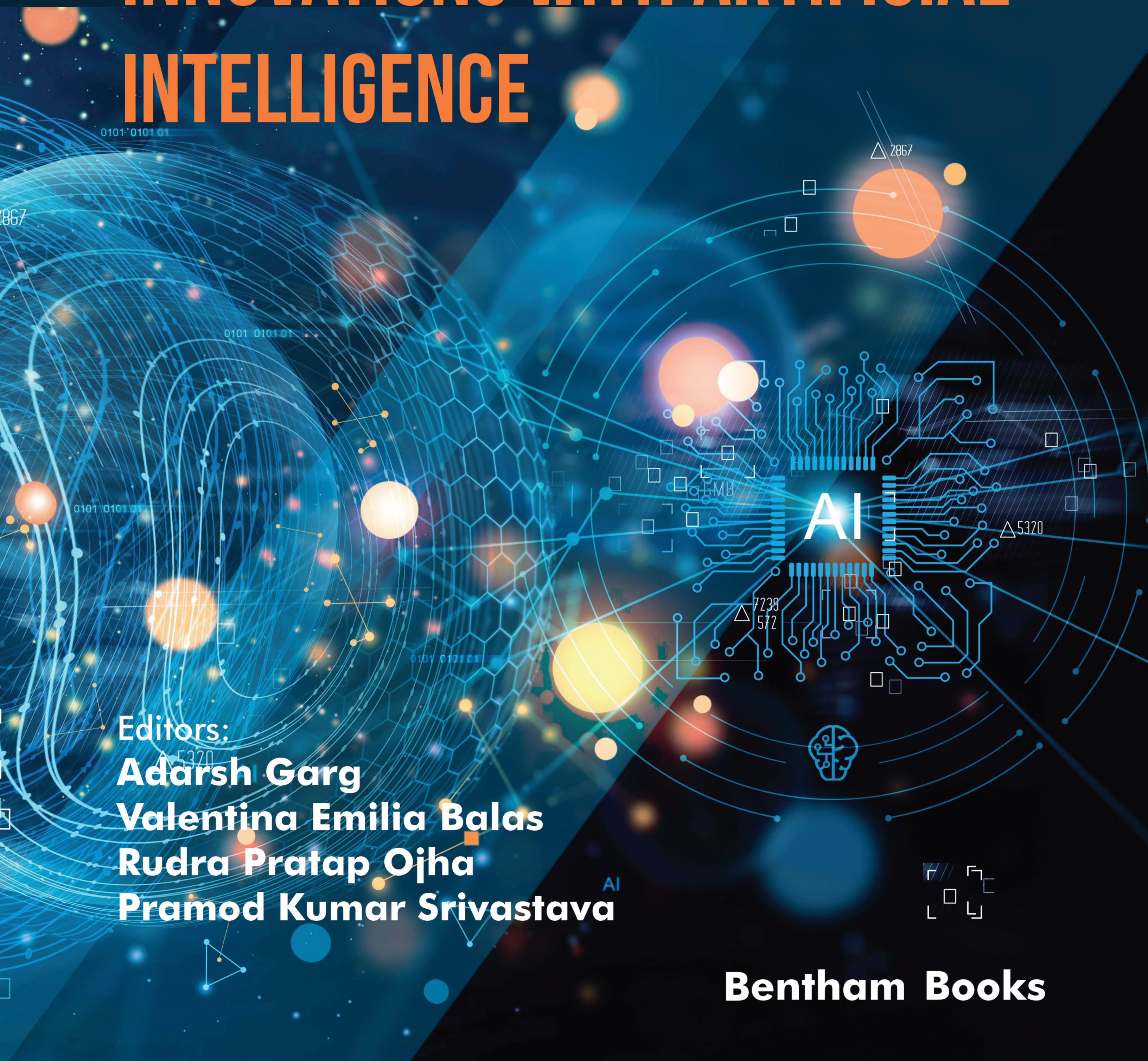
REINVENTING TECHNOLOGICAL INNOVATIONS WITH ARTIFICIAL INTELLIGENCE



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Federated Learning for Internet of Vehicles: IoV Image Processing, Vision and Intelligent Systems

(Volume 1)

Reinventing Technological Innovations with Artificial Intelligence

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Federated Learning for Internet of Vehicles: IoV Image Processing Vision and Intelligent Systems

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BENTHAM SCIENCE

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PREFACE

Augmented and Virtual Reality (AVR) technology shapes the margins between the real world and the digital world. The boundary between the two worlds has become so porous that it nudges into more personalized and unique experiences across a range of industries like tourism, marketing, education, social media, construction, and so on. However, its more revolutionary impact would be to the extent where each one of us would be capable of transforming our real surroundings into digitally enhanced personal experiences with a very thin margin between the real and digital worlds. This is going to transform the whole business world and further revolutionize our surroundings *i.e* Society 5.0.

AR and VR are widely considered, so far, in the gaming and entertainment sectors. But looking at the Gartner report on strategic technology trends 2019, AR and VR technologies are among the top 10 trends and it has been experimented to enhance the productivity of various business domains like marketing, construction, power, education, tourism, telecommunication, automobiles, sports, *etc*. AR technology joins the information and simulated images in the real milieu to augment the users' circumstantial perception of their settings, using some technology-equipped devices whereas VR technology replaces the users' perception of their surroundings to complete virtual surroundings with the help of computers only. The augmentation might be the result of AR, VR or both AVR. Construction industries are using AVR to reduce the risks at working sites. AVR technologies are of extreme significance for the construction segments as the assembled setting is essentially connected to a 3D space and AEC professionals rely mainly on imagery for communication. Boeing's aerospace giant has been using AVR for electricals. A very famous company of UPS is using AVR (AR & VR separately) to provide training for driver safety. However, AVR technologies have not yet been explored, or used to an extent that would make them more reliable for realistic business necessities. Technical limitations, lack of awareness, resistance to use and accept AVR as a substitute, high cost, and time obligation are some of the major challenges of bursting usage of AVR.

Irrespective of the AVR maturity level, there is a need to focus on the effectiveness of AVR technologies to enhance innovations, and sustainability in various business domains, particularly construction tasks, and for the targeted implementation of research. There is no book volume as of now that focuses on the entirety of AVR's strengths, its reliable usage in business innovations and the challenges to be addressed by the researchers. The proposed book volume will address all these points with a more holistic approach, ranging from awareness to innovations and reliability to sustainability from a business perspective. More specifically, no edited volume exists that systematically maps (i) how AR and VR technologies can be used, (ii) their potential benefits, (iii) prevalent issues, and (iv) a futuristic innovation plan.

The book on AI innovations is organized as follows.

Chapter 1 throws light on the use of multi-agent systems which often operate in dynamic, open, and complicated settings. Two approaches to improving agent interactions are presented in this chapter. By using ontologies, the technique may allow agents to create "rich" interaction protocols using Petri net (CPN) based methodologies in order to allow agents to create dynamic protocols.

Chapter 2 describes the need for Artificial intelligence (AI) which has gained enormous usage in business in recent years. But the use of Artificial Intelligence is limited to a greater extent when it comes to measuring business ethics and morality. The chapter, conceptually formulates the implementation of AI in CSR programs by using AMOS 21's Structural Equation Modelling (SEM) and SPSS 21 with empirical testing of projected models for AI efficient CSR practices.

Chapter 3 emphasizes how AI integrated with machine learning (ML) and Deep-learning (DL) techniques are used in various disease diagnosis domains, medication discovery, medical visualization, digital health records, and electro-medical equipment.

Chapter 4 discusses the method of combining information in the form of image alternatives with a software programme that stores knowledge with real images. Augmented and virtual reality (AVR) technologies aid in the explanation of concepts to improve academic learning through the use of two-dimensional media in education.

Chapter 5 discusses the role of VR in 3D reconstruction and visualization of crime situations such as criminal assaults, traffic accidents, and homicides by establishing a new method for criminal investigation.

Chapter 6 explains how rapid advances in artificial intelligence are enhancing the performance of many sectors and enterprises, including green supply chain management. It further analyzes the future outlook of the market for Artificial Intelligence (AI) in GSCM and green sustainability if they follow SDGs.

Chapter 7 discusses the use of information-driven systems to offer problem-specific knowledge to decision-makers using internet-based distributed platforms. An XML-based approach to representing and exchanging domain-specific information for informed decision support is shown in the chapter. The technology's implementation specifics, commercial ramifications, and future research goals are presented.

Chapter 8 portrays the importance of the farming sector which is considered to be the backbone of the Indian economy. The work emphasizes on the use of an automated watering system to reduce the farmer's manual involvement in the field at an effective cost by implementing an artificial intelligence system based on sensing, a control mechanism with required correction for the maximum yielding of irrigation.

Chapter 9 introduces AI as a useful aid to urban planning thereby creating a safer and more sustainable future for its citizens. Applications of AI in smart cities are then discussed, followed by a brief discussion on the prevailing best practices. Challenges in creating AI-enabled smart cities in India are also outlined in the chapter.

Chapter 10 portrays that Augmented Reality is the need of the hour for Human Resource Management in this era of globalization wherein the world has become flat and businesses have no boundaries. The chapter presents the evolution, applications, and challenges of VR and AR with respect to HRM.

Chapter 11 intends to explore how AI-enabled technology, in the fashion industry and fashion environment, is influencing the green economy status of the fashion industry, especially in the post-COVID-19 era of innovative e-commerce fashion.

The work given in the book will give some interesting insights to the readers.

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List of Abbreviations

AAL	Ambient Assisted Living applications
ACLs	Agent Communication Languages
AGFI	Adjusted Goodness of Fit Index
AGI	Artificial General Intelligence
AI	Artificial Intelligence
AIBO	Series of Robotic Dogs
ALS	Alternate Light Sources
ANN	Artificial Neural Networks
AR	Augmented Reality
ASI	Artificial Super Intelligence
ATS	Agent Type Set
AUC	Area Under the ROC Curve
AVR	Augmented and Virtual Reality
BI	Business Intelligence
CAD	Computer Aided Design
CAGR	Compound Annual Growth Rate
CARE	Center of Alternate & Renewable Energy
CEO	Chief Executive Officer
CFI	comparative Fix Index
CMIN/Df	Chi-square Fit Statistics/Degree of Freedom
COO	Chief Operating Officer
COVID-19	Coronavirus Disease
CPN	Colored Petri Net
CSI	Corporate Social Irresponsibility
CSR	Corporate Social Responsibility
CVA	Computer Vision Algorithms
DA	Discriminant Analysis
DAML+OIL	Ontology Language for Semantic Web
DC	Direct Current
DGM	Deep Generative Models
dhh	Difficult of Hearing
DL	Deep-Learning

DLM Deep-Learning Model
DLM Dynamic Learning Maps
DNA Deoxyribonucleic Acid i
DOM Document Object Model
DSS Decision Support Systems
DT Decision Tree
DTD Document Type Definition
EHRs Electronic Health Records
ELM Extreme Learning Machine
EMR Electronic Medical Records
EMRs Electronic Medical Records
ESG Environmental, Social, and Governance
FIPA's Foundation for Intelligent Physical Agents
GA Genetic Algorithm
GA Google Analytics
GAN Generative Adversarial Networks
GE Green Economy
GFI Goodness-of-fit Index
GNN Graph Neural Networks
GPS Global Positioning System
GPU Graphics Processing Unit
GSCM Green Supply Chain Management
GTS Global Telecommunication System
GVA Gross Value Added
HIV Human Immunodeficiency Virus
HMDs Health Monitoring Devices
HRMD Human Resources Management & Development
HTML HyperText Markup Language
HUD Head-Up Displays
IBM International Business Machines
ICT Information & Communication Technology
IDC International Data Corporation
IDSS Intelligent Decision Support Systems
IMD Institute for Management Development
IMU Inertial Measurement Unit

IoT	Internet of Things
KBS	Knowledge-based Systems
KM	Knowledge Management
KMSs	Knowledge Management Systems
KNN	K-nearest Neighbor
KQML	Knowledge Query and Manipulation Language
KR	Knowledge Repositories, Knowledge Representational
KSL	Knowledge Systems, AI Laboratory
LASSO	Least Absolute Shrinkage and Selection Operator
LCD	Liquid-Crystal Display
LDA	Latent Dirichlet Allocation
LR	Logistic Regression
LUAD	Lung Adenocarcinoma
LUSC	Lung Squamous Cell Carcinoma
MAS	Multi-Agent System
MCDM	MULTI-CRITERIA DECISION-MAKING
MIT	Massachusetts Institute of Technology
ML	Machine Learning
MoHUA	Ministry of Urban Development
NASA	National Aeronautics and Space Administration
NB	Naïve Bayes
NPL	Natural Language Processing
NTS	Non-understandable Type Set
PA	Place Attribute
PACS	Picture Archiving and Communication Systems
PCB	Printed Circuit Board
PHR	Personalized Health Records
PLS-DA	Partial Least-Squares Discriminant Analysis
PMCs	Project Management Consultants
PNs	Petri Nets
PPP	Public Private Participation
PT	Place Type
PTS	Place Type Set
PV	Photovoltaic
PV	Photo-Voltaic

RDF	Resource Description Framework
RDF	Resource Description Framework
RF	Radio Frequency
RF	Random Forest
RL	Reinforcement Learning
RNN	Recurrent Neural Networks
ROC	Receiver Operating Characteristic
RPA	Robotic Process Automation
RPART	Recursive Partitioning
RTS	Regional Transit System
SCM	Smart Cities Mission
SDG's	Sustainable Development Goals
SEM	Structural Equation Modelling
SME's	Small and Medium Enterprises
SOAP	Simple Object Access Protocol
SPSS	Statistical Package for the Social Sciences
SPV	Special Purpose Vehicle
SSCM	Sustainable Supply Chain Management
STAR	Smart Tissue Autonomous Robot
SUTD	Singapore University for Technology and Design
SVM	Support Vector Machine
SVM	Support Vector Machines
TVET	Technical and Vocational Education Training
UAV	Unmanned Aerial Vehicle
ULB	Urban Local Body
UNEP	United Nations Environment Programme
USB	Universal Serial Bus
UTS	Understandable Type Sets
VAE	Variation Autoencoders
VR	Virtual Reality
VRD	Virtual Retinal Displays
VRLA	Valve-Regulated Lead Acid
VWC	Volumetric Soil Moisture
W3C	World Wide Web Consortium
WHDs	Wearable Health Devices

WSN Wireless Sensor Network

XML EXtensible Markup Language

XR Extended Reality

CHAPTER 1

Agent Interactions Environments

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Abstract: Any system capable of acting as an intelligent agent has all of these characteristics. When an agent has the capacity to interact with other agents, it is able to do so in a multi-agent system (MAS). Systems with several agents often operate in dynamic, open, and complicated settings. Many factors, such as domain restrictions, the number of agents, and the interactions between agents, are not fixed in an open environment. There are several problems in coordinating the interactions and cooperation of agents; as a result of this, many existing agent interaction protocols are not well-suited for open settings, which is a significant impediment to agent interaction. Two approaches to improving agent interactions are presented in this chapter. To begin, by using ontologies, the technique may allow agents to create "rich" interaction protocols. When it comes to agent interaction in open settings, we employ colored Petri net (CPN) based methodologies in order to allow agents to create dynamic protocols.

Keywords: Constraints Function, Agent Communication Language, Agent Interaction Protocols, Conceptual Frameworks, Computational Science, CPN, Intelligent Physical Agents, Multi-agents, MAS Ontology, Standard Protocol, Supervised Learning.

INTRODUCTION

One of today's most essential design ideas is multi-agent systems. Computational systems that include intelligent agents are called multi-agent systems (MAS). If you want to know what's going on in the world around you at any given time, you need an intelligent agent. There are four key characteristics of intelligent agents in general [1]:

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- Self-control and the opportunity to interact with and work with other agents is a key aspect of social intelligence, which is characterized by autonomy and self-control.
- Agents' social skills may be honed *via* the use of MASs. There are MAS agents that live and work together in the same family. In a multi-agent society, it is difficult to control the connections between the many actors. When one of the agents chooses to influence others to attain a set of objectives,they get involved with one another. The exchange of messages and declarative interpretations of textual information creates interactions between agents in a system [2].
- Agent communication languages (ACLs) include Knowledge Query and Manipulation Language and the Foundation for Intelligent Physical Agents (FIPA's) ACL (FIPA, 2004).
- Protocols for agent interaction specify common patterns for communications sent back and forth between them. Because of the limitations of many current agent interaction protocols, MASs cannot be used in a broad variety of contexts [3].

As a first step, many current MASs application sectors need agents to operate in dynamic and unexpected (open) settings. Interaction among agents in these situations may be affected by unexpected messages, message loss, or message order abnormalities. Agent-interaction procedures as they now exist are unable to cope with the unforeseen situations that may arise. Secondly, certain MASs have a variety of agent designs, and different agents may interact in different ways [4]. One agent can't be sure that the other agents will comprehend or accept the discussion he or she conducts with the other. To make problems worse, the vast majority of agents have interaction protocols hard-coded into their programming. Agent designers are in charge of determining whether to use a certain protocol, what data to send, and how to carry out tasks in the proper order. Changing protocols after they have been pre-programmed into an agent is a trade-off. KQML, for example, is a modern interaction protocol that isn't specifically designed to transfer knowledge [5]. No one should use this “poor” (Lesser, 1998) method of sharing complex information. Many existing interaction protocols are rigid and inflexible, which make it difficult to implement MASs. In this regard, MASs researchers are working to establish a flexible and knowledge-rich interaction protocol [6].

A technique for agent relationships is covered in this chapter that may enhance both theoretical and practical aspects of agent interactions. Agents may design “knowledge-rich” protocols for interfacing as a first step using this method. An ontology facilitator is a person who helps agents identify, acquire, and develop ontologies [7]. Colored Petri nets (CPNs) may be used to construct a strategy that allows agents to dynamically establish interaction protocols, which indicates that it is not the job of agents to create protocols; instead, agents use their talents and condition to determine what protocols should be used.

Here is a breakdown of the rest of the denomination's structure: Both ontology-based MASs and the usage of PNs and CPNs to specify agent procedures are discussed in this work, which is divided into two sections. In the fourth part, agents may use CPN-based approaches to construct dynamically flexible protocols. To conclude this denomination's methodology section, its is explored for potential applications. The project's results and future intentions are summarized in this section.

ONTOLOGY-BASED INTELLIGENT AGENT INTERACTION

Agents require common terminologies to construct their knowledge and theoretical frameworks of the topic of interest to accomplish knowledge-level communication. A semantic web or a computer language may be used to build ontologies, in which these conceptualizations can be articulated. There must be a common ontology for the MAS's working environment to allow agents to create knowledge "rich" interaction protocols. Ontology facilitators should be included to help agents seek, acquire, and construct conceptual frameworks [8].

Multi-Agent System Ontology Expressions

The intellectual discipline of philosophers is where the term "ontology" comes from. It is possible for an agent or a group of agents in MASs to have an ontology that is computer-readable interpretation of knowledge regarding ideas, connections, and limitations.

MASs ontology

In general, MAS ontologies may be divided into two types: common ontologies and special ontologies. It is possible to create broad ontologies, which explain the aggregate knowledge of an entire multi-agent society, and more narrow conceptual frameworks, which define the understanding of just one particular agent in that society. An ontology representations format and standard working domain ontologies are both necessary components of the MAS design process. Several renowned supervised learning research institutes have already developed standard ontologies for a broad variety of application disciplines as a consequence of the advantages of predictive modeling (for example, the Stanford KSL Ontolingua Server) [9].

As a result, MAS domain ontologies may be created or current ontologies can be referenced.

CHAPTER 2

Strengthening Corporate Social Responsibility Practices through Artificial Intelligence

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Abstract: Artificial intelligence (AI) has gained enormous usage in business in recent years. Still, in regard to measuring business ethics and morality, otherwise called corporate social responsibility, the use of Artificial Intelligence is limited to a greater extent. In this regard, the purpose of the study is to conceptually formulate the implementation of AI in CSR programs. For gathering data, the study utilised a structured questionnaire. Employers from a range of governmental and commercial organisations provided the primary data for the study. Using AMOS 21's Structural Equation Modelling (SEM) and SPSS 21, the projected model was empirically tested. The Research concludes that AI can strengthen effective CSR practices. The research also uses SEM to establish a cause-and-effect connection between the research variables.

Keywords: Artificial Intelligence, Behaviour Analysis, Corporate Social Responsibility, Fraud Detection.

INTRODUCTION

To delve into the conceptualization of efficient corporate social responsibility, it is imperative to grasp the fundamental essence of Artificial Intelligence (AI). AI entails the utilization of computer systems to replicate human cognitive processes and make decisions or solve problems based on trained algorithms. It should be noted that AI is limited to mimicking human intelligence and thus falls short in the domain of corporate social responsibility, as humans inherently possess greater levels of responsibility compared to machines. However, AI can play a

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significant role in assessing and mitigating corporate social irresponsibility, thereby enhancing the effectiveness and efficiency of corporate social responsibility initiatives. There is only a limited literature review on why machines cannot be responsible as much as human beings [1].

The organisation is a part of business for social responsibility; acting responsibly is one of the drivers for firms to showcase themselves as reputed organisations. To prove this, the firm is working on a sustainable CSR program that makes an organisation portray good. However, this comes with some underlying critics. Corporates generally focus on showcasing the better side and the critical aspects. Critics are a vital part that reduces the effectiveness of CSR. To address this criticism, automation is a way to improve the CSR process.

Critical criticism of CSR:

- Behavioural issues: Intention of the manager or management to ignore CSR but to enjoy the economic value the firm has gained.
- Fraudulent: Lying and cheating on Organisation returns or Greenwashing products.
- To address this issue, the research has framed the following objectives for Effective CSR performance.

OBJECTIVE OF THE STUDY

- To review past literature based on the relationship between corporate social responsibility and Artificial Intelligence.
- Develop a conceptual framework for the AI-based CSR model.
- To evaluate integrated AI toward efficient CSR practice.

LITERATURE REVIEW

Applying Artificial Intelligence to Corporate Social Irresponsibility

The crucial idea is that AI cannot perform corporate social responsibility. Instead, AI can help reduce unethical or immoral activities, otherwise called corporate social irresponsibility. According to a study [2], the primary placement of integrating AI into CSR is to train AI for the following measures:

- Measurement of Materiality
- Measurement of Performance

To understand the basic concept of materiality, an organisation that performs CSR will confront economic, social, and environmental issues that apply to sustainable business. A methodical materiality evaluation determines which subject matter should be considered in an industry or sustainability strategy [3] AI can help to assess the stakeholder, meaning AI can help in determining the most powerful or influential stakeholder who can add value to the business. According to a study [4], a mathematical model that is used to resolve MULTI-CRITERIA DECISION-MAKING (MCDM) problems can be utilised to determine preferences and perform the materiality evaluation [5]. The development of materiality assessment has also included failure modes and impact analysis [6]. Measurement of Organisation ESG performance by human power is quite complex; that is, whether AI can be used to measure the firm ESG or CSR performance; AI can use data to track the CSR performance and use processing and quality assurance, then it will adopt the analytical model like sector-based indication weightage and finally through output, provide the Ranking, as shown in Fig. (**1**).

When incorporating the Corporate Social Responsibility (CSR) and Artificial Intelligence (AI) into business operations, it is crucial to be aware of the potential pitfalls to be avoided. To ensure a successful implementation of this integrated approach, it is essential to steer clear of the following errors. There are two categories in which AI can be segregated, *i.e.* Strong AI and Weak AI [7], so when it comes to measurement and suppression of corporate social irresponsibility, AI can perform much more strongly than humans. Regarding actual CSR initiatives, Artificial Intelligence (AI) falls short in its ability to outperform humans in moral activities, resulting in relatively weaker performance in such tasks. Consequently, future research endeavours should focus on addressing the genuine ethical capabilities of AI, seeking to enhance its ethical performance.

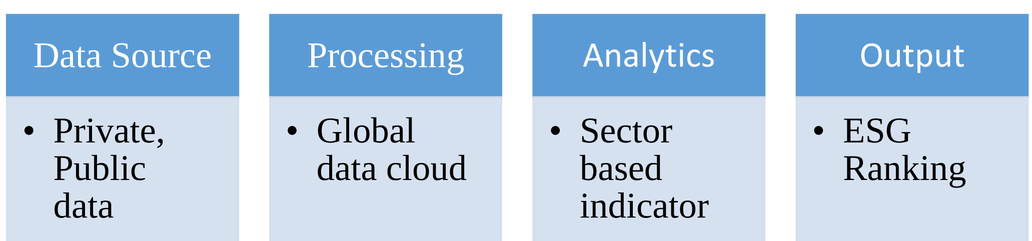

Fig. (1). Performance Measurement model [6].

CHAPTER 3

Role of Artificial Intelligence in Healthcare Management

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Abstract: Artificial intelligence (AI) has recently become one of the most heavily debated themes in the technological world. AI is active in numerous fields and now it has lately entered the healthcare sector. In addition to biomarkers, the use of AI is increasing in a variety of applications such as genetic editing, disease prediction and diagnostics, drug development, personalized treatment, and so on. Accuracy in disease diagnostics is essential for effective and efficient treatment as well as patient safety. Artificial intelligence is a wide and varied field of data, analytics and continuously evolving insights that meet the needs of the healthcare sector as well as patients. The purpose of the many subsections in this book chapter is to shed light on how AI integrated with machine learning (ML) & Deep-learning (DL) techniques operate in various disease diagnosis domains, medication discovery, medical visualization, digital health records, and electro-medical equipment.

Keywords: Artificial Intelligence (AI), Healthcare, Machine learning (ML).

ARTIFICIAL INTELLIGENCE (AI): A NEW ERA

Artificial Intelligence (AI) is a computing technology based on algorithms and used to programme self-learning from data and make precise predictions with real-time decisions using artificial neural networks (ANN), ML, Big data, data mining, robotic process automation and so on. Almost every aspect of modern life is getting influenced by the use of Big data and ML including entertainment, healthcare, and commerce. For prediction modeling, methods from ML and AI have seen a rapid rise in popularity.

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A comprehensive quality and applicability assessment is needed to ensure the performance, safety, and usefulness of sophisticated data-driven prediction models before they are employed and widely used, despite the potential benefits of ML and AI in healthcare.

AI applications have the potential to significantly advance healthcare across the board, from diagnosis to therapy and treatment. Numerous examples of tasks where AI algorithms are outperforming humans include the analysis of medical visualization, medical images, and the similarities between symptoms and biomarkers from electronic medical records (EMRs) with the diagnosis, prognosis, and aid for treatment of the disease [1].

Artificial intelligence has the potential to greatly enhance patient care while also reducing healthcare costs. With a growing population comes a greater demand for medical care. The healthcare industry requires creative ideas to figure out how to be more effective and efficient without spending too much money. Technology can provide the answers in this situation. Rapid improvements in the state of technology, particularly in the disciplines of AI, robotics, and mechatronics, enable the healthcare industry to grow [2]. They can now accomplish human tasks more quickly, easily, and affordably thanks to AI.

Early detection and diagnosis are both heavily pivotal to AI. DeepMind Health Technology from Google combines the use of machine learning with a neuroscience system to model and design AI-enabled human brains. It aids healthcare professionals in making correct diagnosis other important decisions. Potential future applications in the healthcare system are a major driving force behind the development of AI-based technologies. There will be an annual savings of $150 billion in US healthcare costs due to the usage of AI applications by 2026. These savings can be attributed in large part to the transition from a reactive to a proactive healthcare approach, which places more emphasis on health management and less on disease treatment. This is anticipated to lead to a decrease in hospital stays, medical visits, and treatments. The market for AI and robotics-related healthcare systems is anticipated to expand quickly and may reach up to USD 6.6 billion by the year 2021 representing an increased annually compounded growth rate of 40% [3].

TECHNOLOGICAL BREAKTHROUGHS

In the past decade, there have been various technological improvements in the fields of data science and AI. Despite decades of ongoing research in AI for a variety of applications, the current scenario of AI hype differed from earlier ones.

According to Straits research from GLOBE NEWS WIRE (July 2022), the patient portal market expects to reach $11.74 billion by 2023 from past $ 2.41 billion in 2021 at a globally compounded growth rate per year of 19.23%. The demand for electronic health records (EHRs) is rising, and more healthcare payers are adopting a patient-centric strategy, which is growing the market for patient portals. The WHO reports that more than half of the world's upper-middle and high-income countries have national EHR systems in place. Governments throughout the world are focusing on creating standards, legislation, and facilities for preserving medical records, which is driving up demand for patient portals. Cloud-based services, Big data analytics and AI are most frequently used in healthcare industries, together with different patient portals for the fast diagnosis and treatments of various diseases. The sudden global spread of COVID-19 has raised the requirement for effective healthcare assistance solutions even more [4].

APPLICATIONS OF AI IN HEALTHCARE

A variety of tasks such as clinical record keeping, administrative tasks, patient engagement and other professional assistance in areas such as medical device automation, image analysis and patient monitoring can be performed by AI for medical professionals.

Numerous hospitals use AI-enabled processes as decision-support systems for medical personnel in the diagnosis and treatment of various diseases. AI systems also put an impact on organizational aspects of care delivery like improving the performance of various workflows, such as managerial and nursing activities in hospitals [5].

In 2018, Forbes & Accenture stated that the most crucial areas are connected like machines, dose error reduction, cybersecurity, robotic surgery, image processing, virtual assistants, and clinical decision assistance [6, 7]. A computer that has been trained to think like a person is said to have AI. AI will advance clinical judgment and enhance patient diagnosis, prevention, and treatment.

In practice, no Artificial Intelligence tool will ever be able to take the place of a trained medical professional, but it will help them do their jobs better in the medical field. These evolving AI tools in medicine rely heavily on the availability of healthcare data. AI is a collection of technologies, not just one. Some of these technologies, such as machine learning, are widely used in healthcare. ML is a technique in which models are trained with historical data in order to correctly identify test inputs when presented with new data. ML is a kind of AI that is widely used [8]. Fig. (**1**) shows the various applications of AI in healthcare and pharmacy, which are diagnosis and treatment design; discovery and interactions

CHAPTER 4

Perspectives on Augmented and Virtual Reality (AVR) in Education: Current Technologies and the Potential for Education

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Abstract: By combining information in the form of image alternatives with a software programme that stores knowledge on real images, augmented and virtual reality (AVR) technologies aid in the explanation of concepts. This methodology is developed to improve educational learning through two-dimensional media in education. In bloom taxonomy approach to teaching, integrating AR technology with academic content results in a new kind of automated application that serves to reinforce the usefulness of teaching-learning for learners in real-world situations. The learning outcome, which includes knowledge level and performance engagement, has a significant impact on all phases of higher education, from course planning to student evaluation and grading. AVR is a novel technique that combines elements of omnipresent computing, tangible computing, and social computing. This mode offers different affordances, combining the physical and virtual worlds, with continuous and implicit purposes of reading and interactivity. Digital resources are high-potential educational technology that enhances learning by supporting the learning environment through numerous e-resources. The various universities and Technical and Vocational Education Training (TVET) institutions give students an opportunity to complete an experiential learning component in their studies in order to complete their qualifications with the help of AVR implementation. This chapter provides an introduction to Augmented and Virtual reality (AVR) technology, the current status in education from different viewpoints, key technologies, and strategies mentioned in the context of higher educational learning output of students through these applications.

Keywords: Augmented Reality, Technology Augmented Reality in Higher Education.

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INTRODUCTION

Due to the recent rapid advancements in technology, Augmented Reality (AR) has emerged as a sophisticated technology for communication and knowledge exchange [1-4]. Azuma (1997) described augmented reality (AR) as having the following three features: (a) the integration of real and virtual objectives; (b) the interactive and real-time display of images; and (c) the registration (aligning) of augmented reality, and virtual items with one another. Two Boeing airplane engineers named Thoman and David founded AR in 1992. The first experiment's objective is to build a display that can alter the physical world. With this, virtual reality is taking the place of the real world. It requires more sophisticated mechanical arms and programmatically coded machinery to show [5]. It has industrial, medical, and military uses. AR is being used in a variety of fields, including entertainment, tourism, architecture, and marketing [3, 6, 7].

Augmented and Virtual reality (AVR) begins with the most powerful internet itself. It enhanced effective ways for learning and technology to teach complex knowledge. This technology is a theoretical and pictorial representation but left the part of real-time factual reality. Augmented Reality (AR) was designed with three-dimensional digital elements in a real environment to alleviate these drawbacks. Students look at these facts from several perspectives. 360-degree computer-generated images are used in virtual reality (VR) to recreate the virtual world in front of users wearing headsets. Through the application of this technology, people are given the idea that they are physically moving through and engaging with virtual environments. The primary distinction between these technologies is that whereas AR is used to create digital items within the context of the real world, VR is used to engage pupils in a virtual environment. India's higher education system is about to hit a fascinating inflection point. Digital technology is already being used increasingly frequently in educational settings. Higher education is currently being pushed into the experiential sphere by the forces of augmented reality (AR) and virtual reality (VR).

RECENT DEVELOPMENTS AND HISTORY OF AR

It has been thought that AR would improve the knowledge, perceptions, and communication of students. These technologies have the power to boost productivity in global tasks. However, until the 1990s, inertia became important. AR books are important stepping stones that connect the physical and digital worlds for the general audience. The use of AR technology in the classroom can benefit learners with three-dimensional (3D) shows and asynchronous experiences that are attractive to learners (Fig. **1**).

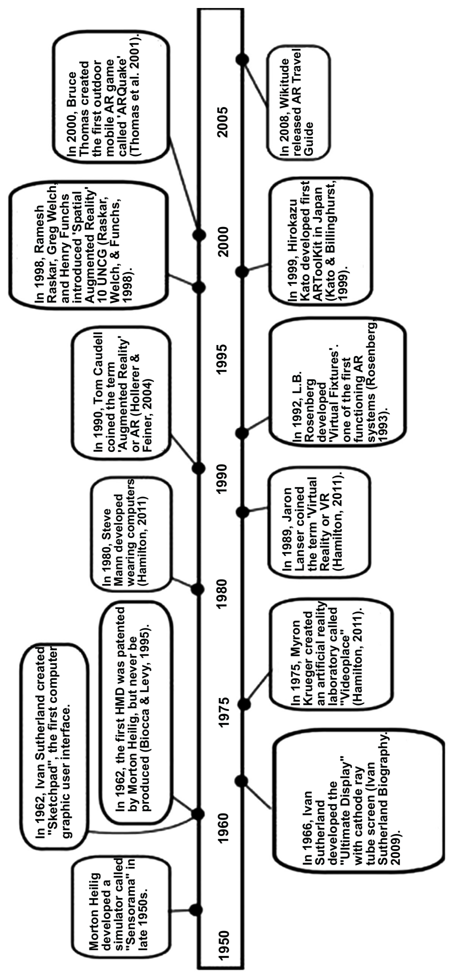

Fig. (1). History of Augmented Reality.

WHAT CHANGES CAN AUGMENTED REALITY MAKE TO THE EDUCATIONAL PROCESS?

AR has its own magic, as I referred to earlier. AR is a platform of technology wherein learning in the classroom becomes more transitional and active. The basis of augmented reality is that it combines many computer-generated graphics with the real world on screen. This indicates that AR enables you to view a computer-generated object on your display if you move your mobile camera in real life. Everything really transpires as you watch it on your webcam in real-time. The technology of augmented reality enables the direct transmission of 3D dimensions to insert, synthesize, and overlay digital and virtual information in the physical world. Only with the help of a smartphone, AR may be used to rapidly obtain

CHAPTER 5

A New Approach to Crime Scene Management: AR-VR Applications in Forensic Science

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Abstract: The crime scene, a place where a crime has been or is suspected to have occurred or where the evidence related to a crime was found, is a vital part of the investigation as it contains all the major information about a crime. A keen eye for the crime scene can determine the possible *Modus Operandi* of a crime and establish *Corpus Delicti* in a court of law. As per Indian law, we are allowed to visit a crime scene once only and if we want to visit again, we have to take permission but it is of no use. During a revisit to a crime scene, the chance or probability of finding any evidence is nearly 0%. Documenting a crime thus became a very crucial step. By using ordinary methods for documenting the crime scene we cannot give a visual or walk to the actual crime scene. It's just a physical view of the documents. It is, therefore, critical to visually capture the crime scene and any potential evidence to aid the investigation. The current demand is for Augmented Reality and Virtual Reality. Virtual Reality is a wholly virtual view of the scenario, whereas Augmented Reality reflects a real-world context. VR is a type of advanced user interface that comprises a real-time simulation of a real-world environment with which the user interacts through numerous sensory channels: sight, hearing, touch, smell, and taste. The 3D reconstruction and visualization of crime situations such as criminal assaults, traffic accidents, and homicides is a new method of criminal investigation that has the potential to improve efficacy. To produce an accurate and immersive virtual environment, modern 3D recording and processing methods, such as AR and VR, are used. Immersion in a virtual environment, on the other hand, allows for various points of view.

Keywords: Crime Scene, Reconstruction, Augmented Reality, Virtual Reality, 3D Capturing.

INTRODUCTION

"An act that is illegal or against the law, and is subject to judicial punishment, is a crime." It is considered to be an intentional act of breaking the law that was perp-

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etrated by someone without cause. Many legal experts have given their own interpretations of what constitutes a crime. Following are a few definitions from well-known jurists:

Crime is defined by William Blackstone as “an act committed or neglected in violation of public law prohibiting or requiring it” in his book Commentaries on the Laws of England.

“A crime is a violation of a right, considered in reference to the ill tendency of such violation as regards the community at large,” according to Sergeant Stephen.

The Indian Penal Code of 1860 and the Code of Criminal Procedure of 1973 neither utilize nor define the term “crime.” Instead of “crime,” the word “offence” is used. It is defined as “offence is an act punishable under the Code” in Section 40 of the Indian Penal Code, 1860 [1].

COMPONENTS OF A CRIME

There are four components that make up a crime, and they are as follows:

- Human being.
- Men’s rea or guilty intention.
- Actus reus or illegal act or omission.
- Injury to another human being.

Stages of a Crime

Every crime begins with the intention to commit it, followed by the preparation, the attempt, and finally, the execution of the intention. The following are the stages:

1. Intention: Having the intent to commit an offence is the first step in carrying it out. However, the law does not take into account an intention; a crime cannot be committed if there is only an intention to conduct it and no subsequent act. The fact that it is so challenging to establish a person's guilty thinking is the reason why the “suspect” is not being prosecuted at this time [1].

2. Preparation: Preparation is the second step in the commission of a crime. It implies setting up everything needed for the performance of the intended act. The crime cannot be committed by intention alone or by intention combined with preparation. The legislation does not now make preparation punishable [1].

Note: Rare Situations where Preparation Is Punishment

- *Preparation is generally not punished, but there are some rare circumstances when it is. Here are some examples:*
- *Section 122 of the Indian Penal Code (IPC) 1860 prohibits preparing to wage war against the Government; Section 126 of the IPC 1860 prohibits preparing to invade the territory of a power at peace with the Government of India;*
- *Section 399, IPC 1860, "Preparation for Dacoity";*
- *Sections 233-235, 255, and 257 pertain to the preparation for counterfeiting money or government stamps.*
- *Having fraudulent documentation, bogus weights, or measurements, or counterfeit currency. Sections 242, 243, 259, 266 and 474 all define possession of these items as a crime, and no possessor may claim that he is still in the planning stage [2].*

3. Attempt: Following preparation, an attempt is the first step in the actual committing of a crime. A try must have these three components:

- Guilty intent to commit an offence;
- Some action taken to contribute to the commission of the offence;
- The action must not constitute the entire offence.

Note: Attempt, The Indian Penal Code, 1860 - The Indian Penal Code includes four different ways to deal with attempt [3]:

- *The same punishment is set forth for both completed offences and attempted offences in the same provision. Sections 121, 124, 124-A, 125, 130, 131, 152, 153-A, 161, 162, 163, 165, 196, 198, 200, 241, 251, 385, 387, 389, 391, 394, 395, 397, 459, and 460 contain such provisions.*
- *The commission of certain crimes and attempts to do them have been dealt with separately, and the penalties for attempting to commit such crimes are different from those for crimes that have already been committed. Examples include the penalties for murder under Section 302 and the penalties for attempted murder under Section 307. Another illustration is that robbery is prohibited under Section 392 while robbery attempts are prohibited under Section 393.*
- *Under section 309, suicide attempts are prohibited.*
- *Section 511, which stipulates that the accused should be punished with one-half of the longest term of imprisonment imposed for the offence, a prescribed fine, or both, applies to all other situations.*

4. Achievement Or Completion: The accomplishment or completion of an offence is the last step in its commission. If the accused successfully performs the crime, he will be found guilty of the full offence; however, if he fails to do so, he will only be found guilty of an attempt [4].

CHAPTER 6

The Influence of Green Supply Chain Management Practices Using Artificial Intelligence (AI) on Green Sustainability

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Abstract: Rapid advances in artificial intelligence (AI) are enhancing the performance of many sectors and enterprises, including green supply chain management. Innovative technologies include machine learning, IoT, and big data. AI in the manufacturing industry aims to utilise automation in production processes, better planning and forecasting, and quality products. Small and medium enterprises play a significant role in reducing carbon emissions, which has turned out to be an even more vital factor for the manufacturing industry in the past two decades. Supply chain management is one of the manufacturing's utmost areas demanding a change. Sustainable procurement enables firms to access resource recycling, efficient production, channel distribution, and end consumption to lessen their environmental impact. The 2030 Agenda for Sustainable Development (2015) is a well-thought-out synthesis of discussion that establishes sustainable growth as a critical issue for the global community. The accomplishment of sustainable goals makes it essential to develop a system of practice. This is especially important for India, which has a history of high labour intensity and industrialization. This review paper will analyse the future outlook of the market for Artificial Intelligence (AI) in GSCM and green sustainability.

Keywords: Artificial Intelligence (AI), Green Supply Chain Management, Green sustainability, SMEs.

INTRODUCTION

The concept of supply chain management has undergone multiple revolutions, evolving to reflect changes brought about by the globalisation of the economy and an elevated level of competition. It is no longer anonymous that a reliable and eff-

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icient supply chain management system may help a company gain a strong position in the market, and businesses grasp this notion. As a result, supply chains within businesses have grown more elastic, and corporations are continually fine-tuning their supply and demand changes for the products they deal with. Companies must compensate for many concepts from diverse domains, such as performance management, project management, talent management, quality management, and visualization of data, in order to get a competitive edge in the marketplace and maintain their financial and growth sustainability. Business dynamics and growth have been identified as the primary drivers of environmental transition [1]. Businesses are drastically altering the ecological landscape and jeopardizing the planet. Traditional corporate models do not address environmental limitations and increasingly absorbed natural resources without adhering to reusing, recycling, and re-manufacturing principles [2 - 5]. Environmental awareness has raised pressure on state and federal government organizations to evolve and effectively execute environmental safety regulations in order to prevent environmental decadence [6, 7]. It is among the primary drivers of change in the GSCM techniques [8]. Organizations have begun to integrate GSCM with other organizational activities like sourcing, manufacturing, and operations [9 - 11]. The notion of GSCM has grown in popularity as a result of knowledge sharing at numerous international conferences, and growing statistical evidence indicates a significant correlation between GSCM initiatives and company outcomes [12]. GSCM serves as a stimulus for business transitions required for a fair and sustainable economy. GSCM is defined as a system that incorporates strategic, calculative, and practical approaches for observing, assessing, and reporting the particulars of GSCM to an organization's constituents [13]. Global Supply Chain Management is a complicated process with back-an--forth movement of substance embracing the product call back, re-manufacturing, and safe disposition methods [14]. Vertical integration, which includes collaboration with customers and suppliers, promotes efficient flow in the closed curve. As a result, GSCM can be an important instrument for sustainable manufacturing and utilization of resources [15]. AI-based supply chain management solutions like computational modeling, expert systems, and agent-based systems are becoming more popular [16]. AI systems can be employed to plan, control, and manage networks in a systematic way [17].

OBJECTIVES

1. To identify the application of AI in GSCM.

2. To recognize the boons of AI usage on green sustainability.

GREEN SUPPLY CHAIN MANAGEMENT

GSCM first evolved in 1996. In reality, it is an environment protection management archetype. From the standpoint of the commodity life cycle, GSCM encompasses the stages of raw resources, goods designing, manufacturing, sales, logistics, and recycling. The organization can reduce adverse ecological impacts by achieving the best of resources and power consumption, utilizing green technology in supply chain management. The method of assessing environmental factors throughout the supply chain is known as supply chain greening. GSCM incorporates environmental needs into supply chain management at all phases of supply chain selection, greening, and product designing, which is the practice of incorporating ecological factors across the supply chain [18]. Despite the terms sustainable supply chain management (SSCM) and GSCM are often used as substitutes in the supply chain composition, the ideas subtly vary. Commercial factors, as well as social and ecological sustainability, become part and parcel of SSCM [19]. Subsequently, the notion of SSCM encompasses something beyond GSCM, and it is a subset of sustainable logistics, previously, the life of products comprised steps from designing to consumption. The environmental management method incorporates a wide range of acquisition of raw materials, design, building, usage, recovery, and the formulation of a circular system of substance flow to limit the emaciation of resources and the environmental impact [20].

Components of the Green Supply Chain

Green design implies the process of acquisition of commodities, manufacturing, and operations, knowing a complete ecosystem, people's well-being, and commodity security, with the goal of preventing environmental contamination. **Green materials** are those which make use of scarce resources and power, generate less sound, are non-toxic, and do not intoxicate the surroundings. Green productivity outperforms total management productivity. **Green production** is often referred to as clean production. Green production can be addressed in several contexts depending on the degree of development or the country. The goal of **green marketing** is to advocate the notion of sustainable growth by harmonizing the ideals of economic, ecological, and social development. **Green consumption** entails attempting to use an environment-conscious commodity and dealing with the garbage that may be hazardous to the ecological setup [21], (Fig. **1**).

CHAPTER 7

Multi-Agent Based Decision Support Systems

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Abstract: Multi-Agent-Based Decision Support Systems (MADSS) have emerged as powerful tools for facilitating decision-making in complex and dynamic environments. This chapter provides an overview of MADSS, highlighting their fundamental concepts, key components, and applications. MADSS leverage the principles of multi-agent systems, artificial intelligence, and decision support systems to enable collaborative decision-making among multiple autonomous agents. The chapter begins by introducing the concept of multi-agent systems, emphasizing the advantages they offer in terms of adaptability, flexibility, and scalability. It then explores the integration of decision support systems within this framework, enabling agents to make informed decisions by analyzing vast amounts of data, evaluating various alternatives, and considering multiple criteria. The architecture of MADSS is discussed, focusing on the interactions among agents, the coordination mechanisms employed, and the information exchange protocols utilized. Various agent types, such as user agents, decision agents, and knowledge agents, are described, along with their roles and responsibilities within the system. The chapter further explores the different approaches and techniques used in MADSS, including rule-based systems, expert systems, machine learning, and optimization algorithms. It highlights the importance of agent learning and adaptation to improve decision-making capabilities over time. The applications of MADSS across various domains are presented, including finance, supply chain management, healthcare, and transportation. Case studies illustrate how MADSS can enhance decision-making processes, improve efficiency, and optimize resource allocation in complex real-world scenarios.

Lastly, the chapter discusses the challenges and future directions of MADSS. Issues such as agent coordination, trust among agents, and handling uncertainty are addressed. The potential of integrating emerging technologies like blockchain, the Internet of Things (IoT), and big data analytics is also explored, envisioning more sophisticated MADSS capable of handling larger-scale problems.

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Keywords: Autonomous Agents, Decision Support System, Human Decision-making, Intelligent Decision Support Systems, Knowledge Representation, Knowledge Management, Knowledge Repositories, Multi-agent, Predictive Modeling, Software Programs.

INTRODUCTION

In today's fast-paced and interconnected world, decision-making has become increasingly complex due to the ever-growing amount of data, the dynamic nature of environments, and the involvement of multiple stakeholders. Traditional decision support systems (DSS) have provided valuable assistance in this regard by leveraging computer-based tools and techniques to aid decision-makers. However, the limitations of these systems have become apparent when faced with highly complex and uncertain situations. To address these challenges, Multi-Agent Based Decision Support Systems (MADSS) have emerged as a promising approach. MADSS combine the power of multi-agent systems (MAS), artificial intelligence (AI), and decision support systems to enable collaborative decision-making among multiple autonomous agents. By integrating the capabilities of various agents and leveraging their distributed knowledge and decision-making abilities, MADSS offer a more robust and effective solution to complex decision problems [1].

The concept of multi-agent systems lies at the core of MADSS. Multi-agent systems consist of a group of autonomous agents that interact with each other and their environment to achieve their individual goals while collectively working towards a common objective. These agents can be software entities, robots, or even humans equipped with decision-making capabilities [2]. The coordination, cooperation, and communication among these agents form the foundation of MADSS. Decision support systems, on the other hand, provide a framework for assisting decision-makers by analyzing data, evaluating alternatives, and generating insights. When combined with the principles of multi-agent systems, DSS can be extended to enable distributed decision-making, where multiple agents contribute to the decision-making process. This collaboration among agents enhances the system's ability to handle complexity, uncertainty, and the diversity of perspectives [3].

In this chapter, we delve into the realm of Multi-Agent Based Decision Support Systems. We explore the fundamental concepts underlying MADSS, including agent architectures, coordination mechanisms, and information exchange protocols. We also examine the different approaches and techniques employed within MADSS, such as rule-based systems, expert systems, machine learning, and optimization algorithms. Moreover, we discuss the wide-ranging applications of MADSS across various domains, showcasing how they have been successfully employed in finance, supply chain management, healthcare, transportation, and more [4]. Through real-world case studies, we illustrate the benefits and impact of MADSS on decision-making processes, efficiency, and resource allocation. While MADSS offer tremendous potential, they also present challenges that need to be addressed. Issues such as agent coordination, trust among agents, handling uncertainty, and scalability need careful consideration. We explore these challenges and propose potential solutions and future directions for MADSS development.

EXPERTISE OF DECISION

Expertise of decision refers to the specialized knowledge, skills, and experience possessed by individuals or systems that enable them to make effective and informed decisions in specific domains or problem areas. It encompasses the understanding of relevant concepts, principles, and patterns, as well as the ability to apply that knowledge in practical decision-making scenarios [5]. In the context of decision support systems, expertise plays a crucial role in enhancing the quality and accuracy of decisions. Decision support systems aim to capture and leverage the expertise of domain experts, either by directly incorporating their knowledge into the system or by providing tools and resources that assist decision-makers in accessing and applying that expertise. There are different types of expertise that contribute to decision-making as given below:-

Domain Expertise: This refers to the deep understanding and knowledge of a specific field or domain. Domain experts possess specialized knowledge, insights, and experience related to the subject matter, enabling them to make informed decisions within that domain. Their expertise is valuable in defining the problem space, identifying relevant factors, and evaluating potential solutions [6].

Contextual Expertise: Contextual expertise involves understanding the specific context or environment in which the decision needs to be made. It includes knowledge about the stakeholders involved, the constraints and limitations of the situation, and the potential consequences of different choices. Contextual expertise helps decision-makers consider the broader implications of their decisions and adapt their approach accordingly.

Analytical Expertise: Analytical expertise relates to the ability to gather, analyze, and interpret data and information effectively. Decision-makers with strong analytical expertise can identify patterns, extract insights, and derive meaningful conclusions from complex datasets. This expertise is particularly important in data-driven decision support systems where quantitative analysis plays a significant role [7].

CHAPTER 8

An Artificial Intelligence Integrated Irrigation System: A Smart Approach

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Abstract: The farming sector is considered the backbone of the Indian economy. The demand for water is continuously increasing with rising population density. Water is frequently wasted on the land due to unscientific irrigation techniques and unpredictable weather conditions. The efficiency of irrigation networks is challenged by the extremely variable and farmer-dependent irrigation water demand. Each farm's irrigation intensity is influenced by both accurate and inaccurate variables, as well as the farmer's behaviour. Accurate and inaccurate variables include soil moisture, crop's water requirement, and climate conditions. An auto solar-powered smart irrigation system enables users to accurately time watering cycles by tracking the soil moisture at numerous sites across the field. This system also brings down the utilization of grid power to save electricity as per the energy crisis for Indian farmers. The objective of our work is to use an automated watering system to reduce the farmer's manual involvement in the field at an effective cost. The artificial intelligence (AI) system is based on sensing a control mechanism with required correction for the maximum yielding of irrigation. It also optimizes the water requirement of a variety of crops. A more accessible and more affordable solution to this issue is provided by the present work. The conventional methods of irrigation used in India are sprinklers and flood-type systems. A large amount of water gets wasted, and crops are destroyed due to the uneven slopes of the field. These problems can be resolved by incorporating an intelligent automated irrigation system with an AI.

Keywords: Artificial Intelligence, Solar Energy, Irrigation, Microcontroller, Smart System.

INTRODUCTION

World's population is increasing day by day and is predicted to be 10 billion by the end of 2050. Agriculture is playing an important role in employment

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generation to boost the Indian economy. The previous two years have seen a brisk expansion in the agriculture industry. The industry, which employs the most people, contributed a significant 18.8% (2021–2022) of the country's Gross Value Added (GVA), growing by 3.6% in 2020–2021 and 3.9% in 2021–2022. Approximately 38% of the land of the world is used for crop production purposes. Par capita income of the rural economy is mostly dependent on agriculture. A network of big and smaller canals from rivers, underground water systems, dams, and rainwater installations are all part of India's irrigation infrastructure [1]. Groundwater water systems are conventionally used in India, and the water level is exhausted day by day. 39-million-hectare land out of 160 million hectares is irrigated using a groundwater system. Two hundred twenty-five of the land is irrigated using a large and small canal irrigation system. The government aims to increase the canal network to enhance irrigation using canals [2]. The irrigation of 67% of cultivated land in India totally depends on the uncontrolled monsoon [3]. Due to the uneven availability of water, only 35% of the total land in India is irrigated only. As whole countries in the world are facing climate change, monsoon in India is also not periodic over the year. This problem leads to the destruction of crops either due to a shortage of water or plenty of water [4]. Therefore, Indian farmers need a smart and intelligent mechanism to control the humidity of soil so that the yield can be increased. Initially, Artificial intelligence was incorporated with fuzzy logic to explain human behaviour. Artificial intelligence predicts water demand using the ground truth and historical data incorporation of fuzzy logic and other intelligent techniques [5].

The use of AI-based technology helps to increase productivity across all industries, including the agricultural sector, and to address difficulties like crop disease, water wastage, agriculture, weeding, and harvesting. Agriculture yield can be enhanced using AI techniques apart from fertilizers' usage. The use of fertilizers and water can be optimized using smart systems [6]. Various technologies, including remote sensing to geotechnical engineering (satellite communication and image processing), are available [7 - 9]. Crop disease is a serious major issue that directly affects crop production. Proper monitoring of crop disease is required. Farmers use pesticides to overcome plant diseases, but they are not much aware of crop pesticide requirements. Pesticides may either affect the yield or be injurious to consumers' health. A smart system that can estimate the number of pesticides using training data is proposed [10 - 12].

There are many steps in cultivation, from the beginning of the crop until its maturity. Among them are crop planting, weeding, watering from time to time, and spraying medicine to avoid diseases. Monitoring of soil moisture using sensors and optimizing water and fertilizer supply is required [13]. In order to supply high-value AI applications in the aforementioned industry, agricultural robots are constructed. The development of smart irrigation technology enables farmers to boost productivity without using a lot of labour by monitoring soil temperature, fertilizers' content, water level, and weather forecasts. Turning the irrigator pump ON/OFF causes the microcontroller to initiate the actuation [14]. The primary goal of the moisture estimation method is to provide a real-time system for measuring soil moisture. The technique is based on the relationship between two variables, specifically the sound speed and the rate at which soils absorb water. According to this experiment, depending on the kind of soil, the sound speed decreases as the moisture content increases [15].

A smart system combines sensing, control, activation, analysis, and decision-making based on different automation operations [16]. The automation processes rely on a variety of novel technologies, networking capabilities, sensing capabilities, and intelligence calculations. Therefore, with the aid of a smart system, we can efficiently utilize water and boost yields. Agriculture based on cutting-edge technologies and intelligent irrigation systems uses less freshwater [17]. Artificial intelligence is used in agriculture to enhance irrigation and pesticides and reduce chemical usage through image processing [18]. A hybrid approach combining AI neural networks, fuzzy logic, and genetic optimization techniques is developed to forecast each agronomist's daily irrigation depth [19, 20]. Through effective and dependable techniques like wireless sensor networking, Global System for Mobile Communication, and short message service technologies. Farmers can avail of this service easily on mobile phones. This system offers this capability that undoubtedly helps farmers increase their yields and, on a macro level, aids agricultural and national economic expansion [21, 22]. The successful forecasting and management of grain production will benefit from the multidisciplinary approach of merging computer science with agriculture [23].

The real-time feedback control system used by the microcontroller drip irrigation system effectively monitors and manages all system operations [24]. The solar-based irrigation system incorporated with moisture sensors, a microcontroller, and a global system for mobile communication module is proposed by Sawant *et. al*. [25]. WSN, and ZigBee-like techniques are discussed to achieve better performance, and optimized and economical systems [26].

As a result of recent technological advancements, it is now important to use smart irrigation systems to boost the agricultural crop's productivity level. The present irrigation system optimizes water supply to the land in respect of various parameters such as soil moisture, land slope, and climate condition. This system is empowered with a solar panel to reduce cost and grid dependency. AI and IoT techniques facilitate the manual operation of irrigation systems. Manual intervention of farmers is almost eliminated for supplying water to the field in all

CHAPTER 9

Leveraging AI for Smart Cities in India

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Abstract: With the fast spread of connectivity *via* 5G and IoT (Internet of Things), the Smart City Artificial Intelligence (AI) software industry is expected to reach a massive value of $ 4.9 billion by 2025 globally [1]. In India, the AI market is slated to reach $ 7.8 billion by 2025 at a CAGR of 20.2% as per an International Data Corporation (IDC) report [2]. This chapter explains how AI can be used in the ambitious Smart Cities Mission (SCM) announced by the Government of India in 2015 [3]. Beginning with the conceptual understanding of the SCM, the chapter introduces AI as a useful aid to urban planning thereby creating a safer and sustainable future for its citizens. Applications of AI in Smart cities are then discussed followed by a brief discussion on the prevailing best practices. Challenges in creating AI-enabled smart cities in India are outlined followed by the conclusion which chalks out the road ahead for AI-enabled smart cities in India.

Keywords: Artificial Intelligence, Smart Cities, Urbanization.

INTRODUCTION

In 2020, 56% of the world's population – 4.4 billion inhabitants – lived in cities. This trend is expected to continue. By 2050, with the size of the urban population will get double, about 7 of 10 people in the world will live in cities [4]. Though urbanization is potentially growth stimulating for any economy, unplanned urbanization can lead to congestion, poor quality of life, over-burdened infrastructure, pollution, *etc*.

To mitigate these damaging spill-overs, the Government of India conceptualized the Smart Cities Mission (SCM) with the aim of driving economic growth and improving the quality of life of people by encouraging local area development and using technology that can lead to smart outcomes.

With a proposed Investment of ₹ 2,05,018 crores, 7,831 projects were tendered at ₹ 1,91,337 crores, 4,161 projects have been completed using up ₹ 68,155 crores, as of August 11, 2022.

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The Smart Cities Mission was launched on June 25th, 2015 as a joint effort of the Ministry of Housing and Urban Affairs (MoHUA) and all state and union territories. It had aimed to be completed by 2019-20, but has been extended to June 2023 as per the latest information available. (Fig. **1**).

Fig. (1). SCM -Plan of Investment (Source: https://smartcities.gov.in) [3].

Hundred cities and towns across States and UTs of India have been selected under this mission which house more than one-third of the country's population. The SCM ensures that people are able to find opportunities in a sustainable and enabling environment. In other words, according to MoHUA, "smart cities are cities that work for the people."

IMPLEMENTATION OF SCM

The implementation of the mission at city level is proposed to be done by a **Special Purpose Vehicle (SPV)** that will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the Smart City development projects. Like any other developer, the SPV would develop a site, generate revenues for itself and exit after completion. This may take the form of joint ventures, subsidiaries, public-private partnership (PPP), turnkey contracts, *etc*.

Registered under the Companies Act, 2013 at the city-level, it would have an equity shareholding of 50% each distributed between the ULB (Urban Local Body) and State/UT. Government funding can take the shape of grants with the MoUD (Ministry of Urban Development) specifying the conditions thereof. (Fig. **2**).

Fig. (2). Smart Cities in India (Source: www.mapsofindia.com) [14].

It is proposed to give full flexibility to SPV to implement and manage the Smart City project. This may be seen in their decision of appointing PMCs (Project Management Consultants) and using frameworks developed by MoUD for the projects.

CHAPTER 10

Virtual Reality to Augmented Reality: Need of the Hour in Human Resource Management

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Abstract: Augmented reality is the need of the hour for Human Resource Management in this era of globalization wherein the world has become flat and businesses have no boundaries. This global business has made varied functions to work in the virtual world full of ease. The functions not only include finance, marketing, logistics, and supply chain but also Human Resource Management has taken a face towards the virtual world for its functions like recruitment, selection, performance management, competency management, or training. The function started with virtual reality and has eventually made a paradigm shift towards augmented reality. The chapter presents the evolution, applications, and challenges of VR and AR with respect to HRM.

Keywords: Virtual Reality, Human Resource Management, Augmented Reality.

INTRODUCTION

Augmented Reality (AR) is an advanced technology that overlays real scenes with computer images. One of the best technical reviews is one that defines the topic, explains many of the issues, and discusses the latest developments. This paper is a good starting point for anyone interested in researching or using augmented reality. AR is part of the collective term mixed reality (MR), which refers to a multifaceted spectrum of topics that include virtual reality (VR), AR, telepresence, and other related technologies [1]. The study demonstrates the potential of VR in HRMD by providing a systematic literature review that focuses on the recruitment, development, and retention of HRM techniques from a scientific perspective. Virtual reality refers to laptop-generated 3D worlds that allow users to enter and interact with simulated settings. Users are prepared to "immerse" themselves to varying degrees into the computer's artificial world, which can be a simulation of a type of reality or a simulation of a posh phenomenon—for example, an AR with virtual seats and a virtual lamp.

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Telepresence attempts to improve the operator's sensory-motor ability and problem-solving ability in a remote setting [2]. It explains how telepresence works as a human/machine system where the human operator gets enough information about the teleoperator and the task environment [3]. Furthermore, In telepathy tries to create the illusion of being in a different location from virtual reality, where we aim to create a sense of presence in a computer simulation.

Virtual reality and perspective can both be used to describe augmented reality. While the environment in virtual reality is fully made up and appears authentic in the scenario, in augmented reality, the viewer sees the actual world enhanced with virtual things. Three factors must be taken into account while creating an AR system:

1. The combination of natural and virtual worlds;
2. Interaction- Real Time;
3. 3D recording.

Augmented scenes can be displayed *via* wearable devices such as head-mounted displays (HMDs), but alternative technologies are also available. In addition to the three previously mentioned qualities, portability can be included. Due to device restrictions, most virtual environment solutions do not allow users to move around much. Some AR applications, on the other hand, need the user to walk through a larger environment. As a result, portability becomes a critical concern. 3D registration becomes considerably more complicated for such applications. Mobile computer apps frequently provide text/graphic information that the monocular HMD does not capture.

Computing platforms and wearable displays utilised in Augmented Reality must now frequently be adapted for broader applications. The field of augmented reality has been established for over a decade, but recent years have seen significant growth and progress. The field has advanced tremendously since then. Several conferences specialising in this field, such as the International Augmented Reality Workshops and Symposium, the International Conference on Mixed Reality, and the Augmented Reality Environmental Conference, have been launched [4].

AUGMENTED REALITY IN HUMAN RESOURCES MANAGEMENT

It combines technology, computer vision, and interaction to make intelligent solutions for employees. Using computer vision to collect information from various sources, like videos, images, text, and voice, can identify template trends and inform employees of the tasks they need to perform. Computer vision should include the artificial or natural picture, during which employee movements are captured by camera sensors, face recognition technology, or fingerprint readers. The info is then analysed to give an overview of trends [5]. The field of augmented reality in people management can be defined as the use of technology, computer vision, and interaction to produce intelligent solutions for employees. Using computer vision to gather information from many sources, such as video, photos, text, sound, and speech, it is possible to discover trends in the workforce and alert employees of essential duties. Computer vision must include a machine or realistic picture recording, employee movements by camera sensors, facial recognition technology, or fingerprint scanning. The data is then analysed to provide insights into trends [6].

Integrating virtual reality and augmented reality is one-way employers can use these technologies to increase productivity and efficiency and reduce labor cost. Employees are already aware of the benefits of using e-learning software and are adopting new technologies to improve their productivity. Employees are trained on specific tasks using augmented Reality in HR departments located in virtual offices involved in all business activities, from conference calls to group training sessions. Organizations looking to reduce costs associated with hiring, training, and training employees can also benefit from using these technologies. Digital Signage, which involves taking pictures with a camera or another device and displaying them on a small screen, is one instance of an AR utilized in HR. Employees get access to well-known programs like Google Maps, which allow them to share addresses, find addresses, and connect with friends on the renowned Google+ social network. Using popular augmented reality, apps may bring a second layer of reality to your company, allowing your staff to view a virtual representation of their actions in real-time. Although augmented reality (AR) has been talked about for a while, it has only recently gained traction. Several businesses already use this technology in their daily operations. Even Google now offers it’s mapping services with this technique. AR has numerous possible applications. Now let's talk about a few of them [7].

EVOLUTION OF AR AND VR

In the 1920s, the first attempts were made to develop technology to demonstrate augmented and virtual reality. AR and VR technologies emerged in the mid-to late 20th century. Products with this technology are now available from a variety of large and small retailers. Virtual reality headsets are often designed to look like masks, goggles, or other types of facial clothing. In 1960, cinematographer and VR pioneer Morton Heilig invented the telesphere for his mask, which became his first-ever head-mounted display. (HMD). Telesphere Mask uses stereo technology, 3D imaging, widescreen vision, and stereo sound to simulate virtual reality

CHAPTER 11

AI-enabled Innovations and Green Economy in Fashion Industry

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Abstract: Digitization has a substantial impact on almost all facets of fashion, starting from the designing of a fashion item to its production and its usage by consumers. Fashion has always been evolving with emerging technologies. With the beginning of Artificial Intelligent (AI) enabled technologies, the fashion industry has become as dynamic as technology, emerging as a forward-looking trend giant. The impact of AI on the augmentation of fashion trends is unquestionable and the industry has witnessed its fast move from 4.0 to 5.0 with the use of advanced technology. Although fashion is changing at a very fast pace with AI, fashion professionals have raised the socio-economic impact of AI on the fashion industry, including the Green Economy (GE) issues, thus, making the exploration of the phenomenon essential. This chapter explores how AI-enabled technology in the fashion industry and fashion environment, is influencing the GE status of the fashion industry, especially in the post-COVID-19 era of innovative e-commerce fashion.

Keywords: Fashion design, Digitalization in Fashion, Artificial Intelligence (AI), Green Economy (GE).

GREEN ECONOMY

The United Nations Environment Programme (UNEP) defines “an improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” or “a low carbon, resource efficient and socially inclusive economy”, which is known as a green economy.

In a green economy, investments that reduce greenhouse gas emissions and pollution, promote energy and resource efficiency, and stop the deterioration of biodiversity and ecosystem services should be the driving force behind the job and income creation. A “green economy” is one that aims to reduce environmental dangers and ecological scarcities and pursues sustainable development without damaging the environment [27].

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The green economy is the origin of growth that is built on an innovative network of economic activities that support social well-being, and wholesome natural ecosystems, and result in successful yet moral company expansion. Life, earth, and income are the three pillars of sustainable development, and the green economy encourages change and progress in those directions. The production and use of renewable energy, energy efficiency, waste minimization and management, preservation and sustainable use of already existing natural resources, and the creation of green jobs are the main components of the green economy.

India stepped down from 21st to 42nd place in the Green Future Index 2021 to 2022. Whereas, Iceland, Denmark, and the Netherlands are the countries most prepared for a low-carbon future, according to a new report. Other countries making up the top 10 of the Green Future Index 2022, are the United Kingdom, Norway, Finland, France, Germany, Sweden and South Korea [28].

NEED FOR GREEN ECONOMY IN THE FASHION INDUSTRY

The worldwide fashion industry produces wastes, and pollution, and uses a lot of energy. The fashion industry hasn't yet taken its environmental duties seriously enough, despite some modest advances. In order to meet the customer's desire for a revolutionary change, the fashion industry's players will need to move away from clichés and advertising noise toward genuine action and regulatory compliance.

The fashion industry flourished in the early twenty-first century. Apparel manufacturing doubled between 2000 and 2014, while the average customer bought 60% more clothing per year as a result of declining costs, streamlining processes, and rising consumer expenditure [1]. Total industry revenues are anticipated to increase annually starting in 2021. In reality, according to the market's 2023 prediction, revenues will rise 5.48 percent to slightly over $1.8 trillion. Given that the average annual growth rate for the global apparel market between 2013 and 2026 is 2.24 percent, this is a significant increase. For some garment companies, fast fashion has been a particularly popular market and a source of remarkable growth.

Sales of apparel increased eight times more quickly in five major developing nations than they did in Canada, Germany, the United Kingdom, and the United States: Brazil, China, India, Mexico, and Russia as depicted in (Fig. **1**).

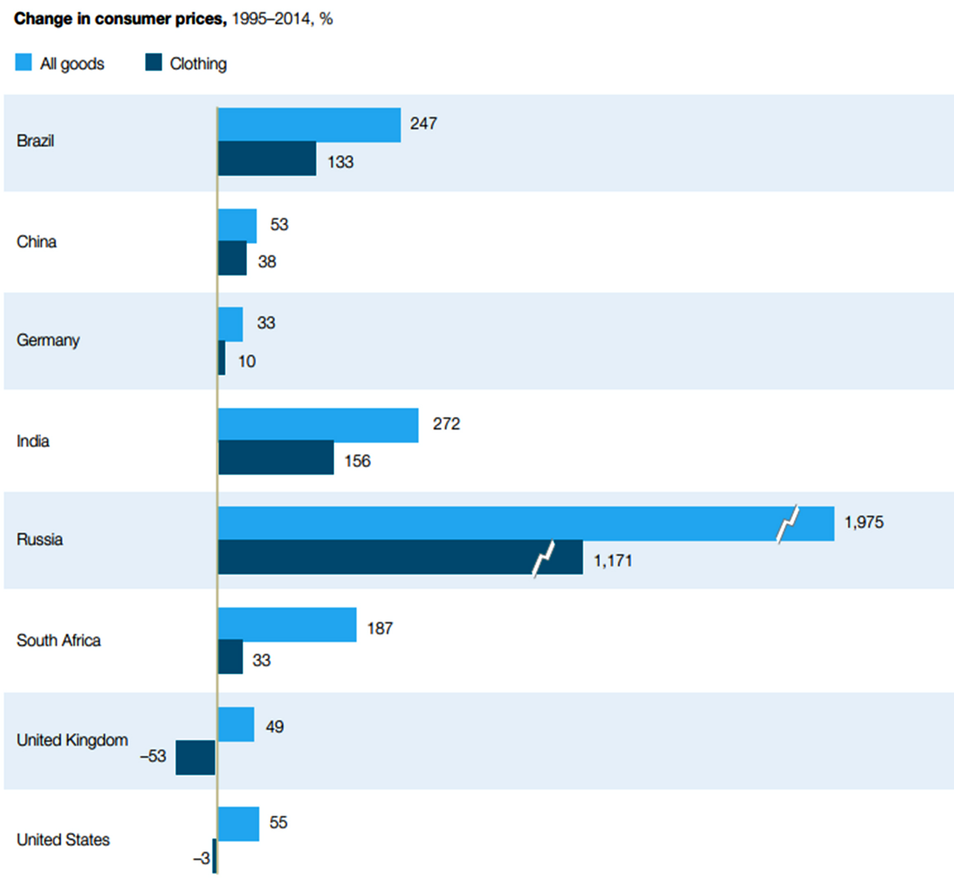

Fig. (1). Change in Clothing Expenditure. Source: McKinsey & Company report, 2016.

Cotton is often farmed using a lot of water, pesticides, and fertiliser, making up around 30% of all textile fibre use. We calculate that the production of 1 kilogramme of fabric results in an average of 23 kilogrammes of greenhouse gases since nations with significant fabric and clothing manufacturing industries mostly rely on fossil fuels for energy production (Fig. **2**).

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