevant information. Trying to meet a goal there is usually more than one option to consider for example a company post their advertisement on social media if it wants more engagement and to reach more audience they will do paid advertisement on social media.

4. Weigh the evidence

After recognizing numerous changes, consider said substitutes or the signals for said. Now check in the past what companies have done and has succeeded in those area and to win and lose in your organization take hard look. Each of your substitute you need to recognise the possible difficulties and to consider the beside the probable achievement.

5. Choose among alternatives

You know where you make the decision and which part of the decision making process. You can clarify and identify that what decision is required to make. For that collect all the significant information and consider and develop the possible route to take .to choose for that you are perfect.

6. Take action

When you took decision, it is the time to take action .developed your plan which decision you took make them visible, grow your project plan and set the team to work on it.

7. Review your decision

Now the time is to review on your decision check what time has been decided to completed the take at the time of decision making process look back honestly. Check did you solve the problem did you got answer? Did you reach on your goal? If you find positive result take note for future as a reference, if negative learn where you did mistake before making another decision making process.

Group Problem Solving

Thought, Discussions, actions all contains in the problem solving process and the first image of challenging situation to the goal is depend on decisions.

Mostly problems in the group are mixed, it is related with budget, funds, how raise fund, planning for events, indicating customers, their problems related product and services, supporting members and about their issues or reasons.

Problems of all sorts have three common components (Adams & Galanes, 2009):

- a) An undesirable situation: there is no problem when conditions are desirable.
- b) A desired situation: there is a ambition to better undesirable situation, it may only be a unclear idea .solution are not generated yet ,so unclear idea may be develop into a more goal which can be achieved.
- c) Obstacles between undesirable and desirable situation.

Desirable and undesirable things are standing in the way of current situation and group goal

Where the decision making happen these mechanisms of the problem requires most work

Few examples of problems are properties, limited funds, workers time or evidence.

Those who are working against group problems can also be take form of the people, some time these three elements helps the group in problem solving process. If we see these elements are available in every problem, group should need to precise features of the problem. it is difficult to consider five common important characteristic group member knowledge with problem, group member attention in problem, number of potential solutions, , and the need for solution receipt (Adams & Galanes, 2009).

Task difficulty

Typically difficult task is more complex. For growth and develop and to share initial knowledge, group need to do more research and discussion on difficult complex. This should be done outside the group and to be discussed and share information and knowledge in the group meeting.

Number of possible solutions

Various problems have more probable solution than others ,To solve a complex problems there are multiple ways to solve, there are more creative based other problems for example if you have to design new restaurant there may be standard solutions and with that you have lot of innovative ideas and layout.

Group member interest in problem

If group member take interest to solve the problem that time they engaged in solving problem and trying to find quality solution. People those have high interest and knowledge about Problem they wants to find solution with freedom to develop and implement solution and low interest people wants structure and direction to solve the problem.

Decision Making in Groups

Daily we all are involved in personal making decision, as we knows some decisions are more difficult then others. When we take personal decision we do not face any problem but it has been take in group that time we have to face some challenges. There are challenges when we take any decision in group. But taking decision in group we get some benefits also.(Napier & Gershenfeld, 2004).More time has been taken by group decision then individual decision; in group if any person not does work in time it become burden and it distract the group in fruitless role behaviour and Self-centred miss meetings. Actually if some decision has been taken with group discussion group members shares their experience understanding of the problem with discussion and debates.

Instead of individual decision group discussion would be more complex and deep because they can spread their own viewpoints and group members are showing to a change of lookouts. For interaction group decision is beneficial, in group discussion one of rewards is that we discussed about matter previous. Specific methods for decision making has not been used in many of group, may be they think it will work out when think may go. Negative significance will lead to unequal participation premature decision lengthy discussion and social lazing.to reach the final decision techniques.

Brainstorming before Decision Making

The solution of the problem should be generated before taking the decision by group. Brainstorming is most commonly method. The recommended step of brainstorming has not been followed by most of people.

To be effective Brainstorming originator said to follow the following rules. (Osborn, 1959):

Ideas evaluation prohibited

Stimulated wild and crazy ideas.

The goal is Quantity of ideas, not quality

Encouraged to present idea in new combinations

Except of idea generating method to making brainstorming more of decision method.

Additional steps have been suggested by group scholar to head and follow brainstorming and group communication (Cragan & Wright, 1991).

Do a warm-up brainstorming session

To communicate their idea publicly some people are nervous, if we give them warm session they will come out of fear and then idea can be generated. In group any one can motivate, it takes only few minutes. This motivation gives a person angry it guide them to maintain their behaviour, it help them to do something special with innovative ideas, it will very helpful for those people who feel that the work is difficulty .So boost them we need to give warm up in any group .

Do the actual brainstorming session

When any one going to give session for motivation it should not more than 30 minutes and also to follow the rue of brainstorming and it will understand that people are encourage with them and it is helpful for people as like piggyback of every ideas.

Eliminate duplicate ideas

It will help to the group member after the brain storming session, through that they will able to abolish their ideas which would be similar and very same.

Clarify, organize, and evaluate ideas

Once you are going to evaluate your idea check it and be clarify then start together on group ideas.

Some harsh and senseless thoughts will inspire you, but before going on you need to do some clarity and suggestions. If every think is ok positive you cab carry on but if you see any idea is not clear have some doubt you don't needs to work on that ideas even you have to remove that.

You should be careful and wise for ideas which ideas are hard to classify need to transform into miscellaneous category.

Discussion before Decision Making

Through a four steps nominal group technique guides decision making idea generation appraisal and seeks were comprised to identical origin for all group members. (Delbecq&Ven de Ven, 1971).

The process of this method is useful because it includes all group members thoroughly. During the session uneven participation fixes the problem. For discussion every contribution is there, it also helps to decrease social relaxing through this method.

Following would be done to use the nominal group technique:

List ideas individually and silently.

Master list of ideas should be created.

If required to be clear ideas.

For acceptance of ideas take a secret vote rank from group members.

In the first step quietly group member have to write every ideas and also to mention the task or and problem what they face quietly. It will take only 20 minutes to prepare this. A person who is smoothing the discussion he should give the reminder to the group members to do brainstorming technique, for this they will not evaluate that they are generator of ideas. Once the group member has finished their list they should keep silent so other should not be disturbed.

In the second step facilitator have to ask from continuously from each and every person to share ideas time to time. Once the group members have shared their ideas facilitator has to keep records list so everyone can access that. How many times ideas come up need to keep track and for more discussion should be an idea that permits. This process should be continuing up to all the ideas has not been shared. Group members have to edit their list or self-censor of ideas to provide the ideas to facilitator demand them. People have hesitation to share ideas. so facilitator have to say to group member to share their list in group and to exchange lists their ideas with some on in-group and from that they will received the ideas from the list without fear before judging themselves.

In the third step now the facilitator have to notice that group members should ask themselves for the clarity of the ideas from the master list. Not to lost the discussion for the evaluate of ideas. Not to waste time and to avoid pointless long discussion it will much helpful if ask one person to next person that which ideas they need to clarify and to go to the facilitator for the clarification for idea.

In the fourth step it's time to know that from the ideas master list members can do voting ballot to rank the idea that which ideas is there to be accepted. If the list is long then ask to group member to select and choose the top five ideas from the list. Now the duty of facilitator is to take the secret votes and to review them in random order. Once selected the highest rank idea now to be discussed and decided on.

Personality Influences on Decision Making

Typology of value orientations long studies has affected in Decision making which has involved these types of decision maker like the economic, aesthetic, theoretical, social, political, and the religious. (Spranger, 1928).

What are practical and useful based decisions has been made by the economic decision makers.

Form and harmony, desirous a clarification which is sophisticated and in sync with the surroundings made decisions based on *aesthetic* decision maker.

To discover the truth through rationality wants to discover by theoretical decisions makers.

The personal impact of a decision and empathizes has been highlighted by the social decision with those who may be affected by it. Interest has been taken by political decision maker in power and influence and views people.

A larger purpose, works to unify others under that goal, and commits to a viewpoint, often denying one side and being dedicated to the other has been seeks to identify by religious decision maker. Economic, political, and theoretical decision making incline to be more dominant decisionmaking directions, with its stress on competition and competence. Which is likely agrees to the individualistic cultural orientation. Before situational setting as we discuss that can also influence our decision making. What is practical and useful is decide by economic decision makers which affect decision of personality.

Leaders and other active group members by the climate of group where effected with the personality of group members. Categories done on the base of personality of group members where they fall on field anchored by the descriptors: leading/passive, outgoing/unfavourable, and active/ expressive (Cragan & Wright, 1999).

There are more group members in extreme of these categories, in those characteristics group climate will also shift to resemble more likely.

Leading versus passive

More leading act of group members are self self-reliantly and directly, pledge discussions, directly eye contact,, pursue leadership positions, and also controlled over processes of decision-making, many of passive members are reserved they sit quietly if some on ask then they contribute to the group, they also don't do eye contact, and they are silent and left their personal needs and thought or they do not give suggestions to others.

Friendly versus unfriendly

Friendly side group members keep balances in speaking and listening, they never try to defeat other members of the group, they are not week are elastic and in decision making they are value democratic. On another side those are unfriendly in group they always problem creator and disagree with any decision, their we can see indifference, withdrawn, selfishness, they try to lead that decision according to them in their benefit and in the favour of group.

Instrumental versus emotional

A persons who leads them to work hard, he is optimistic, task oriented, commitment follower, systematic, objective, and contribute themselves toward the work in the group decision making as long it has completed and agree to follow all rules this type of members are instrumental group members. If we see on the other side those who are rash decision maker they are artistic, frisky, self-determining, random and expressive and switch often from relational to task focus. hese type of members are emotional.

Cultural Context and Decision Making

In United states Demographic are changing and increasing in technology which can brings different peoples together which brings more interacting that they were making more heterogeneous groups. Just like neighbourhoods, schools, and countries, small groups differ in terms of their degree of similarity and difference. (Allen, 2011).Some of member are more different more homogenous, more different in small group. Within diversity and different groups had pro and cons. In general group and term of advantages research found that overall heterogeneous have better performance more than homogenous. (Haslett & Ruebu.sh, 1999).

Due to different perspectives, better decision making include diversity advantage when group member communicates across their differences and they have time to understand each other capably.(Thomas, 1999).Group experience conflict is not solely for the reason of presence diversity the main disadvantage is the possibility for conflict, of heterogeneous groups. Under time constraints groups often operate in appropriately, to understand difficulty and intercultural dialogue.

References

- 1. Allen, B. J., *Difference Matters: Communicating Social Identity*, 2nd ed. (Long Grove, IL: Waveland, 2011), 5.
- 2. Adams, K., and Gloria G. Galanes, *Communicating in Groups: Applications and Skills*, 7th ed. (Boston, MA: McGraw-Hill, 2009), 220-21.
- 3. Braybrooke D, Lindblom CE. (1970). *A strategy of decision: Policy evaluation as asocialprocess*. Free Press: New York.
- Cragan, J. F., and David W. Wright, *Communication in Small Group Discussions: An Integrated Approach*, 3rd ed. (St. Paul, MN: West Publishing, 1991), 77-78.
- Delbecq, A. L., and Andrew H. Ven de Ven, "A Group Process Model for Problem Identification and Program Planning," *The Journal of Applied Behavioral Science* 7, no. 4 (1971): 466-92.
- Mintzberg H, Raisinghani D, Theoret A. (1976). The structure of "unstructured" decision processes. *Administrative Science Quarterly* 21(1): 246:275
- 7. Napier, R. W., and Matti K. Gershenfeld, *Groups: Theory and Experience*, 7th ed. (Boston, MA: Houghton Mifflin, 2004), 292.
- Osborn, A. F., *Applied Imagination* (New York: Charles Scribner's Sons, 1959).Spranger, E., *Types of Men* (New York: Steckert, 1928).
- 9. Spranger, E., *Types of Men* (New York: Steckert, 1928).
- Haslett, B. B., and Jenn Ruebush, "What Differences Do Individual Differences in Groups Make?: The Effects of Individuals, Culture, and Group Composition," in *The Handbook of Group Communication Theory and Research*, ed. Lawrence R. Frey (Thousand Oaks, CA: Sage, 1999), 133.
- 11. https://harappa.education/harappa-diaries/strategic-decision-making.

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Effect of Process Parameters on the Surface Properties of chips produced by LSEM: A Review

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Abstract

Manufacturing of bulk nano structured are in high demand in today's industry because of recent development and application of advanced materials. Many traditional machining process were used but none of them have been able to produce complex shapes precisely at low cost. In order to overcome this difficulty Large –strain extrusion machining (LSEM) is introduced. It is basically a fabrication process. It is a single step manufacturing process. It is a method of severe plastic deformation (SPD) which is used particularly for machining bulk nano structured materials. It is a low-cost manufacturing technique with advantage of machining and controlling dimensions simultaneously. Different shapes such as foils, sheets and bars of controlled dimensions are produced with controlled geometric parameters of the deformation using large strain extrusion machining. The paper reviews all the characteristics of large strain extrusion machining (LSEM): its background, its developments, effect of various parameters (rake, feed, speed) on mechanical properties of chips, its mechanics, study of chips at microstructure and nano level. Effect of strain, porosity, hardness and other properties on chips have also been studied.

Keywords: LSEM, Microstructure, Nano, Extrusion, BULK.

Introduction

With the rapid development in the fields of aviation, aerospace technology, defense and manufacturing, the use of lightweight alloys like magnesium, titanium alloys possessing high strength and limited ductility, have increased tremendously. With excellent mechanical, physical and chemical properties, nano structured materials are widely used in various fields. The fabrication processes of nano structured material have gained attention in the recent past. So, research and development are being carried out across the globe to develop components using nanostructured materials. [1] Significant interest has been shown in developing different methods for machining of bulk nano structured metals and alloys with the objective of exploiting their enhanced mechanical properties for various applications. For effecting microstructure refinement most the methods used are found to be dependent on severe plastic deformation (SPD).



Figure 1: Schematic of experimental set up of LSEM [8]

Methods such as equal channel angular extrusion (ECAE), highpressure torsion (HPT) and more recently, chip formation in machining are found to be particularly effective in imposing large plastic strains in also to low deformation temperatures. Also, multiple passes of deformation are needed to create the large strains, resulting in uncertainties in the estimation and control of the deformation parameters and deformation path. In order to overcome these limitations and study the effects of effective strain, strain rate and temperature one method is the study of chips formation by machining [8]. This further leads to the development of large strain machining and large strain extrusion machining. This is because LSEM can geometrically controlled chips which can overcome limitation of conventional machining.

Large strain extrusion machining (LSEM)

Background of LSEM

A rotary configuration of plain strain machining is used to produce continuous strips process of controlled thickness and by combining machining and extrusion imposed in a single step using a specially designed tool. In this configuration, a LSEM tool moves into a diskshaped workpiece rotating at a constant cutting speed, V. The tool consists of two components. A bottom section with a sharp cutting edge inclined at a rake angle (α) and a wedge-shaped top section made that act as a constraining edge. Both sections are of a hard material. The machined material is simultaneously forced through an "extrusion" die formed by the bottom rake face and the top constraining edge, thereby, effecting dimension and shape control. Undeformed material is continuously fed into the machining zone by advancing the LSEM tool radially into the workpiece at a constant feed rate. This feed is the rate of radial advance of the tool per revolution of the workpiece machining. Deformation takes place during the tool 10 advance in the shaded region as shown in figure 1.10. In LSEM the thickness of the strip is predetermined in contrast to cutting; furthermore, the strip thickness can be larger or smaller with respect to undeformed chip thickness. This unique feature offers imposition of different levels of strain that are sufficiently high to induce formation of an UFG microstructure in a single-step deformation process.

LSEM Process

In the last few years machining-based deformation process has emerged as a feasible alternative to convention severe plastic deformation methods. The Chip formation in machining offers a simple route for the production of nanostructured and UFG materials by the imposition of large uniform plastic strains in a single pass of a cutting tool. Shear strains in the range 1-15 can be imposed in a variety of materials, [9] including those of moderate to high initial strength, in a single step of deformation. But in machining, unlike conventional deformation processing methods, the geometry of the deformation and resulting chip is not determined a priori; hence, there is limited scope for control of shape and dimension of the resulting fine-grained chip material. A modification of the machining process that controls the geometry of deformation would be particularly useful for taking advantage of the simplicity of conventional machining as a method of SPD. This may be realized by constraining the chip flow with a suitable "die" or "tool" placed in the vicinity of the cutting edge, thereby maintaining shear strain values on the order of those imposed by machining alone, while introducing control on the shape of the chip.



Figure 2: Schematic of Large strain extrusion machining [15]

Such a process would be of interest not only for the creation of bulk nanostructured materials but also, for production of wire, sheet and bar with conventional microstructures, as an alternative to deformation processes such as rolling, drawing or extrusion. A method designed for this purpose, as depicted in figure 1.10 which will be called as a large strain extrusion machining (LSEM), a variant of the machining-based deformation process which combines microstructure refinement by "large-strain machining", with shape and dimensional control of the chip by "extrusion", simultaneously, in a single step deformation process. LSEM is a controlled method of SPD, offering a far greater level of control over deformation parameters than conventional SPD [7].

Background of LSEM

Large Strain Extrusion Machining (LSEM) is a process which chips are fabricated by the combination of "machining" which is done for microstructure refinement and "extrusion" for controlling shapes and dimensions. It can also be called as extrusion-machining process. LSEM can fabricate materials in form of strips, foils, sheets, rods etc. with application of different configurations of LSEM it may be either rotary or linear configurations as shown in Fig. a, b. The linear configuration of LSEM process can be elucidated as shown in Fig. a hydraulic press of high force capacity is used to drive the workpiece against the tool (M2 steel, hardened to 60 HRC, and finished by grinding), while imposing a large shear strain in the chip [7]. Deformed chip thickness values in the range 1 to 10 millimeter could be readily achieved in this configuration because of the large force capacity of presses, enabling sheet specimens to be created by samples created with different levels of strain; and of the incipient stage (transient deformation stage) of chip formation.



Figure 3: Schematic of Large strain extrusion machining in (a) rotary configuration and (b) linear configuration [7]

To produce bulk nano structured (chips) of controlled dimensions in single step of deformation by especially designed tool in rotatory LSEM configuration can be elucidated herein. The LSEM tool moves radially into a disk-shaped workpiece rotating at a constant peripheral speed, V. The tool consists of two components – a wedge-shaped bottom section with a sharp cutting edge inclined at a rake angle (α); and a wedge-shaped top section that acts as a constraining edge. Both sections are made of a hard material. The machined material is simultaneously forced through an "extrusion" die formed by the bottom rake face and the top constraining edge, thereby, effecting dimensional control. Undeformed material is continuously fed into the machining zone by advancing the LSEM tool radially into the work piece at a constant feed rate of t (mm/rev). This feed is the rate of radial advance of the tool per revolution of the work piece and is the analog of the undeformed chip thickness in machining. Deformation takes place when the tool advances in the shaded region shown in Fig. a. When plane strain conditions prevail, the velocity of the material at the exit of the LSEM tool is given by equation which will be covered next section of mechanics of LSEM.



Figure 4: Schematic representation of LSEM [7]

Literature review

Large strain extrusion machining for magnesium alloy

(Sagapurm, et al. 2011) have investigated the effects of deformation temperature on microstructure and texture evolution machining of **Mg-AZ31B** magnesium alloy in LSEM. They found that at warm deformation temperatures (~200°C), cold-worked type

microstructures with predominant tilted basal texture were observed. With increase in temperature, grain structure sharply transformed into equiaxed type with predominant in-plane basal texture. This sharp transition was found to be consistent with change in temperature dependent dynamic re crystallization mechanism from continuous to discontinuous type [1]. (Efe, et al. 2012) have investigated the mechanics of LSEM process and its application for deformation processing of bulk Mg alloys, also analyzed the interactive effects of deformation temperature and hydrostatic pressure on sheet formation. At small strain rates microstructure development in single pass SPD was found to be very similar to that observed in multiple pass ECAP. By in situ control of hydrostatic pressure and temperature in the deformation zone, segmentation in chip formation was suppressed, enabling sheet to be created [2]. (Chandrasekar, et al. 2014), have highlighted the capability of producing a variety of continuous bulk forms having controlled microstructures, including crystallographic textures from LSEM process for magnesium alloy. Deformation conditions were set such a way that it was possible to obtain a predetermined crystallographic texture in the continuous bulk form that differs from the crystallographic texture of the solid body. Major controllable parameters were found to be chip thickness ratio (λ), rake angle (α) [3]. (D. Sangapuram et al. 2015) have demonstrated the application of LSEM for Mg, Ti alloys to produce sheets. They have investigated effects of process parameters on sheet segmentation flow, microstructure, and texture. They found Segmentation and fracture at the larger sheet thicknesses were pronounced in the case of Mg and Ti-6Al-4V, but not with ductile metals, such as Cu and Al. furthermore they concluded the enhanced formability of LSEM sheet have a fine dynamically recrystallized microstructure and shear texture.[4]

Large strain extrusion machining for Lead

(Guo, *et al.* 2012) have highlighted the characterization of the deformation field in LSEM, and its controllability for deformation processing of bulk material of lead (Pb) in form of sheet using direct

measurements with high-resolution optical techniques. After PIV analysis they found for $\lambda < 1$, a larger fraction of the undeformed chip thickness region was flowing into the work piece subsurface and a greater spread of the deformation occurs into the subsurface. The deformation field was found to be intense, narrowly confined and controllable.[5]

Large strain extrusion machining for copper

(Moscoso, et al. 2006) have performed a series of experiments in order to study the enhanced characteristics of nano structured materials and ultra-fine grains (UFG) of copper (Cu) created by LSEM. They found the hardness of nano structured chips was significantly higher than that of the bulk material. With increasing strain, the evolution of microstructure refinement and formation of UFG structures were found. They found that, at lower value of strain, elongated UFG microstructure were observed while at moderate values equi-axed UFG was seen, and lastly, at highest strain UFG of 250 nm were produced. [6] (Sevier, et al. 2008) have highlighted the development of a finite element method (FEM) procedure for prediction of deformation field parameters for (UFG) materials of Copper and Lead produced by LSEM, and their variation across the thickness of the chip for various chip thickness ratio (λ) were observed. According simulations performed by them they found that the strain produced in the chip, for a given rake angle (α), is entirely controlled by chip thickness ratio (λ). The strain was seen to be uniformly distributed through the chip thickness with a thin primary deformation zone allowing for the application of high strain rates [7]. (Brown, et al. 2009) have have highlighted the interactive effects of deformation field parameters on resulting microstructure of copper material while machining in LSEM process. The microstructure evolution at different deformation rates led to development of following results. The increase in the proportion of high angle boundary misorientation with increasing strain at small deformation rates, which results in the grain refinement in LSEM. At small strain rates microstructure development in single pass SPD was found to be

very similar to that observed in multiple pass ECAP [8]. (Iglesias, et al. 2007) have highlighted the wear rate behaviour of nanostructured materials like copper (Cu) and commercially pure titanium (Ti) fabricated by LSEM and they were compared with their coarse grain counter parts, and their wear mechanism were also discussed. They found that wear rates of these materials were lower than that of the microstructure materials, the reduction in wear rate for Cu-nano was particularly important under low shear strain value. The adhesive wear mechanism of Ti manifested an abrasive component. Micro structured Cu manifested severe plastic deformation and fracture characteristic of adhesive wear, while nanostructured Cu manifested a milder oxidative wear mode [9]. (Deng, et al. 2013) have investigated the effect of constraining tool corner radius(R) on deformation behavior on strain and strain rate, in LSEM deformation processing of copper bulk material into nano structured material of chips. After evaluation of deformation behaviour of experimented chips. It was found that the effective strain increases with an increase in constraining tool corner radius. Furthermore, the effective strain rate decreases with an increase in constraining tool corner radius. [10] (P.lin et al. 2013) have analyzed the effect of coefficient of friction (μ) on deformation behaviour in LSEM using finite element method (FEM). A series of simulations were conducted using FEM model to obtain distribution of simulated effective strain with different friction coefficients. They found that the level of effective strain increased as the coefficient of friction increased. It was also manifested. At higher value of μ chip faces difficulty to get pushed out and chip gets deformed more in homogeneously at this point. When cutting length was same the lengths of chip that were detached from workpiece are different at different coefficients of friction [11].

(Deng, *et al.* 2012) have highlighted the application of finite element method (FEM) to investigate mechanism of LSEM process for pure copper material, to understand the advancement of temperature field, effective strain, and strain rate under distinct chip compression ratios. The cutting and thrust forces were also analyzed with respect to time

by performing simulation in FEM they found that as λ becomes small, significant increases in effective strain and thrust force were obtained. Grain refinement of nanostructured materials were attributed for the large strains imposed in the primary deformation zone (PDZ) and the secondary shear zone. [12]

Large strain extrusion machining for aluminum alloy

(**Deng**, *et al.* **2014**) have studied the thermal stability of ultra-fine grains of Al alloy fabricated by LSEM. The annealing treatments were performed at different temperatures and for different lengths of time. UFG of Al alloy chips maintained high hardness under 200°C but started losing hardness as temperature increases to 300°C and above.



Figure 5: Plot illustrating the predicted values of shear strain and hydrostatic pressure as a function of chip thickness ratio [13]

When annealing was done temperature less than 100°C most of the fine grain were replaced by elongated grain their grain sizes increased with significant increase in the aspect ratio as the annealing time increased, when annealing was done at temperature up to 200°C re crystallization occurred, along the grain with growth [13]. Andrew (Kustas et al. 2014) have studied the porosity level and mechanical properties in strips fabricated from casted ingot of aluminum 5052 by employing large strain extrusion machining process. They discovered

significant reduction in porosity, due to high shear strain and hydrostatic pressure during extrusion. Also, the mechanical behavior from LDH test of strips was found to be ranging within conventionally rolled and annealed strips [14].

Large strain extrusion machining for steel alloy

(Efe et al. 2014) have studied the mechanical properties of AISI 1020 steel fabricated by LSEM.Slip line field theory is used for calculating strain.they have discovered significant increase in hardness of steel strips that was about 68% .it was also found that with increase in rake angle and chip thickness ratio strain was found to be increased [14].

Conclusion

- The effect of rake angle, chip compression ratio or chip thickness ratio, constraining tool corner radius and coefficient of friction on LSEM has been analyzed.
- > Nanostructured UFG strip formation in LSEM were discussed.
- The result shows that rake angle and chip compression ratio have a significant impact on total shear strain for the strip.
- The decrease in the rake angle causes effective strain and strain rate to be increased.
- > But smaller the rake angle, the smaller in grain sizes the microstructure was obtained.
- ➢ With increase in shear strain the evolution of microstructure refinement of UFG microstructures was found.
- > The wear rate analysis showcased that the wear rate of nanostructured material is less than micro structured material.
- Creation of thick sheet from large strain extrusion machining was best achieved using high hydrostatic pressure or large deformation temperature.

References

1. D. Sagapuram, M. Efe, W. Moscoso, S. Chandrasekar, K. P. Trumble, 'Deformation temperature effects on microstructure and

texture evolution in high strain rate extrusion-machining of Mg-AZ31B', Material Science Forum ,pp. 52-55,702-703, 2011.

- 2. M. Efe, W. Moscoso, K. P. Trumble, W. Dale Compton and S. Chandrasekar: 'Mechanics of large strain extrusion machining and application to deformation processing of magnesium alloys', Acta Mater., vol 60, no.5, pp .2031-2042, 2012.
- S.Chandrasekhar, K.P Trumble, W. Moscoso, Mert Efe, D. Sangapuram, CJ. Saldana, J.B. Mann, W.D Crompton, 'Large strain extrusion machining processes and bulk produces therefrom', US Patent no.0017113, 2014.
- S.Chandrasekhar, K.P Trumble, W. Moscoso, Mert Efe, D. Sangapuram. 'Direct sngle stage processing of light alloys into sheet by hybrid cutting-extrusion', vol 137, pp. 105-107, 2015.
- Y. Guo, M. Efe, W. Moscoso, D. Sagapuram, K. P. Trumble and S.Chandrasekar: 'Deformation field in large-strain extrusion machining and implications for deformation processing', Scr. Mater., vol. 66, no. 5, pp. 235-238, 2012.
- W. Moscoso, M. R. Shankar, J. B. Mann, W. D. Compton and S.Chandrasekar: 'Bulk nanostructured materials by large strain extrusion machining', J. Mater. Res., vol. 22, no. 1, pp. 201-205, 2012.
- M. Sevier, H. T. Y. Yang, W. Moscoso and S. Chandrasekar: 'Analysis of severe plastic deformation by large strain extrusion machining', Metall. Mater. Trans. A, vol 39A, no. 11, 2645–2655, 2008.
- Brown, Travis L. Saldana, Christopher Murthy, Tejas G.Mann, James B.Guo, YangAllard, Larry F.King, Alexander H.Compton, W. D.Trumble, Kevin P. and S.Chandrasekhar, 'A study of the interactive effects of strain, strain rate and temperature in severe plastic deformation of copper', Acta Materialia, vol.18, no. 57, pp. 5491-5500, 2009.
- Iglesias, P., Bermudez, M. D., Moscoso, W., Rao, B. C., Shankar, M. R., & Chandrasekar, S. (2007). Friction and wear of nanostructured metals created by large strain extrusion machining. Wear, 263(1-6), 636-642.
- Deng, Wen Jun Lin, Ping Li, and Qing Xia, Wei: 'Effect of constraining tool corner radius on large strain extrusion machining', Materials and Manufacturing Processes, vol. 28, no. 10, pp. 1090-1094, 2007.
- Ping Lin, Zin Chun Xie and Qing Li: 'Effect of the friction coefficient on large strain extrusion machining', Applied Mechanics and Materials'vol. 273, pp.138-142, 2013.
- 12. Wen Jun Deng, Ping Lin, Zi Chun Xie, and Qing Li: 'Analysis of Large strain extrusion machining with different chip compression ratios', Journal of Nanomaterials, pp. 1-12, 2012.
- W.J. Deng, Q. Li, B. Li, Z.C. Xie, Y.T He, Y Tang and W. Xia 'Thermal stability of ultrafine grained aluminium alloy prepared by large strain extrusion machining', Materials Science and Technology, vol. 30, no. 7, pp 850-859, 2014.
- Sagapuram, D., Kustas, A. B., Dale Compton, W., Tumble, K. P., & Chandrasekar, S. (2015). Direct Single-Stage Processing of Lightweight Alloys Into Sheet by Hybrid Cutting-Extrusion. Journal of Manufacturing Science and Engineering, 137(5).

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