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CONTENTS

Under Thousand Words: Editorial Communication 01-02
On the launch of a New Academic Venture:
Management & Technology Research Journal
Prof Ayesha S Ali

Life-Long Education for Sustainable and Green Economy: Adopting Innovative 03-1
Technologies for Better Health and Quality of Life
Prof Jan W Dobrowolski

Healthcare Cybersecurity: A Mini Review on Recent Incidents and Preventive Strategies 12-19
Maseera Khan, Ranveer Kumar and Jasim Khan

Examining Blockchain Adoption and Usage Behavior in Private Banks in 20-26
India: An Empirical Study Based on Rogers' Diffusion Theory
Prof Pooja Jain

Outsourcing Healthcare Services and its Impact on Strategic Goals of Patient 27-35
Care in Nigerian Private Hospitals
Dr Subramani Senthil Kumar, Dr Sanjoy Kumar Pal, Dr Sudhakar Kota,
Mr Haroon Rasheed and Dr Shanmugam Sundararajan

Circular Bioeconomy for Sustainable Development:Biohydrogen Production 36-39
From Different Lignocellulosic Wastes
Prof DK Belsare

Application of Artificial Intelligence: A New Approach for Human Resource Management 40-43
Dr G Kassab

On the Intertwining of Management, Science and Technology for a Sustainable 44-50
Future: Challenges, Opportunities, and Strategies
Prof Ayesha S Ali

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SSN Journal of Management and Technology Research Communications

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About Us

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Society for Science and Nature, has been publishing an academic international peer-reviewed journal since 2008: **Bioscience Biotechnology Research Communications**, which is in 17th year of successful publication. SSN has ventured into starting yet another international publication, **SSN Journal of Management and Technology Research Communications.** It is an open-access, international peer reviewed quarterly journal for publication of original research articles, exciting reviews, interesting case histories and perspectives in applied areas of management and technology, including biological and medical sciences.

The journal welcomes empirical and analytical papers, reflecting both methodological rigor and practical relevance as well as literature reviews and meta-analyses showcasing and promoting current academic research in upcoming areas of management, science and technology. The insufficient publishable research in the sub-continent, and the developing nations, on the intertwining between management and successful management of science and technology, particularly in areas like health, basic science, engineering, including computer sciences prompted the proposal of this new journal.

The experienced and highly qualified board of editors of this journal will aim to foster diverse investigations of management of science and technology research, encompassing various types of applied areas. We intend to evaluate the theoretical and practical perspectives, utilising a range of methodologies and data—including quantitative, such as surveys, lab experiments, and archival research, as well as qualitative approaches, including case studies and examining the different settings in Management, Science and Technology.

We are particularly interested in – but not limited to – the following research avenues in applied areas of **Management, Science and Technology:** Biological Sciences, Health Sciences, Physical Sciences, Natural Sciences and Engineering.

Our Vision: In the coming years we hope and wish that **SSN Journal of Management and Technology Research Communications** will try to maintain high standards of ethical and quality publication, as we believe that it is only quality which can fully utilize the science for our welfare!

We do have a vision to become an important force for pluralism—teaching and disseminating the research skills of management, in living with science and technology. **SSN Journal of Management and Technology Research Communications** strongly believes that it will achieve high standards of ethical and quality publication as we visualize that it is only quality, which can truly help shaping technology for our existence!

Complaint Policy of SSN Journal of Management and Technology Research Communications

Genuine complaints in Publication: Complaint or expression of dissatisfaction made in honest intention of improvisation are always welcome, as they provide an opportunity and instant moment of attaining quality. The editorial team of SSN Journal of Management and Technology Research Communications shall strive hard to establish, along with the publisher, a transparent mechanism for appeal against editorial decisions or any related matter of publication. If still there are any genuine complaints related to ethical publishing, we are always open to them for the sake of maintaining quality and ethics of publication.

Please write your complaint with Journal title, Vol No/ Issue No /Year /Page numbers, full title of the MS and necessary author details along with type of complaint. The complaint must be about something that is within the jurisdiction of SSN Journal of Management and Technology Research Communications, its contents or process such as authorship, plagiarism, copy right violation, multiple, duplicate, or concurrent publications/ simultaneous submissions etc. Similarly, undisclosed conflicts of interest, reviewer bias or competitive harmful acts by reviewers or any bias of apparent discontentment, backed by logic and judicial discretion will be immediately looked into without any bias and discrimination.

If the Editor receives a complaint that any contribution to the Journal breaks intellectual property rights or contains material inaccuracies or otherwise unlawful materials, a detailed investigation may be requested into, with the parties involved, substantiating their materialistic claims in writing, following the law of natural justice. We assure that we will make a good faith determination to remove the allegedly wrongful material or take actions as per law. All the investigations and decisions are to be documented to the Journal.

Our aim is to ensure that Management and Technology Research Communications follows best practices in publication and is of the highest quality, free from errors. However, we accept that occasionally mistakes might happen, which are inadvertently made or beyond human control, giving opportunity to all parties to decide the best to rectify.

Editorial Complaints Policy: The Managing Editor and staff of Management and Technology Research Communications will make every effort to put matters right as soon as possible in the most appropriate way, offering right of reply where necessary. As far as possible, we will investigate complaints in a blame-free manner, looking to see how systems can be improved to prevent mistakes occurring.

How to Make a Complaint: Complaints about editorial content should be made as soon as possible after publication, preferably in writing by email to editor@mntrc.in or by on-line submission at www.mntrc.in.

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Submission of an article to Management and Technology Research Communications implies that the work has NOT been published or submitted elsewhere, therefore, the journal is strongly against unethical withdrawal of an article from the publication process after submission. Once the article is submitted, it is the absolute right of the editorial board to decide on article withdrawals. For genuine withdrawal, the corresponding author should submit a request which must be signed by all co-authors explaining the explicit reasons of withdrawing the manuscript.

Accepted articles in final stages of publication if are withdrawn, will entail withdrawal fees. The request will be processed by the editorial board and only serious genuine reasons will be considered if possible. The decision of the editorial board will be final and not negotiable. Unethical withdrawal or no response from the authors to editorial board communication will be subjected to sanction a ban to all authors, and their institute will also be notified.

It is a general principle of scholarly communications, that the editor of a journal is solely and independently responsible for deciding which articles submitted to the journal shall be published. In making this decision the editor is guided by policies of the journal's editorial board and constrained by such legal requirements in force regarding libel, copyright infringement and plagiarism. An outcome of this principle is the importance of the scholarly archive as a permanent, historic record of the transactions of scholarship.

Articles that have been published shall remain extant, exact and unaltered as far as is possible. However, very occasionally circumstances may arise where an article is published that must later be retracted or even removed. Such actions must not be undertaken lightly and can only occur under exceptional circumstances. In all cases, official archives of our journal will retain all article versions, including retracted or otherwise removed articles.

This policy has been designed to address these concerns and to take into account current best practice in the scholarly and library communities. As standards evolve and change, we will revisit this issue and welcome the input of scholarly and library communities. See also the National Library of Medicine's policy on retractions and the recommendations of the International Committee of Medical Journal Editors (ICMJE) concerning corrections and retractions.

Article withdrawal

Only used for Articles in Press which represent early versions of articles and sometimes contain errors, or may have been accidentally submitted twice. Occasionally, but less frequently, the articles may represent infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Articles in Press (articles that have been accepted for publication but which have not been formally published and will not yet have the complete volume/issue/page information) that include errors, or are discovered to be accidental duplicates of other published article(s), or are determined to violate our journal publishing ethics guidelines in the view of the editors (such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like), may be withdrawn. Withdrawn means that the article content (HTML and PDF) is removed and replaced with a HTML page and PDF simply stating that the article has been withdrawn according to the Policies on Article in Press Withdrawal with a link to the current policy document.

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If the Editor receives a complaint that any contribution to the Journal breaks intellectual property rights or contains material inaccuracies or otherwise unlawful materials, a detailed investigation may be requested into, with the parties involved, substantiating their materialistic claims in writing, following the law of natural justice. We assure that we will make a good faith determination to remove the allegedly wrongful material or take actions as per law. All the investigations and decisions are to be documented to the Journal.

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Accepted articles in final stages of publication if are withdrawn, will entail withdrawal fees. The request will be processed by the editorial board and only serious genuine reasons will be considered if possible. The decision of the editorial board will be final and not negotiable. Unethical withdrawal or no response from the authors to editorial board communication will be subjected to sanction a ban to all authors, and their institute will also be notified.

It is a general principle of scholarly communications, that the editor of a journal is solely and independently responsible for deciding which articles submitted to the journal shall be published. In making this decision the editor is guided by policies of the journal's editorial board and constrained by such legal requirements in force regarding libel, copyright infringement and plagiarism. An outcome of this principle is the importance of the scholarly archive as a permanent, historic record of the transactions of scholarship. Articles that have been published shall remain extant, exact and unaltered as far as is possible. However, very occasionally circumstances may arise where an article is published that must later be retracted or even removed. Such actions must not be undertaken lightly and can only occur under exceptional circumstances. In all cases, official archives of our journal will retain all article versions, including retracted or otherwise removed articles.

This policy has been designed to address these concerns and to take into account current best practice in the scholarly and library communities. As standards evolve and change, we will revisit this issue and welcome the input of scholarly and library communities. See also the National Library of Medicine's policy on retractions and the recommendations of the International Committee of Medical Journal Editors (ICMJE) concerning corrections and retractions.

Article withdrawal

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We are particular in demonstrating conformance with established industry guidelines and best practices promoted by professional scholarly and academic quality publishing organizations such as: Committee on Publication Ethics (COPE) and Principles of Transparency and Best Practice in Scholarly Publishing. Acceptable manuscripts will be checked for data analysis and verification of references before the author will be notified about the status of the paper with any suggestions for modifications. Finally accepted articles will be forwarded to the printer for typeset and formatting, etc. and the proof will be sent to the authors for proof reading, before publication, to be obtained in a time bound frame.

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Unbiased, independent, critical assessment is an intrinsic part of all scholarly work, including the scientific process. Peer review is the critical assessment of manuscripts submitted to journals by experts who are not part of the editorial staff, and is, therefore, an important extension of the scientific process. Each article submitted to SSN Journal of Management and Technology Research Communications for publication is reviewed by at least two specialist reviewers of the concerned area. The dual anonymized review process is strictly followed and in certain controversial cases, the opinion of a 3rd reviewer can also be sought.

3. Conflict of Interest

For Authors:

All manuscripts for articles, including the original research data-based articles, reviews, editorials, perspectives, comments and letters that are submitted to SSN Journal of Management and Technology Research Communications must be accompanied by a conflict of interest disclosure statement or a declaration by the authors that they do not have any conflicts of interest to declare. All articles that are published in the journal must be accompanied by this conflict of interest disclosure statement or a statement that the authors have replied that they have no conflicts of interest to declare.

To facilitate this policy, all authors must privately disclose 'All their potential conflicts of interest' to the editor of SSN Journal of Management and Technology Research Communications at the time of submission. Authors should also disclose any conflict of interest that may have influenced either the conduct or the presentation of the research to the editors, including but not limited to close relationships with those who might be helped or hurt by the publication, academic interests and rivalries, and any personal, religious or political convictions relevant to the topic at hand.

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If you are submitting your article to SSN Journal of Management and Technology Research Communications. make a 'Declaration of Conflicting Interests' please include such a declaration at the end of your manuscript, following any acknowledgments and prior to the references, under the heading 'Conflict of Interest Statement'.

If no declaration is made, the following will be printed under this heading in your article: 'None
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1. On Ethical Issues:
Animal and Human Studies

Ethical declarations in research form an integral part during the submission process of a manuscript to a journal. SSN Journal of Management and Technology Research Communications , requires that the experimental conditions under which animal and human assays and tests are performed are as per standard protocols used worldwide.

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Studies involving human subjects / patients / and also if the manuscript includes case reports / case series, authors need to provide the following: Name of the Ethical Committees /Institutional review Board, they have obtained consent from along with approval number /ID. Authors should specifically mention that the study was in accordance with the Helsinki Declaration of 1975 (Human Research: Helsinki Declaration as revised in 2013, SCARE criteria etc).

Human Studies: Ethical Standards and Informed Consent

++For studies involving human subjects and volunteers, please indicate in the manuscript, in a section preceding the References, the following statement or an analogous statement that applies to your situation: "All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975 Human research: Helsinki Declaration as revised in 2013.

Case Reports: Case Reports should be followed as per the guidelines of SCARE criteria

Informed consent should be obtained from all patients for being included in the study." If any identifying information about participants is included in the article, the following sentence should also be included: "Additional informed consent was obtained from all individuals for whom identifying information is included in this article." If you have not included or cannot include this statement in your manuscript, please provide the reason or an alternative statement here and in the manuscript.

1. Disclosure of Interest

Author Contribution: Authors must mention the nature of contribution as per standard format.

Authors must provide details of any financial or personal relationships that might bias the work being submitted. In a section of text preceding the References, please provide relevant information for each author(s) with regard to any conflicts of interest. All submissions must include disclosure of all relationships that could be viewed as presenting a potential conflict of interest.

Acknowledgement of sources:

Proper acknowledgement of the work of others must always be given. Funding acknowledgement must be properly made with grant details, number etc.

Data access and retention: Authors may be asked to provide the raw data in connection with a paper for editorial review, and should be prepared to provide public access to such data.

6. Editorial Committee The Editorial committee comprises of the Editor- in-Chief, Academic Editors, Executive Editor, Managing Editor, Assistant Editor (s) and the editorial secretaries, who meet frequently to expedite the business of the journal. The editorial committee follows the guidelines provided by the International Committee of Medical Journal Editors in Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication which can be downloaded from http://www.icmje.org/

7. Advisory Editorial Board

An international advisory board comprising of members from diverse regions, with significant professional experience in different fields of biological and biomedical sciences helps the Editorial Committee in policy matters when needed. Senior advisory board members from India as well as abroad are members of the journal. Each member is selected due to the expertise and experience in the field of his/her specialization. Affiliations, biographies and addresses of all members of the Editorial Board is displayed on the website of SSN Journal of Management and Technology Research Communications.

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Generally, functioning of the journal is overseen by an Editorial Advisory board, which consists of eminent and competent researchers in the field, who contribute by inviting contributions and proposing expert opinions on the suitability of submissions. The Editorial board consists of the following important positions:

Editor-in-Chief: The Editor-in-Chief is primarily the one responsible for activities conducted for the journal and maintains the right of final acceptance or rejection of manuscripts. An experienced academician with quality publications is appointed by the Society for Science and Nature, Bhopal India www.ssn.org the official Publishers of SSN Journal of Management and Technology Research Communications to oversee the entire publication process of the journal.

Executive Editor: Executive Editor is who directs processing of the manuscripts which entail soliciting manuscripts from potential contributors, assessing the suitability of the manuscript with respect to its scope, managing the peer review process, devising strategies for the progress of the journal, coordinating with the reviewers and board members, taking decisions on the revised submissions and occasionally assisting the Editor-in-chief in final acceptance or rejection of manuscripts.

Associate Editors: Their role is in handling in reporting to the Chief Editor, and supervision of the editorial team, managing submissions, assigning articles, overseeing publication schedules and other matters related to smooth functioning of the journal.

Academic Editors: Academic Editors are associates who will assist the Chief / Executive Editors in assessing the suitability of the manuscript with respect to its scope, managing the peer review process, devising strategies for the progress of the journal, coordinating with the reviewers and board members.

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Editorial Team: The editorial team is made up of experienced and highly qualified researchers and faculty members of different subjects who help the management of editorial process.

Peer Review

SSN Journal of Management and Technology Research Communications follows the anonymized peer-review procedure for submissions of all manuscripts to its journal. All submitted manuscripts, after initial evaluation for scope, originality, conformity to the journals instructions and check list, language and academic quality writing are then subjected to an extensive anonymized peer review in consultation with members of the journal's editorial board and independent external referees (usually two reviewers). All manuscripts/chapters are assessed in a time bound frame (usually a month with the reviewers), and the decision based on all the peer reviewers' comments, finally taken by the journal's Editor-in-Chief, is then conveyed to the author (s).

(Ethics, Duties and Responsibilities of Authors Reviewers and Editors, Plagiarism and its Control, Malpractices and Ethical statements) Link of copy right form and Plagiarism Check Statement.

i). Ethics

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These features include information about the methods of selecting articles, especially on the explicit process of external peer review; statements indicating adherence to ethical guidelines; evidence that authors have disclosed financial conflicts of interest; timely correction of errata; explicit responsible retractions as appropriate; and opportunity for comments and dissenting opinion.

We are deeply committed to fair practice of this publication, especially with regard to plagiarism, collaboration, originality, fraud and conflict of interests.

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CONTENTS

MNTRC

SSN Journal of Management and Technology Research Communications Volume 1 • Number 1 • May-June-July (2024)

Under Thousand Words: Editorial Communication **01-02**
On the launch of a New Academic Venture:
Management & Technology Research Journal
Prof Ayesha S Ali

Life-Long Education for Sustainable and Green Economy: Adopting Innovative **03-11**
Technologies for Better Health and Quality of Life
Prof Jan W Dobrowolski

Healthcare Cybersecurity: A Mini Review on Recent Incidents and Preventive Strategies **12-19**
Maseera Khan, Ranveer Kumar and Jasim Khan

Examining Blockchain Adoption and Usage Behavior in Private Banks in **20-26**
India: An Empirical Study Based on Rogers' Diffusion Theory
Prof Pooja Jain

Outsourcing Healthcare Services and its Impact on Strategic Goals of Patient **27-35**
Care in Nigerian Private Hospitals
Dr Subramani Senthil Kumar, Dr Sanjoy Kumar Pal, Dr Sudhakar Kota,
Mr Haroon Rasheed and Dr Shanmugam Sundararajan

Circular Bioeconomy for Sustainable Development:Biohydrogen Production **36-39**
From Different Lignocellulosic Wastes
Prof DK Belsare

Application of Artificial Intelligence: A New Approach for Human Resource Management **40-43**
Dr G Kassab

On the Intertwining of Management, Science and Technology for a Sustainable **44-50**
Future: Challenges, Opportunities, and Strategies
Prof Ayesha S Ali

SSN Journal of **M**anagement and **T**echnology **R**esearch **C**ommunications Vol 1 No (1) May-June-July 2024
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Under Thousand Words: Editorial Communication

On the launch of a New Academic Venture: Management & Technology Research Journal

Ayesha S Ali PhD*
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ABSTRACT

The management of science and technology is crucial for addressing global challenges and ensuring a sustainable future. We intend to address in this new journal, quality communications on the current state of science and technology management, highlighting challenges, opportunities, and strategies for effective management of science and technology for a sustainable future. The dwindling quality of publishable research in management, science and technology, in the developing nations makes us more aware to work dedicatedly on this venture with a young team, as science and technology are key drivers of economic growth, social development, and environmental sustainability. How ever their communicative management poses significant challenges, including knowledge gaps, and innovation barriers. Our attempt will be to help young researchers and authors of the sub-continent, to communicate their findings so that their research plays a vital role in the success of the society, in today's digital era. We hope that this combination of research and its communication will lead to effective technology management, easing businesses to leverage tech trends and innovations to their advantage, gain a competitive edge, and drive growth fulfilling the sustainable development goals of society.

KEY WORDS: MANAGEMENT, TECHNOLOGY, RESEARCH, GLOBAL CHALLENGES, SUSTAINABLE DEVELOPMENT

INTRODUCTION

It is my great pleasure and privilege to don the mantle of Editor in Chief of SSN Journal of Management & Technology Research Communications. This newly launched journal aims to promote high quality of research and development in areas of management, science, and technology. Our first inaugural issue of Management & Technology Research Communications Vol 1 No (1) 2024, is on the stands, and we sincerely hope, it will make an interesting read.

We look forward for your valuable suggestions and responses. The section of *Under Thousand Words* is our new venture for academic and related correspondence from our readers, distinguished researchers. Management & Technology Research Communications is an open-access international peer reviewed, quarterly journal for fast-track quality publication of original research articles, exciting reviews, interesting case histories and perspectives in applied areas of management and technological sciences including applied areas of biological, medical and engineering sciences.

The management of science and technology is crucial for addressing global challenges and ensuring a sustainable future. We intend to address in this new journal, quality communications on the current state of science and technology management, highlighting challenges, opportunities, and strategies for effective management of science and technology for a sustainable future.

It is a fact, that useful and important papers are on a decline in management of science and technology. Our professors of the 1980s used to come across in any journal, many interesting and useful papers. Holob et al[1] hypothesised that the output of published scientific papers was going up geometrically, but the number of important papers was only going up arithmetically. They did several analyses, and found a gradual increase in important, useful papers, but a dramatic increase in the number of publications. The result is that the proportion of important papers keeps dwindling. They called this the Iron Law of Important Papers.

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The dwindling quality of publishable research in management science and technology, in the developing nations makes us more aware to work on this lacunae, as science and technology are key drivers of economic growth, social development, and environmental sustainability.

How ever their communicative management poses significant challenges, including knowledge gaps, and innovation barriers. MNTRC welcomes empirical and analytical papers reflecting both methodological rigor and practical relevance as well as literature reviews and meta-analyses showcasing and promoting current academic research in upcoming areas of management, applied science and technology.

The insufficient publishable research in the sub-continent, and the developing nations, on the intertwining between management and successful management of science and technology, particularly in areas like health, basic science, engineering and computer sciences prompted the proposal of this new journal.

Our attempt will be to help young researchers and authors of the sub-continent, to communicate their findings so that their research plays a vital role in the success of the society, in today's digital era.

We hope that this combination of research and its communication will lead to effective technology management, easing businesses to leverage tech trends and innovations to their advantage, gain a competitive edge, and drive growth fulfilling the sustainable development goals of society.

The experienced and highly qualified board of editors of MNTRC aims to foster diverse investigations of management of science and technology research, encompassing various types of applied areas. We intend to evaluate the theoretical and practical perspectives, utilising a range of methodologies and data—including quantitative, such as surveys, lab experiments, and archival research, as well as qualitative approaches, including case studies and examining the different settings in Management, Science and Technology.

We are particularly interested in – but not limited to – the following research avenues in applied areas of Management Science and Technology: Management Sciences, Biological Sciences, Health Sciences, Physical Sciences, Natural Sciences, Technology and Engineering. Management & Technology Research Communications strongly believes in maintaining high standards of ethical and quality publication as we believe that it is only quality which can help shaping science for humanity!

On behalf of SSN Journal of Management & Technology Research Communications, it is a privilege to invite your valued submissions, for our forthcoming issues. Original unpublished articles after fast-track peer reviews will be published on-line as well as in print. Please visit the journals website for instructions to authors for preparation and online submission of your manuscripts https://mntrc.in/instructions-to-authors. Looking forward to receive your valuable communications at the earliest.We also invite senior authors and academicians to submit their curriculum vitae for joining our editorial board. Please feel free to contact us if you have any further questions.

REFERENCE

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Life-Long Education for Sustainable and Green Economy: Adopting Innovative Technologies for Better Health and Quality of Life

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ABSTRACT

In this paper it has been proposed that there is a requirement of a foundation for International Network of Experts in New Transdisciplinary Areas of Biomimetic Green Chemistry (Environmental Biotechnology integrated with Human Ecology, Biological and Chemical Sciences). These would play a key role for the success of such human-oriented missions supported by experts in material engineering, architecture, IT and many complementary research fields, contributing to optimization of new inventions and discoveries. I would like to introduce a working hypothesis that will be starting point for solving these crucial problems. The next step would be optimization of sustainable design of innovative constructions as result of cooperation of experts in architecture, mathematical modeling and IT. The next step of this mission would be supplementation of new constructions resistant to strong earth-quakes, more and more common winds due to climate change that would include development of living houses with life support systems (a bit similar to circular bioeconomy recommended for long-term manned outer-space missions). We have to collect complementary achievements in biotechnology-based circular wastewater treatment and reuse them for adaptation to climate change as well as waste bio-management. This can yield bio-fuel and bio-energies useful for optimal climate conditions, for production of pollutant-free food, vegetables, mushrooms, algae, aquaculture products, fishes and their breeding. Such new concepts of underground centers. integrating modern environmental biotechnology with large-scale production of food for inhabitants of big cities - may be a significant contribution to urban agriculture in different regions of the world. Proposed solutions would be also useful all over the world for better adaptation to climate change, in particular for prevention of infections during periods of epidemics, and for sustainable labor market related to bioeconomy-driven over all sustainable development.

KEY WORDS: BETTER LIFE, BIOMIMETIC, SUSTAINABLE SOCIETY, CIRCULAR BIOTECHNOLOGY, INNOVATIVE TECHNOLOGIES, ADAPTATION, CLIMATE CHANGE.

INTRODUCTION

Tradition of human rights has to be focused on optimization of progress in different fields of science and technology for efficient prevention against common environmental health hazards. We have to focus on primary prevention of incurable diseases of civilization as well as against incidence of new mutations including viruses and bacteria and risk of pandemics. Priority is to work for promotion of sustainable management of the natural resources by dissemination of low energy and waste-free biotechnology based on renewable sources of energy. These are bio-energy from wastes, biomass from hydro-botanic, wastewater treatment plants, using large scale energy plantations in areas out of use. We must work on reclamation of deteriorated land and enhancement of assimilation of green-house using laser-photo-stimulated plants in linkage to climate change. [1-3]

We must follow good experiences of all generations contributing to the trans-disciplinary concept of sustainable development, as introduced by Prof. W Goetel from AGH-

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University of Science & Technology, Krakow, Poland adopted by IUCN long back in 1956. Prof. Goetel introduced basic ideas of a new science, Sozology supported by Open to All Seminars and gave key note lectures together with eminent experts in environmental health science and its management. The Pandemic Director of WHO Prof. Kostrzewski in 1968 had initiated, such programs, which were later led by me in the 1st National Summer School on Human Environment in one of the oldest model areas of Europe nearing the border park in the Pieniny Mts.[4,5]

To maximize the efficiency of common action of experts with the whole society focusing on better quality of life, I propose that it is it is necessary to provide inter-generation integration programs, (versus isolated action of only staff of experts or only separated young enthusiastic people). This has to be based on lifelong interactive learning, focused on common action for Nature-based solution of crucial problems including both better Adaptation to Climate Change and Circular Bio-economy-driven Sustainable Development, which is adequate to new current situations of the world. [6,7,8]

I could offer methodological experiences of over 50 years of voluntary training of scientific clubs (NGOs), voluntary teams of thousands interested students of more than 30 natural, social, technical and other subjects of studies. This includes graduates from different university centres from mainly European countries as well as other continents. They can focus on problem-solving along with of Technical Experts from Universities and Colleges, and inhabitants of different regions for lifelong learning, integrated with transdisciplinary case study and education of local society. Sustainable Development can be achieved with efficient protection of nature, culture heritages of some Polish, Italian, Spanish, French, English buildings and other parks, health resorts of historical cities like that of Krakow and Firenze with tourism, open for all education, which will be a great contribution to knowledge-based sustainable society. [9,10]

I have also useful experiences connected with long-term Open for all Seminars, and 25 years of activity in this field of AGH-University of Science and Technology Open University, Krakow, Poland, following my concept introduced in 1988 and started in 1989. This began as lectures and discussion on our common future planning, under my scientific leadership till 2015 in the University. We focussed on the background materials obtained from several International Schools, Workshops and about 15 International Conferences on Sustainable Development and Eco-innovation (Bio-economy) since 1989.

The team of experts from different countries (under my scientific leadership) have recommended good practices for dissemination via Internet and by International Workshops, Schools and Postgraduate Courses for talented leaders. The areas in particular are for young creative people - and contribution to the academic mission of education for improving human wellbeing and creative contributions with low investments. [1,2,3 5-11]

This can help in creating green jobs like tele-work, self-employment in innovative enterprises promoting sustainable biotechnology focused and inspirited by Leonardo da Vinci, Alexander von Humboldt and their contemporary followers. Biomimetic integrated with sozology is following the concept of Prof. Goetel and ecological engineering according to principles introduced by Prof. Siuta of Poland. Let us also take into consideration very basic philosophical and ethical problems related both to discovery of Copernicus and Nature-inspiration creativity of Leonardo da Vinci, as well as human-oriented activity making reasonable life of hero of Goethe's poem Faust.[3,4,5,6,11]

Let us discuss about modern concept of the International Centres of Sustainable Development and Circular Bio-economy and also survey the foundation of International Network of Experts in this field (including distance education for dissemination Know How and good practice in environmentally-friendly biotechnology and ecological engineering) for training by international and local experts. This will generate green jobs for different regions and countries (as creative contribution to international cooperation e.g. with the World Academy of Arts and Science), integrated with Life-Long Education of knowledge-based Society (including both voluntary teams of young people as well as mid and third age generation) focused on Common Action with Experts for Better Quality of Life as Action Open to All for Benefit of All. [7.8.9.10.-17]

Creation of the International Network of Experts as Scientific Leaders of Interdisciplinary Cooperation on Green Economy and Innovative Environmentally-friendly Eco-technologies including Data-Base of Good Practices from different countries, would be very useful for stimulation integrated training and education on this priority area - Sustainable Development recommended by e.g. the United Nations in 2015 as the world-wide priority.[3,5,7,9.12-18.]

Development of interned-based distance education on System Approach to Solving Problems of staff of experts and stakeholders (including progress in cooperation with mass media including IT modern tools)- seems to be a proper way for wide-scale international cooperation Postgraduate Courses (based in particular during pandemic period on distance training of experts staff both young people from developing and European countries) may be especially helpful for sustainable management of the natural resources and adaptation green economy to climate change

in developing countries including protection of biodiversity and health of local population. Let me mention about good cooperation for promotion sustainable development for 3.5 millions of students National Open University in India. [18,19,20-27]

Let us contribute to more efficient protection of Life, both at personal level as well as on the scale of the Biosphere, by the adaptation of human activities to Nature-based mechanism of protection. Homeostasis is based on negative feed-back system (learning from basic mechanism of homeostasis and ecological balance of the whole biosphere) as necessary condition for efficient protection of environmental conditions for Proper Reproduction of Biological Resources and Biodiversity) Let me recommend series of innovative interdisciplinary , international studies and related papers – including summary, focused on new trends in Computational Science for Better Quality of Human Life and Personal Medicine.

These studies opening new perspectives of application in different fields like exascale computing platform in the scope of the EU HORIZON 2020 project PROCESS for processing large data sets for based on satellite teledetection monitoring changes in plants vegetations related both to climate change and applied agrotechnology with potential linkage to management technology 3D. Such kind of modern computing services may be especially useful for innovative common action focused on both better life quality and protection biodiversity. Other application of this team study is related to early authomatic cancer detection increasing efficiency of therapy with linkage to personal medicine. Another good practice useful for wider dissemination is connected with advances of the Cloud Platform Delivered in the Infrastructure as e-Science on Distributed Computing Infrastructure a Service Model for the Polish-Grid Scientific Communities, including both generic architecture of the Open-Nebula-based Platform and enhancements connected with providing following needs of the users as well as the requirements of the platform.

Practical output of this team study based on developed numerous solutions, integrated authentication and authorization mechanism working with the standard project accounts, based on X-509 proxy certificates and a group synchronization solution as flexible way to accounts cloud instances dispite the need to conserve IPv4 resources either through Network Address Translation mechanism, or the Virtual Private Network.[(29)] There new perspective for wide scale scientific application is related to teams' evaluation by a broad analysis of cloud providers for biomedical applications with the VPH-Share Project , as very helpful for development research on computing and storage resources.[(27)] Some security problems are crucial in applications of cloud systems including linkage to management technology research [(25,37-30)].

Therefore very useful are team study related to storage and processing confidential data (including personal medical data used in scientific research, trade secrets, financial information) and propositions of relevant mitigation strategies. The team of experts proposed a set of solutions for ensuring data security, describing feasibility studies using cryptographic software facing with the scientific software.[(28)]

Let us recommend also the development of international cooperation on Open for All - Games for Better Quality of Life for All (with active contribution of representatives of all age and professional groups) related to cooperating regions (facing with similar problems e.g. historical cities, area for cooperation, rural or industrial regions, etc.) as well as common action focused on better adaptation to climate change and to sustainable transport e.g.by minimization of negative effects of motorization, greening cities in Europe.[19,20,21]

Recommendation for cooperation on Education for the 21st Century, including new pilot projects. Replacement of task-oriented training with problem-solving training, focused on system approach to the protection of homeostasis of all living systems from the human body in connection with personal environmental health to the Biosphere, based on interdisciplinary case studies with practical output for Common Action Open for All. Integration of training with the prediction of needs and trends in labor market; focused on promotion Green Jobs.

Underground Centers of Environmental Biotechnology integrated with Production of Pollutants-free Food-in big cities as subjects for discussion welcome any supplementation with complementary eco-innovations. Integration of future study with international online training course seems to be activity, promoting sustainable management of the natural resources, integrated both with improvement biodiversity and quality of environmental-nutritional health as well as with sustainable society and labor market.[19,21]

Integration of professional training with action-oriented Life-long Education of All Age Groups (including inter-generation linkage)is required for Common Action of Experts and Knowledge-based Society for Better Quality of Life for All. We have to use better applications of progressive society, in different (complementary) fields of science and technology. Supplementation of up-to-day knowledge with ecological culture, ethics, sense of common responsibility and stimulation of individual talents and creativity are required.

We can use the skills and efficient cooperation of multidisciplinary teams of scientists and practitioners from a knowledge-based society for more efficient solving

of crucial common problems. These can be adaptation to climate change and prevention of dissemination mutants of coronavirus pandemic and similar environmental risk factors for our health. Better understanding is needed among both producers, consumers and decision-makers of sustainable management of the natural resources (including renewable and clean sources of energy). This is the best way to permanently develop a sustainable society and circular bio-economy.[22,23,24,]

Improvement of socio-technological tools for better motivation of partners towards Common Action on local scale integrated with regional, international and global cooperation (reflecting integration of the natural environment and technological with bio- economical network on the global scale is recommended. Let me introduce the contributions, initiated by my colleagues, Prof. Belsare in India and Prof. Carioca in Brazil which has focused on improvement of quality of life by introduction innovative know-how in environmentally-friendly biotechnology. These contributions are significant for improvement of quality of environmental health and creation of green jobs in poor regions of the world, by adopting local needs and possibilities of bioeconomy-driven sustainable development.[3,4-9.]

Replacement of popular socio-pathogenic computer games with attraction for young generation like games promoting interactive education can help in stimulating the sense of common responsibility for better future. This can be based on green economy and team action, which is useful for dissemination of positive motivation, skills and abilities for sustainable management of natural resources. These can be adopted to different regions and human environment in buildings, green- habitants on local scale as contribution will be open to all. Games for better future of the humankind can make human life more reasonable and better focused for more effective protection of life. We can include bio-ethical aspects and common responsibility for better future.

Following my over 50 years of good practice and experiences from different regions of the world, let us start as soon as possible with IT based global cooperation focused on problem-solving transdisciplinary training of experts on global scale (focused on target regions very high rate of infections with SARS COV-2 virus and high mortality in developing countries like Brazil, India and Peru, following my experiences (including training experts in Sustainable Development supported by Eco-Innovation for also these countries). Let me offer coordination for such problem-solving transdisciplinary Trainings (related to life, social and technical disciplines) with Lifelong Learning for Common Action of Experts (from different countries) and local knowledge-based society) adopted to needs and possibilities of different regions of the world.

Let me also recommend series of innovative interdisciplinary studies and related papers – focused on new trends in Computational Science for Better Quality of Human Life and Personal Medicine. The Digital Twin paradigm in medical care has recently gained popularity among proponents of transitional medicine, there are quoted papers over viewing clinicians to make informed choices regarding treatment on the basis of digital simulations.

In this section of the paper with is presented an overview of functional and non-functional requirements related to specific IT solutions which enable such simulations - including the need to ensure repeatability and traceability of results - and propose an architecture that satisfies these requirements. We can propose a computational platform that facilitates digital twin simulations, and validate our approach in the context of a real-life medical use, for example case of bone strength applications.

Biotechnology for Better Adaptation to Climate Change and Sustainable Development on regional and global scale

Better adaptation of cultivated plans and consortium of soil microorganism to extreme environmental conditions connected with climate change requires additional energy. Empiric selected algorithms of laser photo-stimulation (of high energy density) is new cheap and very useful tool for enhancement of food, biomass for bio-energy production under suboptimal conditions including water deficiency. It can also be used for better reclamation of deteriorated areas out of use, for enhancement assimilation of greenhouse CO2 and for more efficient bioremediation and biodegradation of pollutants in contaminated soil. This technology can result in much more efficient biodegradation of carcinogenic PAHs in soil and water, connected with oil and natural gas exploitation. Consequently, there can be a better reclamation of areas contaminated by petrochemical pollutants, as well as these can be used for waste water bio-treatment and re-use of water, as well as for improvement of environmental health and better protection of our fast depleting biodiversity[7,8.9,13,19.]

Laser biotechnology was adopted by me and my students for worldwide promotion sustainable development of model rural areas in Brazil, China, Cuba, Georgia, India, Japan, Laos, Madagascar, Malaysia, Mexico, Myanmar, Nepal, Peru, Poland, Turkey, USA and Uzbekistan. Such eco-innovation is especially useful for prevention against both desertification and flooding as well as for creation during short time many new green jobs and promotion bio-based green economy in developing countries all over the world (e.g. in regions of high unemployment, semi-desert areas) including model International Center of Bioeconomy and Sustainable Development Adopted to Climate Change in Brazil and India. [19,21,23]

The above mentioned long-term experiences and my new concept of Underground Urban Agriculture could be a starting point for Interned based distance training of experts and for foundation of the International Network of teams of experts and innovative enterprises for wide scale applications of Laser Biotechnology and complementary eco-Innovations for sustainable adaptation of local biological resources to climate change (as modern Bioeconomy) and for improvement Quality of Life of millions of people including populations under risk of malnutrition and environmental born diseases (e.g. incurable Minamata disease and common infective diseases), (including e.g. Iron-deficiency anemia) and hunger on global scale. My long-term experimental study integrated with training of staff of new experts in laser biotechnology for sustainable development may be also useful for acceleration re-forestation as well as for more efficient greening of cities and their regions in linkage with Better Adaptation to Climate Change.

Possible are Expertise Opinions and Projects related to Innovative solution crucial problems of Sustainable Development for selected countries. Following are recommended priority tasks in Model Areas [including introduction of new Laser Biotechnology for Bio-based green economy and Sustainable management of the natural resources; water and soil in particular as well as system approach to improvement of quality of the natural environment and environmental health focused on better prevention of water-borne diseases and introduction of good practices for health and food and also for lifelong learning oriented towards development of sustainable labor market. Following are newly introduced concepts and experiences of Prof. J.W. Dobrowolski in applications for much more efficient production: -

1. Adaptation of Agriculture and food production to Climate Change by enhancement tolerance of stimulated by lasers plants to longer periods of water deficiency, salinity of soil and increase of crop yield of biomass of the plant cultivated under suboptimal conditions, including better management of semi-arid areas using local plants.
2. Better Reclamation of Deteriorated Areas (e.g. Post-industrial, Mining Oil /Gas and Metals Exploitation) and another areas out of use for enhancement of water retention and more efficient bioremediation of toxic trace metals, as well as biodegradation oil derivatives including carcinogenic polycyclic aromatic hydrocarbons PAH in water and land for primary prevention associated health hazard, focused on primary cancer prevention.
3. Development of Energy Plantations associated with increase of CO2 Fixation, Biomass and Bio-energy production as Renewable Sources of Energy [including new biotechnology for enhancement of gas production from timber from laser-irradiated bushes and trees].
4. Stimulation of formation and improvement of resistance to traffic output of the Green Areas in Cities [e.g. alongside main streets, surrounding parking places, residential districts etc] for reduction risk for health, nature and culture heritage of traffic output.
5. Acceleration of growth rate of seedlings and Reforestration process and Protection of Biodiversity especially in protected areas like National Parks.
6. More efficient Biological Treatment (using water plants, microalgae etc.) of Wastewater for re-use of Water also for Food Production as well as Better Prevention of Water-born Diseases connected with contamination of drinking water by pathogenic bacteria, fungi, viruses, etc. as well as for better bioremediation of metals and other pollutants.
7. Improvement of Quality of Food e.g. optimization of amount of Vitamins and biologically-active minerals in vegetables, fruits, and other cultivated plants. for contribution to nutritional health .
8. Expected Social Outcome of introduction of Innovative Technologies : New Know How Better Quality and Management of Water, Food, Human and animal Health, creation during short time many New Green Jobs both in developing and developed countries, including stimulation of international training and cooperation of experts with knowledge-based sustainable society .

The above-mentioned perspective of applications of sustainable development including laser biotechnology for improvement quality of the natural environment, environmental health and for promotion bioeconomy-driven sustainable management of the natural resources were taking into consideration within innovative projects and problem-solving training at the Team of Environmental Biotechnology and Ecology AGH University of Science and Technology in Krakow, Poland many interested diploma and doctoral students from different regions of Europe, America, Asia, Africa.

Integration of innovative biotechnology, ecological engineering and sustainable design and other complementary subjects could be a starting point for more efficient Greening Cities and Sustainable Development of Urban Agriculture and introduction of a new generation of eco-houses. These can include evergreen gardens and also Centers of Bio-treatment of Waste Water, Organic Wastes Management of Bioenergy. Innovative Underground Centers of Eco-engineering and Food Production would be in particular good for big cities all over the world [6.7.9.]

We have good experts in all needed discipliners for introduction of my concept into real life (e.g. in Interuniversity Team of Sustainable Development and Eco-Innovation in Krakow Poland), supported by International Team of Experts in Circular Bioeconomy and Corporate Social Responsibility.

Laser biotechnology integrated with sustainable design of green cities by significant acceleration of development green areas within cities. and support sustainable design adequate to climate change and optimal use of renewable sources of energy. The author would like to propose also to follow good 50 years of practice of problem-solving training of staff of experts in sustainable development based on interdisciplinary case studies in different regions of Poland, supplemented with Lifelong Learning. This can develop better environmental health with sustainable labor market, in different cities and their regions based on complementary experiences and inspirited by tradition and good practice of Greening Cities in many countries.

There are perspectives of elaboration Expertise Opinions (e.g. focused on introduction efficient, not expensive and simple Laser Biotechnology adopted to local conditions and possibilities) and Innovative Joint Pilot Projects in result of cooperation with local experts and educated society.Good Experiences and Perspective of Eco-friendly and Pro-Health Application of the Modern Beekeeping System, Api-pol for Sustainable Development in Poland, Sweden, India, Brazil and Many Regions of the World.

Modern beekeeping, based on more than 40 years of interdisciplinary research-developing studies and training staff of experts on national and international scale of the Polish Innovative Beekeeping Enterprise "Apipol-Farma" (supported by team of experts from complementary fields of biology, pharmacology, medicine, mechanical engineering, IT, etc.), corresponds by introduction innovative biotechnologies with the current ideas of Sustainable Development and Eco-innovation.

It helps to create jobs not only in farming areas but also in wide network system and in linkage with greening cities. In Poland alone, this labour market is estimated for approximately 1.5 million people. Dissemination of Good Practice could contribute to the promotion of Green Economy and creation of many millions of new Green Jobs all over the world (especially in developing countries reach in useful plants, including herbs). Integration of many complementary fields of technology (focused on innovative biotechnology) in modern apiculture (beekeeping) can contribute to improvement quality of the products and efficiency of production (based on cost-benefit analysis).

This system of beekeeping is based on biotechnological principles, which are environmentally eco-friendly (and could contribute to increase the biodiversity of flora and fauna (insects in particular) in many rural and protected areas. Thus the 'Apipol' biotechnology of modern beekeeping (supported by permanent control of quality of products in modern laboratories and interdisciplinary case studies based on new achievements in biological sciences and technology) could be recommended as useful tool for reduction of unemployment as well as for Sustainable Development of regions of National Parks, Reserves of Nature as well as not polluted areas for recreation and health resorts.

This modern and low-investment system produces top quality products which are very useful in prevention of malnutrition, and another field of preventive medicine including dietary supplementation (e.g. with some vitamins and biologically active trace elements e.g. vitamin C and iron very useful for nutritional prevention of iron-deficiency anaemia) as well as in the production of health-enhancing cosmetics, including royal jelly. Bee products used many years for medicinal purposes yield surprisingly beneficial results.

This observation led to the creation and development of a new medical discipline: Apitherapy based on interdisciplinary research and long -term application in internal medicine, surgery, dermatology, gynaecology, ophthalmology, dentistry, etc. Referring to basic and applied studies there are some guidelines for using bee products not only for prevention some common diseases (especially among children) but also for prolongation human life, as well as for ensuring dignity in old age (by retardation of the aging process of the human body).

The bee is not only the insect necessary for production of many components important in human nutrition, but also the only example of an animal which breaks records in producing an ample range of substances which are otherwise impossible to obtain (e.g. technical products as pastes and liquids for the preservation of wood and wood-related products would have been impossible to obtain without bees). Some of these products are used instead of synthetic chemicals which according to eco-toxicological evaluation are harmful to the natural environment (ecosystems function) and to human health.

By providing appropriate conditions for optimization populations and activity of bees in the natural environment, it is ensured that ecological balance is maintained and the environment is friendly and good for human health. Modernisation and restructuring of agriculture in terms of "cooperation" with bees is the source of benefits described in the Beekeeping Development Program Using ' Apipol ' System (tested for many years on national scale in Poland and since a few years introduced to Sweden).

The economy of farming is changing dramatically and farming chores turn into pleasure, as work results are beneficial to nature, economy and all people. This is the foundation of a stable eco-friendly economy which reflects the idea of sustainable development. The President of

Enterprise of Apiculture and Pharmacy Apipol-Farma, Eng. R. Tomaszewski, and Professor J.W. Dobrowolski, Poland in cooperation with teams of Professor Belsare from the Bioscience Department in Bhopal, India.

They have shown that products produced by bees propolis and bee bread extracts - used after the great ecological catastrophe in December 1984 – there was much improvement in health status of the numerous victims of cyanide poisoning compounds. Experimental investigations conducted by the team of Professor S.B. Vohora and his staff from the Hamdard University in New Delhi and Dr J.W. Dobrowolski in Krakow Poland, have shown that natural product propolis is very effective for elimination pathogens causing a range of common diseases, which frequently occur in subtropical and tropical countries in Asia, Africa and America.[2,3-11]

Joint publications were found as very useful in many developing countries interested in effective prevention and treatment common infective diseases. Indian experts and authorities have shown great interest in the introduction of modern production and processing methods developed by Polish Apipol Beekeeping Enterprise. It is a very useful tool for sustainable development of a biology-based Green Economy, as well as for prevention and treatment of many infective diseases combining traditions of natural medicine (ethno-medicine) with the new achievements in various fields of science (including medical and biotechnology.[2,3,11,24,18]

Eng. Tomaszewski of Poland, and his staff introduced very efficient (in terms of cost-benefit analyse) and good for nutritional health new generation of phyto-honey. In result of feeding bees with extract of different species of vegetables and medical plants they produce a large amount of phyto-honey (including both forest areas as well as semi-arid regions). Apipol's founding President, Ryszard Tomaszewski, and his team have developed a proprietary system for the development of modern beekeeping (apiculture) with respect to the sustainable development of the labour market. Their offer is aimed not only at Poland (for rural regions and protected areas) and another countries in Central Europe, but also at developing countries, such as India and Brazi[l.2,3,4,19,21,23,25,26]

Professor Belsare initiated in State of Madha Pradesh, an International Training Program in cooperation with Professor Dobrowolski, which is involved in preparation of the International Centre of Innovative Environmentally Friendly Biotechnology for Promoting Research-Developing Study in India and Pilot Projects integrated with Lifelong Education of Experts and Society for Promoting Bioeconomy-driven Sustainable Development.[10,11, 13,14,26]

Introduction of modern high-efficient apiculture (based on innovative biotechnologies (including introduction herbs-honey or phyto-honey and new generation of mobile beehives) supported by modern aquaculture (including efficient cultivation of microalgae) as well as eco-tourism and wide-scale ecological education; could increase financial situation of people living in forest areas as comparable to farmers involved in agriculture or breeding of animals. Such kind of eco-innovative-based common action could contribute to efficient protection the top quality ecological value on international scale[.4.6.8.9.10]

Laser biotechnology could also be useful both for photo-stimulation of physiological activity and growth rate of microalgae, as well as could increase amount of biologically necessary trace elements and vitamins in plants (as source of pollen, propolis, honey and phyto-honey as well). This way training on this new ecologically friendly biotechnology would be useful for higher efficiency of apiculture and aquaculture with very beneficial input of nutritional health as well as bioeconomy adopted to different regions.[13,19]

Integration of complementary eco-innovations with Lifelong Learning and Social Corporate Responsibility could contribute to better quality of life as well as to much more efficient protection of ecological value of the top quality primary forest e.g. in the model areas of Brazil and India (including better adaptation to climate change of very poor regions under high risk of overexploitation biological resources and ecological catastrophe connected also with dramatic situation of great number of people). Global recession due to corona virus pandemic require introduction innovative biotechnologies for efficient stimulation of sustainable development and labour market especially in poor regions of the world. This already tested innovative biotechnology may be one of useful tools needed for regaining stability after big financial crisis in developing nations. [13,19,20,23,25,26]

CONCLUSION

Recommended new concepts integrating modern environmental biotechnology with large-scale production of food for inhabitants of big cities - may be significant contribution to urban agriculture in different regions of the world (both in southern semiarid as well as northern for evergreen gardens especially attractive during long winter time). Proposed solutions would be also useful all over the world for better adaptation to climate change (in particular useful for prevention of infections at periods of epidemics) and for sustainable labor market related to bioeconomy-driven sustainable development.

Integration of innovative biotechnologies e.g. apiculture (modern beekeeping using mobile beehives) with aquaculture supplemented by large-scale macroalgae cultivation and complementary application of sustainable

forestry, agriculture and breeding of animals, focused on dissemination of useful complementary Know-How, which could play a key role for creation of millions of Green Jobs and for Hunger Prevention.

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Healthcare Cybersecurity: A Mini Review on Recent Incidents and Preventive Strategies

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ABSTRACT

Healthcare organizations are fast becoming a prime target of cyberattacks, that threat the sanctity and accessibility to patient data, medical histories, personal details as well financial information. The impact of cyberattacks in healthcare are wide-ranging from ransomware attacks, phishing attack and data breaches. These attacks lead to severe disruption not only to organizations but to patients and stakeholders such as data losses, financial costs, operational disruption, reputational damage. Furthermore, healthcare organizations face the extra challenge of complying with strict regulatory requirements. Healthcare organizations are particularly prone to cyberattacks due to the sensitive nature of data, often outdated IT systems which can attract cybercriminals seeking financial gain or exploit personal information. To prevent cyberattacks, organizations require a multifaceted approach, updating and patching outdated systems to eliminate vulnerabilities. Using data encryption, intrusion detection systems to help protect sensitive data, Regular audit and penetration testing, zero trust architecture (ZTA), employee training and awareness, advanced threat and detection, ensures that the organization can quickly address and mitigate the impact of a cyber incident. Adopting proactive measures and organizing regular audits can help identifying and addressing possible weakness in system and thus healthcare organizations can protect their data and ensure the integrity and trust of their patients.

KEY WORDS: HEALTHCARE, CYBERATTACKS, VULNERABILITIES, RANSOMWARE, DATA BREACHES.

INTRODUCTION

The prevalence and adaption of digital infrastructure in the last few decades gave rise to numerous advanced innovations to the current technology-friendly society. Several cutting-edge inventions with the application of digitalization provided strong and supportive environment for information technology in daily life of human beings.[1] These advancements resulted in the greater improvements in education, communication, workforce productivity, community welfare, industrialization, environmental protection, banking, biomedical research and healthcare.[2]

With all the benefits from these technological advancements, there are few inseparable vulnerabilities which follows digitalization due to generation and exchange of tremendous amount of data from the regular functionality[3]. Organizations have their growth and productivity data available to be accessed to public, but some data are not meant to be freely available and required to be protected from getting into hands of bad actors. [4,5] Technological transformation of healthcare, enhanced efficiency and patient care which accompanied by several vulnerabilities that cybercriminals can exploit [5,6].

Healthcare is one of the prime targets of these cybercriminals as it is a critical part of societal infrastructure involving tremendous amount of sensitive healthcare and financial data involving patients and payment system [6,7]. As per the recent report, cyberattacks against American healthcare system rose 177% in 2023 These incidents negatively affect patient care, healthcare emergency services and financial services involved. These cybercriminals usually ask for huge amount of money in exchange of returning stolen data or service halted by their cyber-attack. [8,9].

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The data breach can impact beyond the patient's privacy and can affect patients' safety by altering the shared networks and devices connected to it. Any cybersecurity flaw in the connected device can cause serious harm to the patients taking services from that device [6,7,8]. The cyber breaches cause elevated financial burden for the industry, which already involves low monetary profits and high expenditures compared to other industries. At present, risk and cost of data breach or loss is much higher for healthcare organization compared to organizations in other sectors.[10,11]

It is estimated that data breaches will cost $10.5 trillion annually by 2025 compared to $3 trillion in 2015.[12] This review will delve into the recent healthcare related cyberattacks, challenges faced by the healthcare sector, and discuss the necessary and robust preventive security measures against the future cyber incidents.

Healthcare

An ever-vulnerable target of cybercriminals? Till last decade, people believed that there are negligible chances of any attack on healthcare system and patient data which led to the loose protective measures to save the system and related data. There was no concept of cybersecurity till 2014, when Boston Children's Hospital was attacked by anonymous entity with distributed denial-of-service (DDoS) attacks. [13, 14] In later years, 2015 and 2016, there were few more similar notable healthcare organizations targeted cyber-attacks done by threat actors.

This led to their unrestricted access to protected health information (PHI) in exchange with the ransom demands.[15, 16] Nowadays, healthcare targeted attacks occur more frequently than before and must be tackled with efficient preparedness in cyber threat landscape Table 1.[17] There are several factors involved in the complex architecture and vulnerabilities in healthcare cybersecurity. Some of them are:

Hardware vulnerabilities in medical devices can become as major shortcoming of cybersecurity system and attackers can exploit these vulnerabilities. To counter these vulnerabilities, advanced and dependable Cyber Physical System (CPS) is required to prevent the shared hardware of the organization,[22]. Studies have suggested regular update of device access passwords, updated firewalls and limiting access to unsecured networks. [21,23]

Impact of healthcare cyberattacks

Healthcare cyberattacks have wide-ranging consequences, which has severe impact on patient care, data security, financial stability, and overall healthcare facilities. These incidents put more risks to the people involved with the targeted organization causing crucial harm. Here is a detailed analysis of these impacts.

Patient Safety Risks

Patient safety is threatened by cyberattacks on healthcare system. Loosing access to medical health records, medical device and all other critical operators which can lead to serious effects on patient health and lives. This causes delayed medical care to the patients in need of emergency care and continuous medical assistance through the respective hospital system for survival. In recent cyberattack to the accension hospital system, clinicians had to revert to paper-based patient care raising the events of delayed medical services to the needy. [32,37]

Data Breaches

Data breaches in healthcare organizations are widely observed because they contain enormous amount of personal sensitive information of patients, including their health record, medical histories, financial information. The PHI are most likely to be breached and used for identity theft, privacy violations, and many more [(38)]. This type of cyberattacks creates following issues:

Financial burden

Cyberattacks in healthcare organizations causes huge impact in financial cost. Financial breach can cause disclosure of financial information resulting in ransomware attacks, Phishing scams, which further impacts financial cost including remediation costs, legal and regulatory penalties, investigation costs, Ransomware payments. Financial data breach in healthcare organization can be severe effecting organizations, patients, employees, stakeholders.[38,39]

Operational Disruption

Cyberattacks can cause significant operational disruptions resulting in device malfunctions, patient appointment cancellation and delays, system outages, delays in diagnosis and treatment. Failure to maintain robust data integrity and security or patient data breaches can lead to fines and legal consequences [(40)]. Scripps health Cyberattack caused shutdown of electronics system for weeks, resulting in compromised patient care. This caused long term detrimental effect on overall healthcare of the organization affecting larger population receiving the medical services. [(31, 32)]

Reputational Damage

Impacts of healthcare cyberattacks can be severe in terms of reputational damage because of the broken trust of the patient, leading to loss of patient trust in healthcare providers. Confidentiality concerns, facing rejection to collaborate with third party organization, media coverage, fear of misusing of data [(31, 41, 42)]. Attacks and breaches which faces media backlashes resulting in negative comments, damaging the organization's reputation [(42)]. For example, Anthem Inc. Healthcare attack in 2015, caused major set-back to the organization's reputation and patient confidence. [(43)]

Table:1 Healthcare cyberattack incidents occurred in recent years.

S.No.	Attack Name	Location	Impact
1	Black Basta Ransomware Attack 2024	United States	A major US healthcare network with over 100 hospitals and 50 senior living facilities was hit by a ransomware attack. This disrupted electronic health records, phone systems, and ordering processes for tests, procedures, and medications, leading to ambulance diversions and operational disruptions[24].
2	Change Healthcare Cyberattack 2024	United States	This attack disrupted the payment processing systems critical for handling Medicare, Medicaid, and commercial health plan claims. It led to delays in payments and operational difficulties across many healthcare providers.[(25)].
3	Norton Healthcare Data Breach 2023	United States	Norton Healthcare has suffered a data breach impacting an It is estimated that around 2.5 million people were impacted by data breach from Norton Healthcare based in Kentucky, United States. They reported that, Cybercriminals got unauthorized access to personal information of patients and many employees[(26)].
4	UK's National Health Service (NHS) 2023	United Kingdom	The NHS faced multiple cyberattacks in 2023, one of which caused significant disruptions in healthcare services, including delays in surgeries and appointments. A specific attack led to the compromise of the data of thousands of patients[(27)].
5	Australian Health Provider Medibank 2022	Australia	Personal data of 9.7 million current and former customers was stolen, including sensitive health records. The attackers leaked the data online after a ransom demand was not met[(28)].
6	AIIMS Ransomware Attack 2022	India	Hackers targeted systems of one the biggest and famous hospital, All India Institute of Medical Sciences (AIIMS) and allegedly demanded ransome of around Rs 200 crore in cryptocurrency[(29)].
7	Morley Companies 2022	United States	Ransomware attack on Morley Companies, a third-party provider of medical services. This caused, exposure of over 521,000 individual records to cybercriminals [(30)].
8	Scripps Health 2021	United States	A ransomware attack caused significant disruptions to the hospital's IT systems, impacting patient care and forcing the diversion of critical care patients. Personal data of around 147,000 patients were compromised [(31, 32)]
9	Ireland's Health Service Executive (HSE) 2021	Ireland	The HSE was hit by a ransomware attack that caused widespread disruption across its network. The attack led to the shutdown of IT systems, affecting patient care and administration across the country. Personal data and medical records of patients were also compromised [(33)].

10	Finnish Vastaamo Psychotherapy Center 2020	Finland	Sensitive patient records were stolen and used for extortion. Attackers demanded ransom from both the clinic and individual patients, threatening to publish their private therapy session notes online.[34]
11	French Hospital System AP-HP 2020	France	AP-HP, which is part of the Assistance Publique–Hôpitaux de Paris, faced a cyberattack that targeted its administrative systems. The attack disrupted operations and threatened patient data [(35)].
12	University Hospital Düsseldorf 2020	Germany	A ransomware attack led to IT systems being shut down, and a patient seeking emergency treatment was redirected to another hospital, resulting in delayed care. The incident raised significant concerns about the impact of cyberattacks on patient safety[(36)]

Figure 1: Graphical representation of preventive cybersecurity in healthcare.

Potential solutions to prevent future cyberattacks

There are various types of impact which is caused by cyberattacks on healthcare organization and it is important to implement robust cybersecurity measures to prevent any possible future incidents. Here are some possible solutions (Figure 1):

Enhanced Cybersecurity Frameworks

Enhanced cybersecurity frameworks play an essential role for protecting healthcare organizations. These frameworks should incorporate risk management, network security measures, incident response, threat detection and robust endpoint protection.[15,44]. Frameworks like NIST Cybersecurity Framework provides a guideline for managing and reducing cybersecurity risks. By implementing these frameworks, healthcare organization can upgrade their cybersecurity prevention methods, give better protection to organization, and ensure compliance with regulations [(45, 46)].

Penetration Testing and Security Audits

Cyberattacks in healthcare can be avoided by regularly checking for security audits and penetration testing ensuring regulatory standards, identifying and mitigating risks and improving overall efficiency [(47)]. Proactively involving simulated cyberattacks against organizations system can be helpful to identify any weakness that could be exploited by malicious actors and to strengthen system defenses. Continuous improvement by regular audits, employee training can protect sensitive patient data and maintain trust with patients and stakeholders [(17)].

Employee Training and Awareness Programs

Employee training and awareness programs plays a crucial role to protect and maintain data security [(48)]. Human errors can be mitigated by training healthcare workers on recognizing phishing attempts, secure data practices to properly handle, store and transmit patient data, password management, incident response and report, compliance with regulations, by implementing training programs can help improving security posture and can significantly reduce the risk of potential cyber-attacks. [(38, 46, 48)]

Advanced Threat Detection and Response Solutions

Advance threat detection and response solutions are vitally important for healthcare organizations to help recognize and address to potential threats and vulnerabilities [(49)]. These solutions can be implemented by using tools like Security Information and Event Management (SIEM), Endpoint Detection and Response (EDR), Network Traffic Analysis (NTA) and many more which can help monitor alerts in real time to detect any suspicious activities and threats.

Integrating threat intelligence platforms can help to stay updated on emerging threats (50, 51). By combining Artificial Intelligence (AI) and Machine Learning (ML) with these tools can help achieve a robust security posture. [(52, 53)]

Data Encryption and Access Controls

Protecting sensitive data from cyber-attacks is crucial in healthcare; by implementing encryption not only it will protect from unauthorized access but remains keeps the data confidential and secure both at rest and in transit. [6, 45] Furthermore, using security measures such as access control can help ensuring data protection, reducing risks of data breaches and helps meet regulatory requirements [7, 22]. They ensure only authorized users have access to sensitive information. Strategies like Multi Factor Authorization (MFA), least privilege principle, audit and monitoring can be used for reducing the risks of internal threats, prevents unauthorized access. [54]

Regular Software Updates and Patch Management

Regular software updates and patch management plays significant role ensuring the systems are up to date maintaining the security, enhancing security by addressing vulnerabilities, maintaining compliance, and saving costs associated with security incidents [55]. Risk of human error and to streamline the deployment process automated patch management tools can be used. Implementing robust patch management policies, prioritizing critical patches, training IT staff on patch management practices can help in reducing risk of cyberthreats [38, 47].

Backup and Disaster Recovery Plans

Backup and disaster recovery plans can help organization to protection of sensitive data from data loss or system failure. It protects critical information of patients from being compromised, ensuring healthcare service can continue with minimal interruption of any event [38]. Strategizing data backup and data recovery plans with regularly testing and software updating can help in reflecting changes in the IT environment and emerging threats [56]. Also, using automated backup process and utilizing cloud services can help in providing consistency, cost-efficiency and remote access, making them a cornerstone of a strong cybersecurity strategy in healthcare. [57]

Information sharing with effective collaborations

Healthcare organizations are required to maintain strong collaborations with cybersecurity experts, and government agencies for efficient protection from potential cyberthreats from the cybercriminals [7]. All the information from the recent threats and appropriate best practices should be shared between the collaborative agencies [58]. This will enable the healthcare organization stay prepared and ahead of cybercriminals strengthening the overall cyber defense. Information-sharing and analysis centers (ISACs) and industry consortiums provide the robust and effective collaborative platform for strong cyber defense for healthcare organizations [59].

Zero trust architecture

Zero Trust Architecture (ZTA) is a security model that works on principle “Zero trust”, meaning that no user or device can be trusted. Zero trust assumes that threat could be exists in outside or outside of the network [60]. By implementing this approach, the user or devices are granted least privileges or minimum access necessary for user to perform tasks which limits potential entry points for attackers reducing risks of cyberattacks [61]. Ensuring end point security, continuous monitoring can help healthcare organization to improved data protection and operational efficiency. ZTA offers robust strategies for better or enhanced security protection. [60, 61].

Incident Response and Management

Incident Response and management are vital for handling, detecting and responding cybers attacks in healthcare. Incident management can minimize impact by reducing potential damage and operational disruption [62]. By using monitoring tools like SIEM can be helping to stay informed about emerging threats and by implementing mitigation strategies threat damage can be minimized ensuring removal of threats from system [63]. Conducting regular assessments, audits, penetration testing can help organization to prevent future incidents. [44, 63]

Recommendations

Early and unified adaption of cybersecurity in healthcare organizations is of utmost importance / These organizations are guardians of sensitive PHI data, innovative clinical research and financial information. This data is considered confidential. Implementing robust cybersecurity measures can safeguard this sensitive data from data breaches which can ultimately protects from legal outcomes and financial loss. Strict regulatory standards should be implemented, and every employee should be trained to oblige to follow them through necessary certifications and regular audits.

Security compliances should be obliged to be updated as per the recent cyberthreat environment which requires considerable investments at regular intervals in cybersecurity compliance. Robust and well-informed cybersecurity environment following the advanced security measures in the healthcare organization by increasing regular employee awareness by workshops on phishing attacks, malicious contents, their implications and promoting the well-informed responsible approach for supporting healthcare organizations can prevent the future operational disruptions in healthcare delivery and possible financial loss.

CONCLUSION

Cybersecurity in healthcare is critical and must have component in the organizational framework to maintain patient trust, prevent data breaches, operational disruptions, and financial loss. This required utilizing latest technologies and promoting awareness in the respective organization. Failure comply with these necessities by

healthcare organization can lead to serious damage to critical and essential resources leading to unprecedented harm to its stakeholders. This can be made possible by regular security audits, addressing regulatory compliance. Another crucial measure for effective healthcare cybersecurity is promoting regular and well-informed awareness on possible cyberthreats through workshops, seminars and trainings for beneficiaries and employees which can harness the robust cybersecurity infrastructure.

Author contribution

MK and JK conceptualized have written the manuscript, MK, RK and JK edited the final version of manuscript.

Conflict of interest declaration statement

Authors declare no conflicts of interest in this manuscript

Ethical declaration statement

No animal or human data is used in this manuscript.

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Examining Blockchain Adoption and Usage Behavior in Private Banks in India: An Empirical Study Based on Rogers' Diffusion Theory

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ABSTRACT

The adoption of blockchain technology in the banking sector has gained significant attention due to its potential to improve operational efficiency, transparency, and security. The study aims to investigate how the relative advantage, compatibility, complexity, observability, and trialability of blockchain, as proposed by Rogers' theory, impact the adoption behavior of private sector banks in India. The study was employed a mixed-methods approach, including a quantitative survey and qualitative interviews, to collect data from relevant bank employee in the banking industry. According to the findings of the study, relative advantage, compatibility, observability, and trialability all have a major impact on usage behaviour and the adoption intention of blockchain technology in private banks. The study also discovered that the complexity of deploying and integrating blockchain technology into banking procedures and systems may have a detrimental influence on bank adoption behaviour.

KEY WORDS: BLOCKCHAIN ADOPTION, INNOVATION DIFFUSION THEORY, USAGE BEHAVIOR, ARTIFICIAL INTELLIGENCE.

INTRODUCTION

By improving operational effectiveness, raising security, and reducing costs, blockchain technology has the potential to revolutionize the banking sector.[1] Like in many other countries, private sector banks in India are starting to show interest in utilizing blockchain's advantages. However, the implementation of blockchain technology in the banking sector is complicated and challenging, taking into account a number of factors that affect bank behavior and decision-making. [2]The innovation diffusion theory by Everett Rogers provides a framework for comprehending how innovations are embraced and dispersed in a social system. According to the theory, relative advantage, compatibility, complexity, observability, and trialability are some of the key factors that affect whether an innovation is adopted. These elements may affect adopters' perceptions, choices, and actions, which in turn may affect the pace and scope of adoption.[3]

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In recent years, blockchain technology has become more and more significant in a range of field of banking sector. Blockchain may be used, for instance, to automate procedures, analyze data, offer insights, and support decision-making, which may affect how people view the relative benefit, complexity, and observability of blockchain technology.[2, 3] In light of this, the research suggests using the innovation diffusion theory to examine the adoption of blockchain by private sector banks in India.[4]

This study aims to examine the effects of Rogers' theory's suggested variables on the adoption behavior of India's private sector banks, including relative advantage, compatibility, complexity, observability, and trialability. By incorporating the innovation diffusion framework, this study aims to provide a comprehensive understanding of the dynamics perception of blockchain adoption in the banking sector and throw light on how blockchain influences the behavior of private sector banks in India.[4, 5]

Overall, this research can add to the body of knowledge about innovation diffusion and blockchain acceptance in banks. The study's findings may have significance for policymakers, practitioners, and researchers interested in boosting blockchain technology adoption in private sector banks in India and elsewhere.

Blockchain Adoption for Banks

Blockchain technology is a distributed ledger that offers safe, transparent, and immutable recordkeeping. Banks can use blockchain in a variety of ways:

- **Payments & Remittances:** By removing intermediaries, lowering costs, and enhancing transaction speed, blockchain can streamline cross-border payments and remittances.(4)
- **Identity Verification:** Blockchain has the potential to improve identity verification procedures by providing a decentralized and safe mechanism to store and verify consumer IDs, hence reducing fraud and increasing security.(4)
- **Smart Contracts:** Smart contracts based on blockchain technology can automate and streamline complicated operations such as loan agreements, trade financing, and insurance claims, decreasing the need for middlemen and enhancing efficiency.(6)
- **Know Your Client (KYC) Compliance:** By securely storing client data and enabling data sharing among banks while preserving privacy and data protection, blockchain can simplify and streamline KYC compliance (7). Blockchain can improve supply chain finance by offering end-to-end visibility and transparency, decreasing fraud, and enhancing trade finance efficiency.(8)

Blockchain Technology and Innovation Diffusion Theory

Everett Rogers' innovation diffusion theory explains how innovations are adopted and spread within a social system. The qualities of an innovation, according to the innovation diffusion theory, impact its acceptance.(9)

Blockchain technology offers distinct qualities that may influence its acceptance in banks, including decentralization, transparency, and immutability. These qualities can influence how banks perceive the benefits and hazards of implementing blockchain technology, and so influence its adoption within the banking industry.(10)

For the acceptance of innovations, the innovation diffusion theory offers a five-stage process: knowledge, persuasion, choice, implementation, and confirmation. When exploring and deploying blockchain technology, banks may go through these stages.(10)

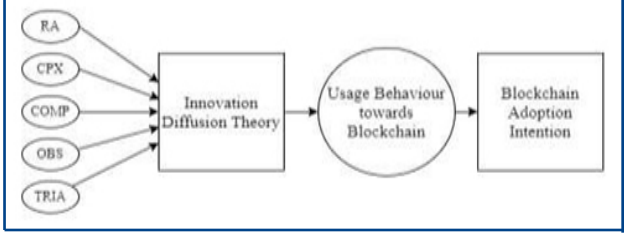
Banks, for example, may become aware of blockchain technology and its potential benefits during the knowledge stage. Banks may examine the benefits and drawbacks of adopting blockchain technology during the persuasive stage. Banks may choose to accept or reject blockchain technology during the decision stage. Banks may install blockchain solutions during the implementation stage, and banks may evaluate the results of their adoption efforts during the confirmation step.(11)

The relationship between blockchain technology and the innovation diffusion theory entails taking into account the characteristics of the invention, the adoption process, adopter categories, communication channels, and the social structure in which banks operate.(6, 12)This research can shed light on how and why blockchain technology might be adopted and spread inside the banking industry.

Literature Review And Hypothesis Development

Everett Rogers' innovation diffusion theory explains how innovations are adopted and spread within a social system. The qualities of an innovation, according to the innovation diffusion theory, impact its acceptance.(9)

Figure 1. Conceptual Model



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The relationship between blockchain technology and the innovation diffusion theory entails taking into account the characteristics of the invention, the adoption process, adopter categories, communication channels, and the social structure in which banks operate.(6, 12) This research can shed light on how and why blockchain technology might be adopted and spread inside the banking industry.

Relative Advantage and Blockchain Adoption in Banks

Relative advantage is a diffusion theory term that describes the perceived superiority of a new innovation over existing alternatives. According to Lin(13), relative advantage refers to the extent to which an innovation is regarded to provide more benefits than its predecessor. Increased productivity, financial gains, and improved status are the effects of relative advantage.(14)

When it comes to the blockchain system in the banking industry, relative advantage refers to the benefits that blockchain technology can offer to banks compared to traditional banking systems. Overall, the implementation of blockchain technology in the banking industry has the potential to provide various relative advantages over traditional banking systems, such as increased security, transparency, efficiency, cross-border transactions, and customer experience. It is crucial to remember, however, that blockchain technology is still in its early stages, and its full potential and impact on the banking industry have yet to be realized.

Banks need to carefully evaluate the benefits and challenges of implementing blockchain systems and consider various factors such as regulatory compliance, scalability, interoperability, and integration with existing systems before adopting blockchain technology in their operations.[15]

H1: Relevant advantage has a positive and significant effect on usage behavior towards the adoption intention of blockchain technology in private banks.

Complexity and Blockchain Adoption in Banks

Complexity refers to the perceived difficulty or complexity of implementing and integrating blockchain technology into existing banking processes and systems. According to the innovation diffusion theory, the complexity of an innovation can influence the rate and extent of its adoption. Innovations that are perceived as more complex may be adopted at a slower pace or face resistance from potential adopters[14, 15]. It is expected that the perceived complexity of implementing and integrating blockchain technology into banking processes and systems may negatively impact the adoption behavior of banks. This is because a higher perception of complexity may create barriers and challenges for private sector banks in India, leading to a lower likelihood of adopting blockchain technology.[7]

H2: Complexity has a negative and significant effect on usage behavior towards the adoption intention of blockchain technology in private banks. Compatibility and Blockchain Adoption in Banks

The degree to which a service is viewed as consistent with users' preexisting values, beliefs, habits, and current and prior experiences is referred to as compatibility[16]. Compatibility refers to the degree to which an innovation, such as blockchain technology, can be integrated with existing systems, processes, and infrastructure without disrupting their functionality or requiring significant changes. In the context of the banking industry, the hypothesis suggests that the higher the compatibility of blockchain technology with existing banking systems, the more likely banks are to adopt and implement blockchain in their operations.[7]

H3: Compatibility has a positive and significant effect on usage behavior towards the adoption intention of blockchain technology in private banks.

Observability and Blockchain Adoption in Banks

Observability refers to the degree to which the results or outcomes of an innovation, such as blockchain technology, are visible and easily discernible to potential adopters. According to the innovation diffusion theory, innovations that are more observable are likely to be adopted more quickly as potential adopters can witness the benefits and outcomes of the innovation. Based on this theory, the hypothesis suggests that observability will have a positive effect on the adoption of blockchain in banking. It is expected that the more observable the outcomes of blockchain technology are to potential adopters in the banking industry, the higher the likelihood of adoption. In other words, if private sector banks in India can clearly see the positive results and benefits of implementing blockchain technology, they are more likely to adopt it.[8]

H4: Observability has a positive and significant effect on usage behavior towards the adoption intention of blockchain technology in private banks.

Trialability and Blockchain Adoption in Banks

Trialability, as a concept from diffusion theory, refers to the extent to which an innovation can be experimented with or tested in a controlled setting before full-scale adoption. In the context of the banking industry and blockchain technology, the hypothesis suggests that the higher the level of trialability of blockchain, the more likely banks are to adopt and implement it in their operations. The ability to trial and test blockchain technology in a controlled environment allows banks to adopt a gradual and incremental approach to its implementation. Banks can start with small-scale trials or pilot projects to assess the viability and effectiveness of blockchain in specific use cases or business areas. Based on the results of these trials, banks can gradually expand the adoption of blockchain to other areas, reducing the risks associated with a full-scale implementation.[17]

H5: Trialability has a positive and significant effect on usage behavior towards the adoption intention of blockchain technology in private banks.

Figure 2. Survey Method

RESEARCH METHODOLOGY

Descriptive study was conducted using a survey to gather primary data. At a significance threshold of 0.05, the mean of the responses was statistically validated to be more than, indicating a potentially significant discovery. The respondents were chosen using a purposive sample method, which means that they were picked based on defined criteria or for a specific goal. Due to the lack of an existing scale, a self-structured questionnaire was developed and pretested based on the outcomes of a pilot study to assure its reliability. A total of 400 bank employees were gathered after screening for missing data and partial responses. However, due to the rejection of incomplete or invalid responses, only 250 respondents were chosen for the final analysis towards perception of adoption of blockchain technology in the private bank.

A structural equation model (SEM) was utilised as the statistical test to examine the hypothesis. SEM is a multivariate statistical approach that is often used to analyse correlations between variables and to evaluate complex

Table 1: Construct reliability, average variance extracted and discriminant validity

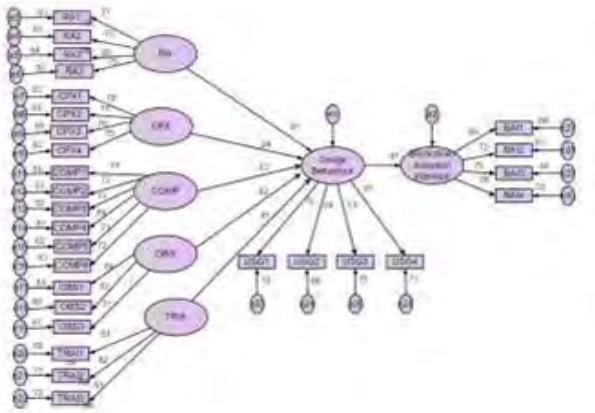
Construct and Factors (Code)	Factor Loads	Construct Reliability	Average Variance Extracted (AVE)	Discriminant Validity
(A) Relative Advantage (RA)				
RA1	0.716	0.777	0.468	0.777
RA2	0.805			
RA3	0.744			
RA4	0.716			
(B) Complexity (CPX)				
CPX1	0.74	0.835	0.6	0.835
CPX2	0.744			
CPX3	0.757			
CPX4	0.749			
(C) Compatibility (COMP)				
COMP1	0.713	0.894	0.6	0.894
COMP2	0.766			
COMP3	0.835			
COMP4	0.782			
COMP5	0.756			
COMP6	0.729			
(D) Observability (OBS)				
OBS1	0.707	0.784	0.5	0.654
OBS2	0.782			
OBS3	0.674			
(E) Trialability				
TRIA1	0.707	0.766	0.5	0.654
TRIA2	0.782			
TRIA3	0.674			
(F) Usage Behavior				
USG1	0.774	0.787	0.5	0.717
USG2	0.874			
USG3	0.734			
USG4	0.674			

(G) Blockchain adoption intention		0.731	0.5	0.654
BAI1	0.716			
BAI2	0.705			
BAI3	0.844			
BAI4	0.716			

Table 2. Hypothesis Testing

No.	Hypothesis	Std Error	CR	p-value	Path coff β value	t-value	Findings
H1	RA→USG	0.071	2.112	0.005	0.09	0.377	Supported
H2	CPX→USG	0.034	2.664	0.005	-0.056	-0.086	Supported
H3	COMP→USG	0.012	2.225	0.005	0.425	3.222	Supported
H4	OBS→USG	0.057	3.642	0.005	0.09	1.287	Supported
H5	TRIA→USG	0.191	8.111	0.005	0.121	0.832	Supported
H6	USG→BAI	0.191	8.052	0.005	0.121	0.812	Supported

Figure 3. Final SEM



hypotheses. It is ideal for analysing complex theoretical models since it allows for the examination of both direct and indirect effects. The SEM appears to have been employed to test the study's hypothesis.

RESULTS AND ANALYSIS

Construct reliability, average variance extracted (AVE), and discriminant validity are important concepts in statistical analysis, particularly in the context of structural equation modelling (SEM). These measures are used to assess the quality of the measurement model and the validity of the constructs being studied.

The results specify that all six hypotheses are supported as there is a substantial relationship amongst analysed variables as presented in Table II. Results indicated that all six alternative hypotheses supported the analysis. For instance, the hypothesized path between RA and USG with a CR value of 2.112 were statistically significant (p=.005), while CPX and USG with a CR value of 2.664 were statistically significant (p=.005). It was found that COMP and USG with a CR value of 2.225 were statistically significant (p=.005), whereas OBS and USG with a CR value of 3.642 were statistically significant (p=.005). Subsequently, TRI and USG with a CR value of 8.111 were statistically significant (p=.005). In addition, USG and BI with a CR value of 8.052 were statistically significant (p=.005) as presented in Table II.

The SEM analysis was performed utilizing a sample of 250 respondents in order to assess the relationship among independent variables. The obtained value of $\chi 2$ was 28.809 and df= 12 and $\chi 2/df$= 2.40075. RMSEA was 0.021 respectively. GFI was 0.923 and AGFI was 0.923 representing that model is a good fit. The incremental fit measures i.e., NFI= .951, RFI= 0.909, IFI= 0.932, TLI=0 .903, CFI=0.912. The value of PRATIO, PNFI and PCFI was 0.672, 0.655 and 0.652.

DISCUSSION

The findings of this study highlight the importance of various factors in the adoption of blockchain technology in private banks. Relevant advantages, such as enhanced security, transparency, reduced costs, and increased efficiency, are significant drivers that make blockchain technology attractive to private banks. The potential benefits of blockchain technology in terms of improving financial transaction security and efficiency, lowering costs, and increasing transparency correspond with the demands and aims of private banks.[1]

Furthermore, the perceived complexity of adopting and executing blockchain technology is a significant element that can impact its acceptance. If private banks view blockchain technology to be complex and difficult to

incorporate into their existing systems and processes, they may be hesitant to adopt it.[2]

As a result, efforts to streamline the adoption process and give clear direction and support may help private banks adopt blockchain technology.The study's findings emphasize the significance of complexity as a significant obstacle to the adoption of blockchain technology in private banks. The apparent complexity of adopting and using blockchain technology might create hurdles and stymie acceptance in private banks. The observability of blockchain technology's outputs and advantages is also essential in encouraging its acceptance in private banks.

When private banks see the positive consequences of blockchain technology adoption in other organizations or industries, it may boost their confidence in its efficacy and urge them to adopt it[1]. To address the perceived complexity of deploying blockchain technology in private banks, efforts to streamline the adoption process and provide clear guidance and support may be required.

This could involve conducting training and education programs, providing technical assistance, and building regulatory frameworks that provide clarity and ease compliance. Furthermore, trialability, which allows private banks to experiment with and test blockchain technology on a modest scale, can allow them to assess its effectiveness and suitability before fully adopting it.[3]This can help reduce the risks and uncertainties associated with adopting new technologies, encouraging private banks to use blockchain technology.

Key stakeholders need to be made aware of the relative benefits of blockchain technology, such as operational effectiveness, transparency, and security, by banks. By emphasising these advantages, banks in the private sector may have a more favourable impression of them and be more likely to embrace them. Banks should give key stakeholders the chance to see the advantages and results of blockchain technology. This can be accomplished through proof-of-concepts, case studies, or pilot projects that demonstrate effective implementation and beneficial outcomes. Increased observability can encourage adoption by boosting confidence.

Recommendations

Conduct comparison study using the innovation diffusion theory to compare the adoption patterns of private sector banks in India with those in other countries or regions. This can provide light on the particular factors that affect blockchain implementation in the Indian banking sector and reveal similarities and differences in adoption patterns, drivers, and barriers in various situations.

Conduct an exploratory study to look at new trends, challenges, and opportunities related to blockchain adoption in the banking industry. This study will combine innovation diffusion theory, AI, and expert perspectives. This can indicate fresh study directions and areas for additional investigation in addition to providing a glimpse into the use of blockchain in India's private sector banks in the future.

In general, more research on the application of innovation diffusion theory to the usage patterns of blockchain adoption by private sector banks in India can help us better understand the factors that influence, hinder, and have an impact on the adoption of blockchain in the banking industry. Additionally, it can provide policymakers, practitioners, and researchers with useful insights into creating policies and initiatives that would increase the adoption of blockchain technology in India's private sector banks.

CONCLUSION

Innovation diffusion theory in conjunction to understand the perception of usage behaviour of blockchain adoption by private sector banks in India can provide valuable insights that can drive decision-making, innovation management, and policy creation. These consequences may lead to the faster adoption of blockchain technology in the financial sector and the realisation of its potential benefits for India's private sector banks. Finally, the study discovered that relevant advantages, complexity, compatibility, observability, and trialability all have a favourable and significant impact on usage behaviour towards blockchain technology adoption in private banks. The study also concludes and suggests that complexity is a significant impediment to blockchain technology adoption in private banks. Addressing the perceived difficulty of adopting and using blockchain technology may be critical for promoting its acceptance and realising its potential benefits in the private banking business.

Conflict of Interest

Author declares no conflict of interest

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Outsourcing Healthcare Services and its Impact on Strategic Goals of Patient Care in Nigerian Private Hospitals

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ABSTRACT

One of the most important indicators of a nation's progress and prosperity is its health. Ensuring healthy lives and promoting well-being at all ages is essential to sustainable development. The role of healthcare professionals in enhancing a hospital's reputation and providing excellent patient care is critical. This article deliberates the re-evaluation of health services and presents a structured study on the reallocation of various health services to patients in Nigeria. The study's hypotheses and objectives were substantiated in terms of the effectiveness of healthcare professional outsourcing (HCE), improvements in key aspects of patient quality health services (PQHS), and the impact of HCE components. Integration of HCE through outsourcing is considered critical to align with the strategic objectives of the Nigerian healthcare industry. The study focuses specifically on components of patient care and explains how private hospitals in Nigeria can promote high-quality clinical patient care and improve patient satisfaction through the use of HCE and its associated components.

KEY WORDS: OUTSOURCING HEALTH CARE EXPERT (HCE), PATIENT QUALITY HEALTH CARE SERVICES (PQHS), PATIENT CARE, MEDICAL SERVICES, HEALTHCARE INDUSTRY.

INTRODUCTION

Social scientists use empirically-derived multidimensional framework for conceptualizing and measuring quality of life and well-being of a country.[1] One of the most important indicators of a nation's progress and prosperity is its health. Ensuring healthy lives and promoting well-being at all ages is essential to sustainable development (UN). "Wellbeing is not just the absence of illness or infection but it is a complete state of physical, mental, and social well-being" stated by World Health Organization (WHO).

Healthcare organizations are faced with the problem of maximizing their resources while also providing high-quality patient care in today's highly competitive and highly regulated climate. Both commercial and governmental institutions are changing as a result of the increased demand for high-quality, affordable healthcare.[2] One way many

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businesses have found to save expenses and make the most of their current resources is healthcare outsourcing.

The healthcare sector in Nigeria holds immense promise, offering avenues for revenue generation, employment opportunities, and overall economic growth.3 However, amid these prospects, challenges persist, notably in healthcare expenditure. Despite the acknowledgment of healthcare as a social priority in Nigeria, current expenditure levels present formidable obstacles,[4] necessitating strategic interventions and innovative solutions. In response to these challenges, there have been concerted efforts to evaluate and enhance healthcare financing initiatives.

This includes initiatives aimed at equipping students with the requisite skills and knowledge to effectively address healthcare financing issues. Efforts to bolster healthcare financing education have included curriculum updates to reflect current industry needs, the provision of practical experiences through internships or fieldwork, and collaborations with healthcare institutions to offer insights into real-world challenges. Continuous feedback mechanisms ensure that the educational offerings evolve in tandem with the dynamic healthcare landscape in Nigeria. The overarching goal of these initiatives is to empower students to make meaningful contributions to the advancement of healthcare financing and delivery within the country.

Amidst these discussions on healthcare financing, the practice of outsourcing healthcare professionals within Nigerian private hospitals emerges as a critical area deserving of scrutiny.[5] This study endeavors to delve into the implications of outsourcing on the strategic goals of patient care within these hospitals, recognizing the vital role played by healthcare professionals in shaping the quality and efficacy of healthcare delivery. By examining the impact of outsourcing, this research aims to provide valuable insights that can inform policies and practices aimed at optimizing patient care outcomes in Nigeria's private healthcare sector.

Need and significance of the study

This study aims to explore the practice of outsourcing healthcare professionals in Nigerian private hospitals, acknowledging their pivotal role in realizing strategic patient care objectives.

Understanding the implications of outsourcing on these objectives is imperative for refining healthcare delivery practices across the nation.

The study seeks to evaluate the efficacy of various outsourcing strategies in aligning with patient care standards and bolstering operational efficiency within the healthcare sector.

The findings of this research are expected to provide insights for policymakers and hospital administrators to formulate effective strategies aimed at enhancing healthcare services, thereby fostering improved health outcomes in Nigeria.

METHODOLOGY

A robust research methodology is integral to ensuring the coherence and reliability of study findings. In this research, a clear logical framework guided the selection of appropriate methods for data collection and analysis. The legitimacy of the survey rested on the careful consideration of methods employed. This study employed a mixed-methods approach, utilizing both primary and secondary data sources. Primary data were gathered through structured questionnaires, while secondary data encompassed hospital profiles, newspaper articles, healthcare magazines and journals, and online portals.

The systematic collection of data aimed to elucidate causal relationships pertinent to the research questions and facilitate the derivation of objective conclusions, thus contributing to the refinement of healthcare strategies within private hospitals in Nigeria. Various statistical tools were employed to analyze the data, including the Henry Garrett Ranking Method, Factor Analysis, and Skewness. These analytical techniques were instrumental in examining hypotheses and addressing research questions.

The sample size comprised 220 participants, selected through purposive sampling techniques. Private hospitals situated in the North-West region of Nigeria, including Kano, Kaduna, Sokoto, Jigawa, Zamfara, Katsina, and Kebbi, were included in the sampling area. By adopting this sampling design, the study aimed to capture a diverse range of perspectives and experiences within the private healthcare sector in Nigeria's North-West region, thereby enhancing the comprehensiveness and applicability of the study findings.

Review of Literature

Omar[6] emphasizes the importance of understanding the extent of outsourcing services in healthcare settings, along with the reasons behind outsourcing decisions, its advantages, disadvantages, and associated challenges. Additionally, Ayaad explores how hospital managers perceive outsourcing practices. Cholewa-Wiktor and Sitko-Lutek [7] highlight the prevalent use of contract outsourcing by public hospitals, particularly for ancillary and commercial services. They discuss the impacts of outsourcing on various metrics, such as current performance indicators, leverage, and financial outcomes, including concerns regarding executive focus and potential price increases by outsourcing companies. Kahouei et al.[8] conducted a survey examining hospital staff attitudes toward outsourced health information management services. Their study aims to assist healthcare organizations in evaluating the potential benefits and challenges associated with outsourcing such services.

Rachael[9] focusses on the utilization of business process outsourcing in the healthcare sector in the United States, emphasizing its role in meeting low-cost requirements, enhancing profitability, and delivering personalized care across multiple healthcare systems. They suggest that outsourcing enables health plans and providers to streamline organizational complexity and concentrate on customer-centric initiatives. Thomas[10] explores the

extraction of relevant information from images and medical records sourced from various healthcare providers.

Their research also examines standard procedures utilized by healthcare professionals to comprehend patient profiles effectively. Antucheviciene et al.[11] established the significant enhancement in access to and quality of healthcare for the population served by allied health centers affiliated with Tehran University of Medical Sciences. Their findings suggest that while outsourcing continues, the delivery of high-quality services remains stable.

Statement of problem

A thorough examination of pertinent literature underscores the growing acceptance of outsourcing practices within healthcare organizations. Cost management and enhanced customer satisfaction emerge as pivotal factors driving healthcare organizations' outsourcing endeavors. While numerous studies have investigated the benefits, significance, and strategic management of healthcare outsourcing, there remains a notable gap in understanding the roles and self-efficacy of key stakeholders in healthcare outsourcing initiatives.

This study aims to address this gap by elucidating the motivations and perspectives underpinning the outsourcing of healthcare professionals to private hospitals. Adopting a comprehensive approach, the research endeavors to assess the impact of outsourcing healthcare specialties on hospitals' attainment of both short- and long-term goals, including factors critical to enhancing patient care. Furthermore, the study seeks to explore the multifaceted dynamics and considerations inherent in healthcare specialty outsourcing.

Table -1 Socio-demographic Profiles of Healthcare Experts

Segment	Facts	No. of Respondents	% of Respondents	Total
Gender	Male	155	72	220 (100%)
	Female	76	35	
Age	Below 30	33	19	220 (100%)
	31-35	56	28	
	36-40	49	26	
	41-45	57	29	
	46 & Above	39	22	
Educational background	MBBS	46	25	220 (100%)
	MS	50	27	
	MD	46	25	
	TMP*	41	23	
	Others	47	25	
Experience (in yrs)	Less than 5	56	29	220 (100%)
	6-10	47	25	
	11-15	44	24	
	16-20	45	25	
	21 & Above	39	22	
Monthly Income	Below 30K	26	16	220 (100%)
	31K-50K	36	19	
	51K-70K	33	18	
	71K-90K	76	38	
	91K & Above	69	34	

* TMP – Traditional Medical Practitioner

Source: Computed from Primary data

Recognizing the existing research lacunae, this study endeavors to comprehensively examine all available variables through an extensive survey aimed at measuring patient satisfaction with the quality of healthcare services delivered. By bridging these gaps in the literature, this research aims to provide valuable insights into the complexities and implications of healthcare outsourcing practices, ultimately contributing to informed decision-making and enhanced healthcare delivery strategies.

Objectives of the study

To examine the relationship between respondents' assertiveness levels towards short- and long-term goals of hospitals and their socioeconomic status.

To assess the primary factors influencing patient satisfaction with the quality of healthcare provided by prominent private hospitals in selected regions of North-West Nigeria.

To analyze the key dynamics of healthcare professional outsourcing within leading private hospitals and identify the factors influencing these practices.

Hypothesis of the study

Anova

There is no relationship between the assertiveness levels of respondents and various socio-demographic factors such as age, educational attainment, experience, and income, influencing the achievement of short- and long-term objectives in private hospitals.

Factor Analysis

There is no significant relationship between the identified factors and patient satisfaction with the quality of healthcare provided by prominent private hospitals in selected regions of North-West Nigeria.

Henry Garret Ranking Method

There is no significant correlation between the key dynamics of healthcare professional outsourcing within leading private hospitals and the factors influencing these practices, as determined by the Henry Garrett Ranking Method.

RESULTS AND DISCUSSION

Table 1 presents a comprehensive overview of the socio-demographic profiles of 220 healthcare experts surveyed. The table is segmented into various categories, each detailing specific characteristics of the respondents.

Gender

Male respondents comprise the majority, accounting for 72% of the total respondents, while female respondents represent 35%. There is a noticeable gender disparity among the respondents, with a significantly higher representation of males.

Age

Respondents are fairly evenly distributed across different age groups, with the largest proportion falling within the age range of 41-45, constituting 29% of the total. The age distribution indicates a diverse range of experiences and perspectives among the respondents.

Educational background

The majority of respondents hold MBBS degrees, representing 25% of the total, followed closely by MD and MS degrees, each accounting for 25%. There is also a notable representation of TMP and other qualifications, indicating a diverse educational background among healthcare experts.

Table-2: Assertiveness Levels towards Short- and Long-Term Goals among Healthcare Professionals

Particular	Assertiveness level			Total
	High	Medium	Low	
Short term goal	87 (40%)	95 (43%)	38 (17%)	220(100.00)
Long term goal	76 (35%)	102 (46%)	42 (19%)	220(100.00)

Source: Computed from Primary data

Experience (in years)

Respondents exhibit varied levels of experience, with a significant proportion having less than 5 years of experience (29%). There is a relatively balanced distribution of respondents across different experience brackets, suggesting a mix of early-career and seasoned professionals.

Monthly Income

The distribution of monthly income among respondents varies, with the highest proportion earning between 71K-90K (38%). A considerable number of respondents also earn 91K & above (34%), indicating a substantial segment with relatively higher income levels. Overall, the demographic profile of healthcare experts reveals a diverse mix of gender, age, educational background, experience, and income levels, reflecting the multifaceted nature of the healthcare industry and the professionals within it.

The table - 2 illustrates the distribution of assertiveness levels among healthcare professionals regarding both short- and long-term goals. For short-term goals, 40% of respondents exhibit a high level of assertiveness, while 43% demonstrate a moderate level and 17% display a low level of assertiveness. Similarly, regarding long-term goals, 35% of respondents show a high level of assertiveness, 46% indicate a moderate level, and 19% present a low level of assertiveness. Overall, there is a relatively balanced distribution of assertiveness levels across both short- and long-term goals, with a notable majority demonstrating either moderate or high assertiveness, underscoring their proactive approach towards achieving organizational objectives.

The analysis explores the relationship between assertiveness levels and socio-demographic factors impacting short- and long-term objectives in private hospitals, as summarized in Table 3. The analysis explores the relationship between assertiveness levels and socio-demographic factors impacting short- and long-term objectives in private hospitals. Regarding age, the results indicate a significant relationship with short-term goals ($F(2, 12) = 12.45$, $p < 0.05$), suggesting that different age groups may exhibit varying levels of assertiveness in achieving these objectives. Similarly, for long-term goals, the relationship with age is notable ($F(2, 12) = 10.67$), albeit not significant at the specified level.

Table - 3: Analysis of Relationship between Assertiveness Levels and Socio-Demographic Factors Impacting Short- and Long-Term Objectives in Private Hospitals - Analysis of Variance (ANOVA)

Particulars	Goal	Source	DF	SS	MS	F-Value	Sig.
Age	Short term goal	Between groups	2	385	192	12.45	
		Within group	12	185	15		
		Total	14	570	207		
	Long term goal	Between groups	2	360	180	10.67	
		Within group	12	205	17		
		Total	14	565	197		
Educational Background	Short term goal	Between groups	2	380	190	9.63	
		Within group	12	240	20		
		Total	14	620	210		
	Long term goal	Between groups	2	365	183	31.89	
		Within group	12	70	6		
		Total	14	435	189		
Experience	Short term goal	Between groups	2	380	190	8.29	Significant at 5% level
		Within group	12	280	23		
		Total	14	660	213		
	Long term goal	Between groups	2	360	180	6.78	
		Within group	12	330	28		
		Total	14	690	211		
Monthly Income	Short term goal	Between groups	2	380	190	2.79	
		Within group	12	850	71		
		Total	14	1230	231		
	Long term goal	Between groups	2	360	180	2.84	
		Within group	12	790	66		
		Total	14	1150	246		

Source: Computed from Primary data

Educational background demonstrates significance for both short- and long-term goals, with F-values of 9.63 and 31.89, respectively. Experience also shows significance for short-term goals ($F(2, 12) = 8.29$) but not for long-term goals. In contrast, monthly income does not yield significant results for either short- or long-term goals. These findings suggest that age, educational background, and experience may influence assertiveness levels in pursuing certain hospital objectives, while monthly income may not play a significant role in this regard.

Factors Influencing Patient Satisfaction with Healthcare Quality in Prominent Private Hospitals - Factor Analysis

The multivariate approach of factor analysis is employed to explore the key factors influencing patient satisfaction with healthcare quality in prominent private hospitals within selected regions of North-West Nigeria. Before conducting the factor analysis, data accuracy was ensured. Subsequently, thirteen factors were identified and delineated. A factor extraction procedure with symmetrical (Varimax) rotation was executed to select the thirteen variables for further analysis. The factor grid represents the interrelationships among components and factors in the analysis.

The factor analysis results presented in Table 4.1 reveal the interrelationships between the variables (Vari) and the extracted factors influencing patient satisfaction with healthcare quality in prominent private hospitals in North-West Nigeria. Factor 1 seems to represent factors

related to operational efficiency and resource management, as evidenced by high loadings for variables such as "Distributing work orders across departments" (0.919) and "Avoid recruitment and training costs" (0.923). On the other hand, Factor 2 appears to capture aspects related to patient-centered care and expertise, with variables like "Enhance patient-centered initiatives" (0.881) and "In-depth expertise in disease treatment" (0.915) showing significant loadings.

These findings suggest that Factor 1 emphasizes organizational and cost-saving aspects, while Factor 2 highlights patient-centric and expertise-related factors. The rotation method used (Varimax with Kaiser Normalization) appears to have effectively segregated the variables into distinct factors, as evidenced by the clear separation of loadings between the two factors. Overall, the results provide valuable insights into the underlying dimensions influencing patient satisfaction with healthcare quality in prominent private hospitals. Table 4.2 shows a Kaiser Meyer-Olkin Measure of Sampling Adequacy of 0.85, indicating excellent suitability for factor analysis. Bartlett's Test of Sphericity is significant, confirming strong correlations among the variables, with an approximate chi-square value of 345.67 and 78 degrees of freedom. The significance level of $p < 0.001$ further supports the validity of the relationships among the variables. These results collectively affirm that the data is robust and appropriate for identifying meaningful factors influencing patient satisfaction in the studied healthcare settings.

Table 4.1 Rotated Component Matrix

	Particulars	Factors	Components (Factor 1)	Components (Factor 2)
Vari 1	Outstanding service quality		0.421	0.758
Vari 2	Enhancing hospital reputation		0.718	0.632
Vari 3	Externalize the management of the building's assets		0.795	0.553
Vari 4	Resolve staff uncertainties		0.744	0.608
Vari 5	Distributing work orders across departments		0.919	0.308
Vari 6	Avoid recruitment and training costs		0.923	0.339
Vari 7	Enhance patient-centered initiatives		0.413	0.881
Vari 8	Patients benefit from specialized knowledge		0.482	0.841
Vari 9	In-depth expertise in disease treatment		0.241	0.915
Vari 10	Assess the effects of outsourcing on organizational operations		0.801	0.546
Vari 11	Round-the-clock availability of medical staff		0.891	0.402
Vari 12	Time-saving while maintaining care quality		0.919	0.353
Vari 13	Ensuring future medical service provision		0.884	0.424

Extraction Method: Principal component analysis, Rotation Method: Varimax with Kaiser Normalization, Rotation Converged in 3 Iterations

Source: Computed data from SPSS output

Table-4.2 KMO and Bartlett's Test

S/N	Test	Value
1.	Kaiser Meyer-Olkin Measure of Sampling Adequacy	0.85
2.	Bartlett's Test of Sphericity	Significant
3.	Approx. Chi-square	345.67
4.	Degree of Freedom	78
5.	Significant at 1% level	$p < 0.001$

Source: Computed data from SPSS output

Table 4.3 presents the Total Variance Explained through factor analysis illustrates the distribution of variance across the extracted components in the factor analysis. The initial eigenvalues indicate the amount of variance explained by each component, with Component 1 explaining the highest variance (83.70%) followed by Component 2 (8.87%). Together, these two components account for 92.56% of the total variance, indicating that they capture the majority of the variability in the data. As we move down the table, the eigenvalues gradually decrease, with subsequent components explaining smaller.

proportions of variance. After the second component, the remaining components contribute minimal variance individually. During the extraction process, Component 1 and Component 2 collectively retained the

highest variance, with Component 1 explaining 83.70% and Component 2 explaining 8.87%. Following rotation, the variance retained by Component 1 reduced to 54.53%, and that of Component 2 decreased slightly to 38.06%. Overall, the table demonstrates how much of the total variance each component explains, aiding in understanding the dimensionality of the data and the significance of each component in explaining variability.

Table No - 4.3 Total Variance Explained

Variable	Initial Eigen Values	Extraction Sum of Squared Loadings		Rotation Sums of Squared Loadings					
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.88	83.70	83.70	10.88	83.70	83.70	7.10	54.53	54.53
2	1.17	8.87	92.56	1.17	8.87	92.56	4.96	38.06	92.59
3	0.325	2.53	95.09						
4	0.224	1.75	96.83						
5	0.122	0.94	97.75						
6	0.088	0.68	98.43						
7	0.069	0.52	98.94						
8	0.043	0.33	99.27						
9	0.039	0.28	99.55						
10	0.027	0.21	99.76						
11	0.020	0.14	99.89						
12	0.009	0.075	99.97						
13	0.007	0.032	100.00						

Extraction Method: Principal Component Analysis

Table 5: Analysis of Key Dynamics of Healthcare Professional Outsourcing in Leading Private Hospitals and Factors Influencing Practices – Henry Garret Ranking Method

Particulars	Total Score	Mean score	Rank
Patient trust diagnosis and effectiveness	9881	44.91	10
Patient education is highly regarded	11877	53.97	3
Presenting ample proof of patient's health status	10893	49.51	8
Doctor-patient relationship with adequate confidentiality	11001	50.02	7
Unclear - Physician's functional assistance is content	11428	51.94	5
Appropriate response in case of emergencies	11019	50.07	6
Medical equipment crafted by scientists	11974	54.42	1
Accessible during critical and urgent scenarios	10718	48.72	9
Flexibility in performance duties	11971	54.42	2
Clear and commendable doctor-patient feedback	11860	53.90	4

Source: Computed from Primary data

The table no 5 displays the outcomes of applying the Henry Garrett Ranking Method to assess the key dynamics of healthcare professional outsourcing within leading private hospitals and identifying influencing factors. According to the total scores and mean scores, medical equipment crafted by scientists received the highest total score of 11974 and mean score of 54.42, positioning it at the top rank. This suggests that the quality and availability of medical equipment play a pivotal role in the dynamics of healthcare professional outsourcing. Flexibility in performance duties closely followed, with a total score of 11971 and mean score of 54.42, securing the second rank. This underscores the importance of adaptability and competence in carrying out various tasks efficiently. Patient

education being highly regarded obtained a total score of 11877 and mean score of 53.97, ranking third.

This implies that patient education programs significantly influence outsourcing practices. Clear and commendable doctor-patient feedback ranked fourth with a total score of 11860 and mean score of 53.90, highlighting the significance of effective communication and feedback mechanisms in healthcare settings. Other factors such as presenting ample proof of patient's health status, doctor-patient relationship with adequate confidentiality, and appropriate response in emergencies secured moderate rankings, suggesting their importance but potentially lesser influence compared to medical equipment quality and flexibility in duties.

Patient trust diagnosis and effectiveness and accessibility during critical scenarios obtained the lowest rankings, indicating areas that may require improvement or further attention in healthcare professional outsourcing practices. Overall, the findings offer valuable insights into the relative importance of various factors influencing outsourcing dynamics within private hospitals.

Health care markets differ considerably from commercial markets and show features of "market failure"— elements such as monopoly market power, limited competition, informational asymmetry, and problems in specifying and measuring outputs and outcome. Outsourcing, synonymous with contracting-out, has been common in many market-oriented health care reforms.[12] One top reason hospital executives choose to outsource support services is to reduce operating costs.[13]

In recent years, the use of healthcare outsourcing has become increasingly popular for businesses and healthcare organizations. Healthcare outsourcing is a popular strategy for healthcare organizations to reduce costs and improve efficiency.[14] Additionally, outsourcing can provide access to specialized skills and expertise that may not be available internally. Outsourced services can provide scalability and flexibility, allowing organizations to respond quickly to changes in demand.

Outsourcing in health care is quickly expanding from nonclinical services to include patient-facing clinical service specialties such as anesthesiology, emergency medicine, hospitalist medicine, radiology, neurological monitoring, and others. However, it is not uncommon to have medical error in outsourced service.[15] There could be chances of other risks factors. For example, there may be a lack of continuity in service delivery, and there may be difficulties in managing the outsourcing process.

There may be concerns about data security, privacy, and compliance with regulations.[16] Moreover, there is a risk of losing control over the services being outsourced. Healthcare outsourcing can be an effective way to reduce costs, improve quality, and increase efficiency. However, it is important to weigh the risks carefully and to ensure that the outsourcing process is managed effectively. Outsourcing can be a beneficial strategy, but it is important to carefully consider the pros and cons before making a decision. It is critical to ensure patient satisfaction, which will lead to repeat business and referrals for providers.

We know there is a correlation between higher patient satisfaction rates and improved outcomes - and conversely, research has demonstrated that unmet expectations significantly decrease satisfaction. However, there has been no explicit definition of patient satisfaction, nor systematic consideration of its determinants and consequences. As a result, measurement of "satisfaction" and its use as an indicator of quality of care remains controversial among health care providers.[17]

Process outsourcing has become part of the core business strategy for healthcare institutions. Outsourcing partners are helping hospitals improve patient experience, increase operational capability and maintain revenue integrity. It's safe to say that an increasing number of healthcare setups will soon shift to outsourcing to deliver quality patient care.[18]

In Nigeria context practical implications include optimizing outsourcing strategies to ensure alignment with patient care goals, enhancing the quality of healthcare delivery through targeted training and performance monitoring of outsourced professionals, and fostering collaborations between private hospitals and outsourcing partners to address staffing shortages. Implementing transparent communication channels and accountability mechanisms can improve coordination between in-house and outsourced staff, ultimately enhancing patient satisfaction and outcomes.

Additionally, leveraging technology solutions for telemedicine and electronic health records can streamline workflows and improve access to healthcare services, particularly in underserved areas. These practical implications have the potential to drive positive changes in Nigerian private hospitals' patient care strategies and outcomes.

Recommendations

Conduct a comprehensive analysis of current outsourcing practices in Nigerian private hospitals to identify strengths and weaknesses. Develop clear criteria for selecting healthcare professionals to be outsourced, ensuring they align with the hospital's strategic patient care goals. Establish robust communication channels between outsourced professionals and in-house staff to facilitate seamless collaboration and information sharing. Implement training programs for outsourced professionals to ensure they are well-versed in the hospital's protocols and standards of care. Regularly monitor and evaluate the performance of outsourced professionals against predefined key performance indicators (KPIs). Foster a culture of accountability and transparency among outsourced professionals by clearly defining their roles, responsibilities, and performance expectations.

Explore opportunities for cost-sharing or revenue-sharing arrangements with outsourcing partners to incentivize the delivery of high-quality patient care. Invest

in technology solutions, such as telemedicine platforms or electronic health records, to enhance communication and coordination among healthcare professionals, both internal and outsourced. Solicit feedback from patients and staff regarding their experiences with outsourced professionals to identify areas for improvement. Continuously review and refine outsourcing arrangements based on feedback, performance metrics, and evolving patient care needs to ensure alignment with strategic goals.

CONCLUSION

This study has endeavored to explore three key objectives related to outsourcing healthcare professionals and its impact on the strategic goals of patient care in Nigerian private hospitals. Firstly, by examining the correlation between respondents' assertiveness levels towards hospital goals and their socioeconomic status, we have gained insights into potential factors influencing decision-making processes. Secondly, through evaluating factors impacting patient satisfaction with healthcare quality, particularly in select North-West Nigerian private hospitals, we have identified areas for improvement to enhance overall patient experiences.

Lastly, by scrutinizing the dynamics of healthcare professionals and the factors influencing them, particularly within the context of outsourcing, we have highlighted the complexities involved in optimizing healthcare delivery. These objectives collectively contribute to a deeper understanding of the challenges and opportunities present in outsourcing healthcare professionals and emphasize the importance of strategic alignment, stakeholder engagement, and continuous evaluation in achieving the overarching goal of providing high-quality patient care in Nigerian private hospitals. Further research and collaborative efforts are recommended to address these findings comprehensively and drive meaningful improvements in healthcare delivery systems.

Conflict of interest

Authors do not have any conflict of interest

Data Availability

Data are available with the corresponding author.

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Circular Bioeconomy for Sustainable Development:Biohydrogen Production From Different Lignocellulosic Wastes

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ABSTRACT

The production of bio-hydrogen on a large scale came into thought after the rapid depletion of fossil fuels. It has been known for more than 70 years that algae can make bio-hydrogen under illumination. The substrates used in the present study were lignocellulosic wastes (agricultural wastes), sewage wastes and livestock wastes. Bioreacter used was stirred tank reactor, pH acidic, temperature for microalgaee was 20 to 30 degrees Celsius. Operation mode was continuous. Methods used were direct biophotolysis, dark fermenter and gassification. The evolution of hydrogen was induced in the cells when pre-incubation in the dark was performed on the cells. Hydrogen production is due to the hydrogenase enzyme expressed during the period of incubation. The co-digestion of cassava wastewater along with buffalo dung for biohydrogen production gave a maximum hydrogen production rate. This method is considered to be an effective process for producing hydrogen without the generation of oxygen. Organic components are decomposed under the presence of light by anaerobic or photosynthetic bacteria via the nitrogenase-catalyzed reaction.

KEY WORDS: CIRCULAR BIOECONOMY, SUSTAINABLE DEVELOPMENT, WASTE RECYCLING

INTRODUCTION

Around 180 million tons per year of lignocellulose materials are produced as byproducts or in the form of agricultural residues, which can be used as an inexpensive source for the production of biofuels.1 The sources selected for the production of hydrogen gas are low cost, biodegradable and having high level of carbohydrate content with the presence of simple sugars such as glucose, lactose, and sucrose, which can be used as reliable biodegradable substrates for bio-hydrogen production.

It is done by photolysis of water using cyanobacteria, microalgae, and photosynthetic an oxygenic bacterium which are most suitable as they utilize major natural resources such as sunlight, water, etc. These microorganisms either supply electrons as an alternate source for the sake of survival in minimal optimum conditions or the need to prevent the reduction of the electron transport chain and act as a security valve. In addition to these biochemical reactions, hydrogen gas can also be produced during nitrogen fixation by the nitrogenase enzyme, which is a major mechanism in the heterocyst forming blue-green algae.

The production of bio-hydrogen on a large scale came into thought after the rapid depletion of fossil fuels. It has been known for more than 70 years that algae can make bio-hydrogen under illumination. The evolution of hydrogen was induced in the cells when pre-incubation in the dark was performed on the cells. Hydrogen production is due to the hydrogenase enzyme expressed during the period of incubation. The co-digestion of cassava wastewater along with buffalo dung for biohydrogen production gave a maximum hydrogen production rate and hydrogen yield of 839 mL H_2/L/d and 16.90 mL H_2/g, respectively. [2]

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METHODOLOGY

The substrates used in the present study were lignocellulase wastes (agricultural wastes), sewage wastes and livestock wastes. Bioreacter used was stirred tank reactor, pH acidic, temperature for microalgae was 20 to 30 degrees Celsius. Operation mode was continuous. Methods used were direct biophotolysis, dark fermenter and gassification.

Lignocellulose waste

Waste such as residues of plants, agricultural waste, and the logging of wood is considered to be lignocellulosic wastes and they are degraded slowly. They consist of a hetero polymeric substance, and in order to break the complex, the raw materials are pre-treated. A large number of monomeric sugars are obtained by hydrolysis of cellulose and hemicellulose.

126 + 22 mlH2/g. Maximum yield - 214 + 62 ml H/g.

High yields of biohydrogen have been obtained by following the steps: Pretreatment--hydrolysis--hydrolysate--fermentor-biohydrogen reactor--hydrogen. 367 + 43 ml H2/g.

Livestock Wastes

Livestock wastes include fodder, manure, and slaughterhouse and poultry farm wastes. Biohydrogen production from livestock waste is illustrated as manure--complex organic matter---hydrolysis---simple sugars by acidogenic microbes---organic acids--acetogenesis--hydrogenesis---hydrogen fermentor---hydrogen. From cow manure-218 + 2.4 ml H2/g. From swine manure 126 + 2.2 ml H2/g. From buffalo dung- 167 + 3.4 ml H_2/g.

RESULTS AND DISCUSSION

The fermentative hydrogen production depends on the type of inoculum used, the reactor type, and its temperature settings. Many types of inoculums are used for hydrogen production and must be pure cultures of hydrogen-producing bacteria, mixed cultures of anaerobic bacteria obtained from compost piles, and anaerobic sludges. Around 180 million tons per year of lignocellulose materials are produced as byproducts or in the form of agricultural residues, which can be used as an inexpensive source for the production of biofuels.[1,2]

These materials, due to their low fiber porosity, heterogeneity, and crystalline nature, are not readily fermentable, and pre-treatment is required for the process of forming fermentable sugars.3 Lateef et al. [4] produced biohydrogen with cow manure as a source along with waste milk as a co-substrate. After adding the organic load, which is obtained from the co-digestion of cow manure, the production of biohydrogen is increased. Tenca et al.5 have obtained biohydrogen with a yield of 126 ± 22 mL H2/g VS-added when swine manure was used, along with fruit and vegetable waste.

Similarly, Marone et al.[6] produced biohydrogen with a maximum yield of 117 mL H2/g VS-added through the co-fermentation of buffalo slurry with cheese whey and crude glycerol using a mixed microbial culture. The maximum hydrogen production rate and hydrogen yield was 109.55 mL H2/L per day and 0.84 mol H2/mol of total sugar consumed, respectively, when elephant dung was used as the inoculum for sugarcane bagasse hydrolysate.[7]

The maximum hydrogen production rate and hydrogen yield were 215.4 (±62.1) mL H2/L/d 152.2 and (±43.9) mL H2/g respectively, achieved at an organic loading rate of 2.1 g VS/L/d of cheese whey via the dark fermentation method using buffalo manure as a buffering agent.[8]

The co-digestion of cassava wastewater along with buffalo dung for biohydrogen production gave a maximum hydrogen production rate and hydrogen yield of 839 mL H_2/L/d and 16.90 mL H_2/g, respectively.[2] Perera and Nirmalakhandan,[9] produced a maximum hydrogen yield of 2.9–5.3 M hydrogen/M sucrose when sucrose along with dairy cattle manure was used for production. Biohydrogen was produced when the liquid swine manure was co-fermented with molasses of which the hydrogen production rate and hydrogen yield of 31.9 L/d and 1.52 L/g sugar, respectively, was obtained.10 Zhu et al.[11] obtained significant quantity of biohydrogen with swine manure co-fermented with glucose as a substrate.

Cai et al.[12] also successfully worked upon the release of biohydrogen from sewage sludge and reported that the hydrogen yield of alkali pre-treated sludge was higher than dry sludge. The yield increased from 9.1 mL of H_2/g of dry solids (DS) to 16.6 mL of H2/g of DS when alkali-pre-treated sludge was used. Yin and Wang,13 produced hydrogen using waste sludge and reported that the irradiation and gamma irradiation combined with the alkali pretreatment was able to produce biohydrogen by dissolving the waste-activated sludge. The co-fermentation of sewage sludge and fallen leaves produced biohydrogen.

The mixing ratio of 20:80 of fallen leaves and sewage sludge produced biohydrogen with a yield of 37.8 mL/g. Natural sludge was used as an inoculum to produce biohydrogen using corn stalks via anaerobic fermentation, and the maximum hydrogen yield was observed to be 126.22 mL g−1-CS [14]. A Continuous Mixed Immobilized Sludge Reactor (CMISR) using activated carbon as a support carrier was used for hydrogen production via dark fermentation from enzymatic hydrolyzed food waste.

The production of bio-hydrogen via dark fermentation involves the use of anaerobic or facultative anaerobic bacteria in anaerobic conditions. Anaerobic bacteria are responsible for using the organic substance as the source of electrons and the energy required for converting it into hydrogen. The reactions taking place during dark fermentation occur as a rapid process as there are no requirements for solar radiation. Large quantities of

biomass are treated using a large fermenter. Photosynthetic and Non-Sulfur (PNS) bacteria have the ability to convert the volatile fatty acid into carbon dioxide and hydrogen under anoxygenic conditions.[15]

PNS bacteria is a non-taxonomic group that is capable of growing as photoautotrophs, photoheterotrophs, and chemoheterotrophs, depending on the availability of carbon, oxygen, and light sources.[16] The optimum growth conditions for PNS bacteria are pH 7 and temperatures ranging between 30 and 35 °C. This method is considered to be an effective process for producing hydrogen without the generation of oxygen. Organic components are decomposed under the presence of light by anaerobic or photosynthetic bacteria via the nitrogenase-catalyzed reaction. Various physical parameters such as the temperature, pH, medium composition, and intensity of light affect the productivity of hydrogen by bacteria.[17]

PNS bacteria have the ability to reduce H+ ions to hydrogen in the gaseous phase by extracting power from the oxidation of certain compounds such as fatty acids of low molecular weight and light energy.18 For the PNS organism to grow and produce hydrogen, photo heterotrophy is generally preferred. This photo fermentation is carried out via the catalytic action of two enzymes involving hydrogenase and nitrogenase via the Tricarboxylic Acid (TCA) cycle.

The production of hydrogen gas by PNS bacteria is possible as a result of one of the important enzymes-nitrogenase. It is highly sensitive to oxygen as it is an iron sulfur molybdenum enzyme. The main source for photo fermentation is light, which is most required for developing a photobioreactor with a greater illumination facility for industrial purposes.

The production of hydrogen under dark fermentation is usually lower compared to photo fermentation, but a 14 h light and 10 h dark cycle can improve the rate of hydrogen production. After biological conversion, gasification became the most widely studied field. More studies on gasification have been performed by China and the United States of America, while the UK, Italy, Malaysia, Canada, and Japan have also contributed many findings in the field of producing hydrogen using gasification. At high temperatures and high pressures, organic feedstock undergoes partial oxidation, which is termed gasification. During this process, several byproducts can also be produced such as tar, biochar and light hydrocarbons.[19]

Biomass is considered to be a very good source for gasification because of its low sulfur content, and if the moisture content is less than 35% for any kind of biomass, then it can be converted into fuel gas.20 Gasification is considered to be a biological process that converts biomass into carbon monoxide, carbon dioxide, hydrogen, and methane with controlled amounts of steam and oxygen used at high temperatures.[21]

CONCLUSION

The production of bio-hydrogen on a large scale came into thought after the rapid depletion of fossil fuels. The substrates used in the present study were lignocellulase wastes (agricultural wastes), sewage wastes and livestock wastes. Bioreacter used was stirred tank reactor, pH acidic, temperature for microalgaee was 20 to 30 degrees Celsius. Operation mode was continuous. Methods used were direct biophotolysis, dark fermenter and gassification.

The evolution of hydrogen was induced in the cells when pre-incubation in the dark was performed on the cells. Hydrogen production is due to the hydrogenase enzyme expressed during the period of incubation. The co-digestion of cassava wastewater along with buffalo dung for biohydrogen production gave a maximum hydrogen production rate.

Conflict of interest

Author declares no conflict of interest

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Application of Artificial Intelligence: A New Approach for Human Resource Management

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ABSTRACT

Technology used to perform tasks requiring intelligence is referred to as artificial intelligence. It is a technological device intended to perform tasks that a human could. Artificial intelligence has resulted in significant changes to today's organisations. Since human resource management is the area where the majority of employees work, it is important to examine not just one aspect of the company but all of its activities and how they impact it separately. This study proposes a conceptional framework of artificial intelligence (AI) technology application for human resource management (HRM). This review highlights the role of AI in human resource management. Most of the organization has been using artificial intelligence or digital technologies in HR like chatbot, machines learning, and robot process automation in human resource management which support in recruitment, screening, onboarding, and interviewing etc. Therefore, AI implementation should be considered a good expectation opportunity, because AI improves lives, AI builds a better future if properly understood and applied to the right way.

KEY WORDS: ARTIFICIAL INTELLIGENCE, HUMAN RESOURCE MANAGEMENT, RECRUITMENT, SCREENING, IMPLEMENTATION.

INTRODUCTION

Technology has always been an amazing tool that enhances and strengthens individuals, increases living standards, creates new opportunities, encourages employee creativity, and levels the playing field for all.[1] Robots have been taking the place of humans in the production department since the 19th century. Personal computers and the internet introduced a third revolution into the workplace during the 1970s, replacing human labour with machine labour. Modern digital technologies, such as artificial intelligence (AI) and machine learning (ML), are permeating the workplace and will revolutionise the commercial world.[2] Artificial intelligence has drawn the attention of researchers and practitioners since Google's Alpha Go system defeated South Korean player Lee Sedol with great ease[3]

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The field of computer science known as artificial intelligence (AI) or machine intelligence refers to the intelligence exhibited by machines as opposed to the natural intelligence exhibited by people and animals.[4] Understanding human intelligence and creating intelligent objects that can carry out tasks that humans are thought to need intelligence for are the two main goals of artificial intelligence (AI). There are many opportunities and difficulties associated with every significant technological innovation. Even though artificial intelligence (AI) is expected to significantly boost economic growth, it is anticipated that automation will result in the loss of some jobs. As a result, it is essential to implement the infrastructure and policies that are needed. [5]

Artificial intelligence is now permeating every aspect of an organization's operations, including the human resources department. In this department, AI systems have taken the place of human workers, performing tasks like performance management, candidate screening, recruitment, and alignment of HR activities.[2] Nevertheless, a comprehensive AI application framework that combines the unique aspects of human resource management with the field's research on AI is still lacking in the analysis of the

technology's particular application. In this article we have explore a brief study of AI and their application for human resource management.

Artificial intelligence (AI)-based technological solutions are used for many business functions, such as social media, data mining, customer growth, better consumer engagement, data collection and segregation for further decision making, improved logistics operations, and increased business efficiencies. Wang et al.[6] has defined intelligence as the characteristic that permits an entity to function effectively and with foresight in its environment, and artificial intelligence as the activity committed to making robots intelligent.

Artificial intelligence (AI) is the term used in computer science to describe the intelligence exhibited by machines as opposed to the natural intelligence exhibited by people and other living things. AI research is described by computer science as the study of "intelligent agents": any technology that senses its surroundings and makes decisions that increase the likelihood that it will accomplish its objectives. According to Kaplan and Haenlein,[7] artificial intelligence (AI) is the capacity of a system to accurately read outside data, learn from that data, and apply that knowledge to adapt and change in order to accomplish particular tasks and goals. The phrase "artificial intelligence" is used colloquially to describe the mimicking of "cognitive" capabilities by a machine, such as "learning" and "problem solving," that people identify with the minds of other humans.

Jarrahi,[8] in his research paper titled, artificial intelligence and the future of work provides information on human- AI symbiosis in organizational decision making. The study has discussed how AI can benefit humans. Artificial intelligence has been useful in helping decision-makers in organisations deal with uncertainty and, in particular, ambiguity in their decisions. Even in this field, human interaction is crucial, and technology cannot replace humans when making subconscious decisions is necessary to assess and expedite decision outcomes.

Geetha and Bhanu,[9] describe recruitment through artificial intelligence, where the researchers have described how artificial intelligence functions in the hiring process, emphasising its centrality to the process. Artificial intelligence assists with employee interactions, interview scheduling, candidate screening, and auto-generated messaging to candidates. Similarly, Jain,[10] has identified the role of artificial intelligence in human resource management. According to the report, the majority of businesses have been implementing contemporary technology in a variety of HR processes, including hiring, performance reviews, and cloud-based HR systems.

RESEARCH METHODOLOGY

This article is based on a literature review. The research study is using the evocative research design. In the research study the researcher has used secondary data. The secondary data has been collected from research papers, published materials, online websites, HR blogs etc.

Role of Artificial Intelligence in HR

Now a days HR department heading towards the digital revolution is using various method to simplify the resources by big data analysis, artificial intelligence, and cloud computing.[11]Most of the organization has been using artificial intelligence or digital technologies in HR like chatbot, machines learning, and robot process automation in human resource management which support in recruitment, screening, onboarding, and interviewing etc. Following are the role of artificial intelligence in human resource management;

Recruitment

The researcher[11] in his paper defined that only 40 percentages of companies and industries are using artificial intelligence. Organizations like SAT, Facebook, GE are using digital technologies in screening, interview, and identify the new talent for the recruitment process in an organizational. Through AI recruitment manager can examine the application and candidate can get quick response. Chat box system or automated answering machine plays essential role to solve the quires and problems regarding the process of recruitment in an organization.

Screening and Interview Process

Artificial intelligence is helpful in automating the interview process by examining them with word or speech patterns exams. Through Ay software digital interview can take place and AI also helps to improve the candidate experience. Tools like Amy and Clara are used to scheduling interviews, working meetings.

Reduce Administrative Burden

In an organization HR have to play multitasking roles where using technology and Artificial intelligence companies try to reduce workload. AI provides solutions of problems and it helps to increase the efficiency of HR in an organization.

Selecting the Right Candidates

The researcher[12] has examined that through AI human resource manager can able to trace right candidate in short time of span and technology will helps out to identify the suitable candidates as per required skills sets.

Reduce Discriminations

Nowadays, AI is being used to reduce the favouritism and will help to increase the transparency at workplace. In such a way organization can able to select the resume. AI applications can be used to analyse job descriptions[13] 6. Increase Efficiency: - Artificial Intelligence will helpful to reduce the redundancy of employees at workplace. Various robotic task has been carried out to increase the efficiency at workplace. Robotic task includes collecting data, filing reports, copying data, identifying required data from available data, processing, collecting data for HR and payroll systems etc.

Enrich workplace Learning

Now a days, computers and digital technology can do the behind-the-scenes role in industry. Through computers and modern technology industries can able

to manage data analysis and provide real-time feedback during training, alteration of course of actions based on progress and responses which industries got.[14] To save a time companies used Microsoft 365 which helps employees to work and increase the efficiency at workplace. AI tools like Engazify (To Provide feedback), Obie and Niles (For knowledge sharing), Wade & Wendy (For Career advancement), and Duolingo (Learning domain) are used .[11]

Role of AI In Human Resource Management

Nowadays HR professionals strive to maximise the benefits of human-machine collaboration to establish a straightforward, well-organized, and user-friendly work environment. It provides time for applicants and employees to apply their imagination, expertise, and comprehension to create a positive experience. The HR procedure could be confusing, repetitious, and prone to errors and misinterpretations. Transactions involving human-machine duplication and artificial intelligence (AI) technology has been developed to assist humans in a variety of fields to manage challenging and tiresome tasks.[15]

AI has advanced significantly over the last 10 years, making it essential to address a wide range of challenging market issues, including human resource management. A deeper understanding of the software tools used in all human resource management (HRM) processes to locate, train, and hire employees has resulted from the implementation of important AI concepts including expert programmes, machine learning, and analysis of natural languages and patterns.[16] "Artificial intelligence" has a broad, nuanced definition that is ever-evolving. AI is opening up more and more opportunities in a number of HRM domains, including talent acquisition, candidate assessment, employee retention, and career development. [17]

The foundation for AI applications has been established by the creation of the Human Resource Information System (HRIS). HRIS With AI's growing capabilities for human-computer interaction, managers now have more opportunities to use AI to increase management effectiveness. "HRIS is a procedure for gathering, storing, preserving, retrieving, and verifying data that an organisation needs regarding its personnel activities, organisational unit characteristics, and human resources".[18, 19] The information that HRIS can provide for labour force supply and demand projections, application qualifications, training development, performance evaluation, and other areas can help with strategic planning.

Though the information system deals more with data intake and storage than AIHRM does, the intelligence decision assistance function is still somewhat restricted. The system's capacity for business analysis can be strengthened by artificial intelligence, resulting in more output references that can be used in decision-making. Additionally, data mining techniques are suggested for e-resume scanning. Expert systems are suggested as a solution to the problem of business knowledge management. There is also debate over whether artificial intelligence (AI) can take the role of human resources.[20, 21] The use of AI technology to HRM sectors is currently lacking in research.

CONCLUSION

The development of organisational performance is undoubtedly significantly impacted by the integration of AI-based applications with HR practices. These sophisticated HRs are built on AI applications, which can analyse, anticipate, diagnose, and so forth—a tremendous resource for any kind of organisation, even though these apps may not be as emotionally capable as humans and cognitive talents. The way AI is demonstrating its impact on the leading edge of work sectors worldwide, however, is what really horrifies global employees. But the truth is that human beings are not going to be replaced by sophisticated technology; rather, it is all about how people view and use this technology to create wealth and prosperity. So, AI implementation should be considered a good expectation opportunity, because AI improves lives, AI builds a better future if properly understood and applied to the right way

Conflict of Interest

Author declares no conflict of interest

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On the Intertwining of Management, Science and Technology for a Sustainable Future: Challenges, Opportunities, and Strategies

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ABSTRACT

The management of science and technology is crucial for addressing global challenges and ensuring a sustainable future. This article reviews the current state of science and technology management, highlighting challenges, opportunities, and strategies for effective management. It discusses the role of governments, industries, and individuals in promoting innovation, addressing ethical concerns, and fostering international collaboration. In conclusion, looking back over several decades of academic journey, the merging of management, science and technology, it is impressive to note that we have made great progress toward the goal of promoting development and encouraging the applications of a science of management per se. At the same time, there has never been a more exciting time for the future of management science and technology. The massive increase in data availability, the proliferation of analytics tools, and the rise of new business models are converging to create an unprecedented need and an extraordinary opportunity for the development of a science of management. Ample opportunities exist, to fill in these gaps by providing quality communications.

KEY WORDS: INTERTWINING,MANAGEMENT, SCIENCE, TECHNOLOGY.

INTRODUCTION

The concept of management has been around for thousands of years. According to Pindur, et al [1] elemental approaches to management go back at least 3000 years before the birth of Christ, a time in which records of business dealings were first recorded by Middle Eastern priests. Socrates, around 400 BC, stated that management was a competency distinctly separate from possessing technical skills and knowledge. [2]

According to Armstrong,[3] a broad view of management is that it involves procedures to forecast, plan, analyse, decide, motivate, communicate, and implement.

On the scientific side, the definition is limited: science is the use of objective and replicable procedures to compare different approaches, techniques or theories. Management science has delivered many useful things and it has made management more efficient, but it can do much more.

Research and development in management has been remarkable, and we owe this to the pioneers of this field who have given a strong foundation to develop our world, economically as well as scientifically. How ever in the developing world, it has often been observed that only a small percentage of the studies in management science are useful, and that proportion is declining. Meanwhile, useful findings that do occur are often unseen, or rejected, or ignored.

Much has been written about the exponential growth of science and technology. It has been reported that today's iPhone has more than 100,000 times the computing power of the computer that helped land a man on the moon.[4]

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Bwalya[5], stated that management involves planning, organising, leading and controlling activities, operations and employees of organisations to attain organisational goals and objectives. Williams,[6] summarized management as getting work done through others. Managers therefore are responsible for getting work done in the organisations and departments they manage, but they have to do it through others. This demands for managers to skilfully and professionally manage others using scientific or artistic means.

Management today must grapple with the explosion of data now available to facilitate business decisions. Developing an understanding of how to use data analytics without getting bogged down will be a significant challenge for the 21st century schools of management. Collecting, organizing, utilizing data in a logical, timely, and cost-effective manner is creating an entirely new paradigm of managerial competence. In addition to data analytics, cybersecurity, drones, and virtual reality are new, exciting technologies and offer unprecedented change to the way business is conducted. Each of these opportunities requires a new degree of managerial competence which, in turn, creates opportunities for the modern-day management experts.

Science and technology are key drivers of economic growth, social development, and environmental sustainability. However, their management poses significant challenges, including ethical concerns, knowledge gaps, and innovation barriers. Technology management plays a vital role in the success of businesses in today's digital era. It encompasses technology planning, technology implementation, and monitoring of technological resources and strategies to achieve organizational goals. As a result, effective technology management enables businesses to leverage tech trends and innovations to their advantage, gain a competitive edge, and drive growth.

When we ponder over the role of management in science, we have to discuss the broad view of management, which states that it involves procedures to forecast, plan, analyse, decide, motivate, communicate, and implement. On the scientific side, the definition seems to be somewhat limited: science is the use of objective and replicable procedures to compare different approaches, techniques or theories. Combining these two great disciplines is the hall mark of today's development, using science and technology with skills of management will deliver incredible innovations.

Management science has delivered many useful things and it has made management more efficient, but it is capable of doing much more. Only a small percentage of the studies in management science are useful, and that proportion is declining. Meanwhile, useful findings that do occur are often unseen, or rejected, or ignored. So, in addition to talking about improving management science, it is important to discuss how to improve the communication of important research and development findings, we see a serious decline in quality of management and scientific communications. These areas using the latest tools of technology have to be developed by the curious minds of aspiring young generation.

We need management science because not everything can be learned from our practical experience. Many things contradict our experience and many are difficult to assess. Management is a science because it meets all the characteristics of science, universal acceptability and validity, these principles are capable of universal application, we see managers across the globe conduct annual performance appraisals in a scientific manner, to establish whether their employees are performing as expected, and if not take appropriate action such as arranging for additional training - if need be.

This is a world-wide practise in human resource management, an important component of management as well as science. Organised body of knowledge – Management, like science, already has a systematized body of knowledge. Principles of management are virtually available in every function of science. Experimenting and Observation – The principles of management existing today have been developed through continuous observations and empirical verification. These have been developed by studying large numbers of managers' practical experiences, views and approaches. Cause and effect relationship, scientific principles identify, establish and explain a cause-and-effect relationship between two or more variables.

Science is an organised body of knowledge pertaining to a particular field of enquiry, which accommodates general facts explaining a phenomenon[7]. Science is systematized in the sense that is establishes a cause-and-effect relationship between various variables. Beasley [8] and Luthans [9] observed that science is characterised by the features such as universal acceptability and validity. Scientific principles and conventions have global genuineness and are capable of universal applications. Science contains concepts, theories and principles which help explain past events and can also be used to predict the future outcome of specific actions.

It is our view and school of thought, to regard management as a set of principles and techniques that can be studied and applied systematically like science. There is an emphasis on the importance of data-driven decision making, Koontz and Weihrich[10] and use of empirical evidence to guide managerial decisions6. Proponents of the science perspective submit that management can be taught through formal education and managers can use scientific methods to improve organisational performance. It is how ever worth noting that management as a science is not as exact as other allied branches of sciences – such as biology, physics and chemistry.[11]

Essentially science and art are not mutually exclusive but are complementary to each other. In fact they can be seen as two faces of one coin. Management is more effective when there is a combination of both science and art.[12] Many scholars have noted that in management, science provides the knowledge while art deals with application of the knowledge and skills. Therefore, successful managers are likely to be those who have mastered the 'know-how' –

from science and the application of 'doing' – from art. Based on the arguments above, management is both an art and a science. The trick lies in separating the good ideas from the bad ones and knowing when to be scientific or artistic. Today's managers need a blend of acquiring the knowledge of science and the art of applying it. Managers should be both scientific and artistic – as the situation dictates.

Challenges In Management

Ethical concerns: Ensuring responsible innovation and addressing societal implications.

Human resources and management professionals may find it challenging to manage ethical issues effectively. Although there are laws to hold people accountable, unethical behaviour can still occur in the workplace and an organisation can also act unethically. As a management expert, learning about the ethical issues a business can face can help the organization to prepare and manage them effectively, if they occur. Ethical issues in business and management occur when a decision, activity or scenario conflicts with the organisation's or society's ethical standards. Both organisations and individuals can become involved in ethical issues since others may question their actions from a moral viewpoint. Complex ethical issues include diversity, compliance, governance and empathetic decision-making that align with the organisation's core values

Ethical conflicts may pose a risk for an organisation, as they may imply non-compliance with relevant legislation. In other instances, ethical issues may not have legal consequences but may cause an adverse reaction from third parties. It may be challenging to effectively manage ethical issues when no guidelines exist. For this reason, an HR or management professional can help develop policies to guide employees to make the right decision when faced with moral and ethical issues. Having a good work ethic generally means there is a commitment to do the best job possible at all times. It can mean you possess dedication, responsibility, and a positive attitude towards everything your work requires. Doing your job diligently with a strong work ethic can help you perform tasks better, form stronger relationships with colleagues and develop a positive image for the business.

Work ethic is a combination of qualities, personality traits and beliefs that an individual applies on their job which includes accountability, discipline, honesty, humility, integrity, organization, high-quality work, responsibility, teamwork and time management. A good work ethic is essential for building strong networking connections, career advancement, and fostering a positive workplace environment leading to new professional opportunities and career goals. To improve and demonstrate a good work ethic, one should minimise distractions, set and focus on goals, organize workspaces, manage time effectively, and maintain a healthy work-life balance.

Knowledge gaps: Bridging the gaps between management, science, and technology

Dutton[13] discusses few important initiatives that could help bridge the gap between management-organizational and public policy. First enriching research distribution channels, arguing that traditional avenues for publishing are a more valuable means for distributing research to a specialized group of academics and practitioners than they are for reaching public policy makers. Second, that incentives be created to encourage contributions to public policy knowledge and debate and lastly, the author advocates the creation of social networks linking researchers and public policy makers, suggesting that doctoral education should place a greater emphasis on public policy issues.

Schauz[14] has been shown that there is a perceived gap between scientists and policy makers as research is now being considered largely a concept of science-based policy or of negotiations between the scientific community and policy makers. While science profits from society's growing demand for research, researchers simultaneously face pressure from society's expectation that science should produce knowledge for evidence-informed policy making. Scientists and policy makers are beginning to join forces to narrow the gap between them. Operating in this gap are many knowledge experts who use research to influence policy and often carry out knowledge transfer, knowledge brokering, and other activities. The usual answer to how to bridge the gap between management, research and practice or policy is to disseminate scientific findings more efficiently. This focuses on the back end or downstream, (knowledge dissemination) of the knowledge transfer process.[15]

Innovation barriers

Overcoming obstacles to innovation and adoption: Innovation has been widely recognized as the main driver and first impetus for a sustainable regional or national economic growth, as well as global competency. Consequently, both developed and developing countries are trying to build up their national innovation system in order to cultivate creative talents, high-tech based start-ups and new technology that could be translated into sustainable power for industrial upgrading and economic growth.[16]

This is also the main reason why Asian countries such as South Korea, Japan, China and India continue to increase their domestic expenditure on research and development (R&D), sharing the largest proportion of the worldwide R&D expenditure, about 42.9 percent in 2017, according to the 2017 Annual Global R&D Funding Forecast. For example, South Korea ranks number one in national innovation competitiveness among all the countries in 2018, according to the 2018 Bloomberg Innovation Index. China moved up two spots to 19th, buoyed by its high proportion of new science and engineering graduates in the labour force and an increasing number of patents by innovators such as Huawei Technologies Co and is the first-ever developing country who gets a position in the top 20 most innovative countries in history.

Innovation is a double-edged sword in terms of social impact.[17] On the one hand, many innovative products make our life better. For example, the plane and the high-speed rail make travel faster, and Apple smart devices have

changed our lifestyle fundamentally. A large number of new products and services are delivered to every corner of the world. An increasing share of the public can have access to more plentiful food, life necessities and better medical services.

But innovation means possible negative effects as well. For example, industrial technologies may cause pollution, agricultural and fishing technologies may aggravate ecological problems and medical technologies may involve drug-resistance problems and bioethical issues (like genetic engineering). However, technology is essentially a knowledge-based means of solving problems and achieving goals. Overall, innovation, if effectively managed, will minimize its negative effects to better serve mankind, in which case we call it an inclusive innovation or responsible innovation. [18]

Opportunities in Management and Technology: Strategies for International Development

Fostering global partnerships for management, science, and technology.

The recent report on global cooperation in science, technology and innovation for development has been presented by United Nations in April 2024, where in it has been stated that due to the growing complexity of new technologies and their fast pace of change, as well as the significant transformation brought about by recent waves of innovation, there is an urgent need for a collaborative approach to Science Technology and Innovation.

In view of the scale of global challenges and the significant potential of technology to deliver responses, global cooperation is indispensable, hence steps are being taken urgently, to achieve the international community's commitment to leave no one behind. Global partnerships, particularly in areas of management, science and technology, including the Global Partnership for Sustainable Development is being addressed under Sustainable Development Goal 17 of the United Nations.

There is a great necessity to mobilize financial and knowledge resources from government, business, academia and civil society, including the talent and knowledge available in developing countries and to facilitate the co-creation of global solutions to global challenges. Strengthening the national capacities of developing countries in science and technology is therefore integral to the achievement of the 2030 Agenda for Sustainable Development, which is the road map of the international community for a prosperous and sustainable future for all.

Implementing the inclusive 2030 Agenda will require collaborative efforts to accelerate the development of the national innovation systems of countries in which such systems are still emerging, in order that truly global technological networks can thrive and deliver results.

Integrated approach Encouraging interdisciplinary research and collaboration.

Interdisciplinary research has been a topic of interest among scientists, scholars, university administrators, and policy makers for many decades.[19] According to Lattuca [20,] the question of how to join different strands of knowledge within a learning environment is as old as academic scholarship itself. Interest in interdisciplinarity stems from a belief in its various perceived benefits: many observers such as, Lattuca, [20,22,23] who claim that interdisciplinary collaboration, by its very nature, promotes creativity, innovation, and outside-the-box thinking.Moreover, there is increasing consensus that real-world policy problems are inherently interdisciplinary and cannot be addressed with knowledge from only a single scientific or academic discipline.[23,24,25]

And yet, even now, in an era of advanced communications technology, instantaneous access to information, and increasingly insistent demands for academics to demonstrate research impact, and despite continued research efforts in this area, there is still much we do not understand about how to stimulate collaboration across research disciplines. Newman26 in a recent detailed review of literature on promoting interdisciplinary research collaboration suggests to adopt a view toward generating more empirical data on practical strategies for connecting researchers and encouraging them to work together across disciplinary boundaries, will be required to further the research agenda on interdisciplinary collaboration.

It has been suggested that interdisciplinary collaboration is desirable because of its ability to promote creativity and innovation, and also for its potential to help academic research contribute to addressing real-world challenges. In addition to discipline-based research, interdisciplinary research can add value that is greater than the sum of its parts. There is, therefore, understandable interest in how interdisciplinary research can be increased, without diminishing discipline-based research. [26]

Promoting diversity, equity, and inclusion in science and technology

Technology plays a pivotal role in fostering diversity and inclusion by providing accessible platforms, tools, and services. In this digital era, technology breaks down barriers and eliminates historical patterns of discrimination. By offering inclusive technology that ensures equal access and opportunities, it exemplifies the transformative power of digital tools in driving societal change. The findings of rigorous investigation of Tripletti 27 suggest that technology plays a vital role in promoting diversity and inclusion. The study revealed that technological tools and solutions have the capacity to actively dismantle barriers, thus leading to a more inclusive and diverse society.

While the findings demonstrate the positive impact of technology on diversity and inclusion, it is essential to acknowledge the challenges and limitations in this area.

One primary challenge is the digital divide, which refers to the unequal access to technology and the internet among different socioeconomic groups. This can hinder the full realization of the potential benefits of technology in promoting diversity and inclusion. Additionally, concerns regarding privacy, security, and online harassment were raised by participants, highlighting the need for continuous monitoring and improvement of technological solutions to effectively tackle these issues.27 These challenges and limitations underscore the importance of adopting a comprehensive approach that addresses both technical and social aspects, ensuring that technology facilitates diversity and inclusion in a fair and ethical manner.

Digitalization in Management Science and Technology

Education is the most important sector for attaining sustainable development goals (SDGs) where digital technology can play a crucial role. Nowadays digital technology has become an essential part of the learning environment. The integration of digital technology into education is necessary for leveraging better education for all by 2030 28.

Leveraging digital technology is the access to technology for the transformation of the traditional learning system to modern and digitalized learning system. 29. Digital technology provides an opportunity to reduce the gap between traditional manner to modern learning approach as an inclusive factor with underpinning human rights and dignity.[30]

Digital technology in education generally means to model which engage in information and communication technology (ICT) for supporting, enhancing and enabling the delivery of education. It is an effect on individual or combination of various digital devices for better education. The major indicator of leveraging digital technology in education are a political commitment, curriculum, infrastructure, teaching staff and development, public participation, skills, outcome and impact. [31, 32 33]

Managing a business, regardless of its size and nature, can be challenging. Imagine having to manually track various processes, data, and information. This can consume significant time and effort, leaving little room for growth and innovation. Fortunately, with the rapid advancement of technology, businesses now have access to a wide range of digital tools that can help streamline and improve their management processes.

In business and management, data security has become a major concern for businesses, especially AI (Artificial Intelligence) startups, with the increasing use of digital tools. However, technological advancements have also brought about robust security measures, along with policies such as cyber essentials checklist, to protect sensitive information. Some of the best data security tools include firewalls, antivirus software, encryption tools, and secure cloud storage services. These tools can safeguard your business's confidential information, such as financial records, customer data, and trade secrets.

Also, using digital tools for data security can also save businesses from costly breaches and reputational damage. It is essential to regularly update these tools and train employees on proper cybersecurity practices to ensure maximum protection. Effective communication is crucial for the success of any business. With traditional methods, ensuring timely and efficient communication among team members can be challenging, especially in a remote work setting.

Digital tools such as project management software, online video conferences, and instant messaging applications make it easier for working teams to better communicate and collaborate. These tools allow for real-time communication, file sharing, task allocation, and progress tracking, making it easier for teams to work together even when physically apart. Thus digital technology has made a tremendous development in management, science and technology.

Selecting the right digital tools and incorporating them effectively into business processes can greatly enhance productivity, customer experience, and overall success. It is essential for the management of businesses to continually evaluate their needs and invest in the right tools to stay competitive in the digital world we are in. With the right combination of technology and strategic decision-making, one can drive growth and achieve long-term success in this digital world which is in fierce competition, advancing in days rather than years.

Adaptive management Embracing flexibility and continuous learning in science and technology management

Adaptive management is a structured approach to decision-making that involves learning and improving management practices over time. It is an intentional approach to making decisions and adjustments in response to new information and changes in context, required in fast changing developments in management, science and technology.

Adapting or adaptive management also refers to intentionally and systematically using relevant knowledge to inform decision-making and ultimately take action. Within the development context, that action could be adjusting interventions or whole strategies, experimenting with new ways of working, scrapping programming that simply isn't working, or scaling approaches that have demonstrated value.

It is a well-known fact that adapting is arguably the most important element of collaborating, learning, and adapting. If we collaborate and learn effectively, but do not do anything differently as a result, then the efforts can get waste. Effective collaboration and learning can often make job more enjoyable, at the same time help in achieving desired results more efficiently and effectively.

Management of Knowledge from a Technology Transfer Perspective

Knowledge Management is a theoretical framework utilized by organizations to collect knowledge

through processes of knowledge creation, storing, sharing and application to accomplish objectives. Organizations constantly learn new ways to utilize the knowledge management framework. Good managers within organizations make use of the know-how of workers they hire with experience and necessary skills for effective management within ad-hoc situations. However, knowledge management is an effective, systematic, and more efficient way to capture knowledge.

Scholars and practitioners suggest knowledge is the most important resource within an organization. Various studies confirmed that knowledge is a key source of competitive organizational advantages. Knowledge management is vital in assisting organizations with creating and gaining knowledge and selecting, organizing, and disseminating information. Consequently, technology transfer serves as a necessary component of innovation, supporting research and development processes throughout higher education.

Anderton and Watson 34 have reviewed factors that influence knowledge management during the technological transfer process between higher education and manufacturing firms, their findings indicate higher education and manufacturing firms should acknowledge the importance of knowledge management during the technology transfer process. Evaluating the relationship between managing knowledge and innovation are emerging findings associated with the creation or modification of products, goods, or services.

The effects of knowledge sharing should be managed in a manner that would motivate workers to share knowledge during the technology transfer process. To lower the barriers to technology transfers, it is necessary to develop a strategy for a successful technology transfer based on the diagnosis of technology donors, looking to the enormous developments in science and technology, including management.

In conclusion it is strategically stated that management, science, and technology, with rapidly growing new markets through technological innovation have become critical factors in achieving success. As of now, companies cannot develop and commercialize all technologies, consequently, the importance of technology transfers will increase by leaps and bounds. Technology transfer is a crucial strategy adopted by organizations to remain innovative and competitive.

CONCLUSION

Effective management of science and technology is crucial for addressing global challenges and ensuring a sustainable future. By understanding the challenges, opportunities, and strategies outlined in this article, governments, industries, and individuals can work together to promote responsible innovation and foster a better future for all. Moreover, there is increasing consensus that real-world policy problems are inherently interdisciplinary and cannot be addressed with knowledge from only a single scientific or academic discipline. And yet, even now, in an era of advanced communications technology, instantaneous access to information, and increasingly insistent demands for academics to demonstrate research impact, and despite continued research efforts in this area, there is still much we do not understand about how to stimulate collaboration across research disciplines. With the right combination of technology and strategic decision-making, one can drive growth and achieve long-term success in this digital world which is in fierce competition, advancing in days rather than years.

Conflict of interest

The author declares no conflict of interest

Data availability

All data are available with the author.

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3. Case Presentation
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