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Editorial

Making BRICS Work for its People and for those in the Global South

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Guest Editor

Since 2009 and more specifically in the past five years, there has been growing global fascination with the burgeoning BRICS as many countries express interest at its membership. From five to ten nations after the Johannesburg Summit of 2023, BRICS Plus (Brazil, Russia, India, China, South Africa, Plus Egypt, Ethiopia, Iran, Saudi Arabia and United Arab Emirates), BRICS Plus has become a formidable global multilateral powerhouse with a combined Gross Domestic Product (GDP) over $28,5 trillion (28% of global GDP) and a combined population over 3.5 billion people (45% global population).

BRICS has prioritised its operations to be pegged against its three main pillars of cooperation, i.e., (a) Political and Security Cooperation, (b) Finance and Economic Cooperation, and (c) Cultural and People to People Cooperation. (3.5 billion people). To date, one of the boldest initiative distinguishing BRICS from all other multilateral formations outside of the United Nations (UN) system include the establishment of the New Development Bank (NDB). Outside of the NDB, there are numerous initiatives coming of the annual declarations which are adopted by the heads of states at the various BRICS Summits.

This special issue was conceived out of the 2nd BRICS Research Institute Conference co-hosted between the University of Kota from and Durban University of Technology that took place between 13th and 15th February 2023 at the University of Kota in India. The conference keynote address and opening were delivered by the honourable Vice Chancellor of the University of Kota, Professor Dr Neelima Singh. The theme of the conference was *"Growth and Sustainability of Livelihoods in the BRICS countries: Knowledge Sharing in Social Justice, Governance, and Multilateralism,"* and the primary objective of the conference was to solicit contributions from BRICS scholars regarding advancements made by BIRCS in the themes of: (1). *Entrepreneurship and development research; (2). New Development Bank – as a Catalyst for the BRICS Economic Growth and Development;(3). Climate emergency and challenges for BRICS countries; and (4). BRICS people-to-people exchange and cultural integration through tourism and air transport.*

A total of 203 abstracts were received towards this conference as follows: 63 for the theme of *Entrepreneurship, 62* towards *New Development Bank – as a Catalyst for the BRICS Economic Growth and Development; 46* to *climate emergency* and 36 towards *BRICS people-to-people exchange and cultural integration.* A total of 40 full papers were received post conference and subjected to double-blind peer review process by an esteem team of BRICS scholars. A total of eleven papers that went through the double-blind peer review process made it to this publication on the basis of their quality.

In this publication, papers are clustered in only three main themes which are (a) Climate emergency and challenges for BRICS countries, (b) BIRCS and COVID-19, and (c) Entrepreneurship and future perspectives in BRICS.

Given the rapid developments within BRICS and thus related data, it is an achievement that this special issue comprises papers that result from both primary research as well as literature reviews and secondary sources. The papers have been selected to represent aspects of the challenges and opportunities that are part of BRICS and aim at giving the reader a holistic insight as to how BRICS academics approach these topics. Moreover, the reader is invited to use their critical thinking in comparing and identifying synergies between the different papers which not only allows them to gain a more holistic yet detailed understanding of issues and opportunities within the BRICS framework but also allows them to exercise in a way, a more multilateralist approach in understanding by being invited to take a more active role when engaging with the literature. Since the conference in 2023 and as of October 2024, BRICS has expanded to becoming BRICS+ with the additions of Egypt, Ethiopia, Iran, the UAE, and Saudi Arabia; surpassed the GDP of the G7; expressed strong intentions of de-dollarization, received 34 formal expressions of interest to join BRICS+, paving the way to a new inclusive multilateralism never seen before.

The BRICS Research Institute is at the forefront of producing unique scholarly research output, which is of paramount importance in the paradigm shift the world is currently experiencing. As the saying goes “Luck is what happens when preparation meets opportunity.”

Environmental Sustainability: The Case of a Multi-Business Packaging Organisation in South Africa

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Abstract

South Africa contributes to greenhouse gas emissions and is vulnerable to climate change's effects on health, livelihoods, water, and food. The South African Department of Environment, Forestry and Fisheries (DEFF) supports an equitable transition to a low-carbon economy and a climate-resilient society protected for the benefit of present and future generations. The increased awareness and requirement to protect the environment has resulted in a growing demand from environmentally conscious customers for suppliers to practice the triple bottom line that requires a balanced approach to managing people, planet, and profit. Organisations therefore must have clear environmental objectives that must be aligned with the strategic goals of the organisation, to ensure better, utilisation of the organisation's resources, management of cost, and management of the organisation's environmental culture.

Organisations implement Environmental Management Systems (EMS) to evaluate, eliminate and mitigate their impact on the environment to improve their environmental performance. This study was conducted across three business units of a South African packaging organisation that aimed to ascertain the environmental sustainability status of the organisation. A mixed quantitative and qualitative research methodology was used to gain an understanding of the current environmental sustainability initiatives of the organisation and the challenges that the organisation faced towards achieving its' contribution towards environmental sustainability.

The results of the research indicated that the organisation has environment management systems that support environment sustainability, however, there is room to further improve their environmental performance.

Keywords: Environment, Sustainability, Circular Economy, Environmental Objectives

Introduction

(Kahraman and Sarı, 2017), allude that sustainability development aims to balance the economic, environmental, and social needs of human beings, allowing the sustainability of current environmental resources for future generations. The increased awareness and requirement to protect the environment has resulted in a growing demand from environmentally conscious customers for suppliers to practice the triple bottom line. The triple bottom line concept, which requires a balanced consideration for people, planet, and profit, is becoming a core macro environment requirement in gaining a competitive advantage for an organisation's economic, environmental, and social sustainability (Wilson, 2015). Organisations, therefore, must have clear environmental objectives that must be aligned with the strategic goals of the organisation, to ensure better, utilisation of the organisation's resources, management of cost, and management of the organisation's environmental culture. Whilst organisations may have environmental initiatives in place, there is a need to ascertain their environmental sustainability status against global trends.

Organisational Context

This research was based on a case study of three business units of a metal packaging organisation that is driven by environmental regulative, legislative, and environmental sustainability requirements of the market that the organisation serves. The organisation is the leading packaging manufacturer in Africa that operates from 19 sites in South Africa and has been listed on the Johannesburg Stock Exchange (JSE), since 1969. It specialises in packaging using different substrates comprising of paper, plastic, and diversified metal packaging division (Anon 2020:1). This research is based on the environmental management system of the diversified metal packaging division that produces primary packaging from tinplate and aluminium. The metal packaging division of the organisation is the leading food and diversified metal can supplier in South Africa, manufacturing two-piece and three-piece food cans, plain and lacquered ends, full aperture ends and easy-open and peel-off ends, polish cans, paint cans, aluminium, and tinplate aerosols cans.

Product life cycle assessment is a tool that provides a transition from a linear to a circular economy by evaluating the environmental impact of the different stages of a product from cradle to grave to develop and implement strategies to minimise the environmental impact at each stage of the product life cycle (Andersen, Birgisdottir and Birkved, 2022). The organisation recognises the challenges and benefits of producing environmentally sustainable packaging using the product life cycle perspective that supports the circular economy objectives, thus minimising environmental impact. The environmental sustainability efforts of the organisation are supported by the environment product life cycle assessment of the organisation that contributes to the circular economy.

The research organisation is certified to the ISO 14001:2015 standard and is subjected to annual surveillance and three yearly certification audits. Annual environmental legal audits are conducted to ensure alignment and compliance with regulatory or statutory requirements. The organisation's ISO 14001:2015 environment management standard certification requires the organisations to set environmental objectives that are aligned to the strategic direction of the organisation (South African National Standard 14001:2015, 2015). Table 1 presents the organisation's environmental objectives and initiatives.

Table 1: The Organisation's SHEQ Objectives and Initiatives

Objectives	Initiatives
Adherence to legal compliance of the effluent discharge pH level	Effluent plant pH levels are monitored and actioned daily by a dedicated outsourced service provider.
Reduce manufacturing process waste	Manufacturing process waste is monitored and actioned daily and forms part of management's performance contract. There are interventions in place to reduce manufacturing process waste.
Reduce electricity consumption	Electricity consumption is monitored and tracked monthly with initiatives to convert to LED energy and convert electric curing ovens to gas ovens
Reduce water consumption	Full-time maintenance crew on site for quick response to repair water leaks. The feasibility of rainwater harvesting is being explored.

Objectives	Initiatives
Reduce chemical spillage incident impact on the environment	Chemical spillage awareness environment talk conducted with all employees. A dedicated spillage control team was assigned and trained on the management of chemical spillages
Comply to environmental regulatory and statutory requirements	Annual environmental legal audits are conducted to ensure compliance with regulatory and statutory requirements. ISO 14001:2015 certification is maintained Internal environment auditing and GEMBA walks are conducted
Implement a circular economy strategy	Adopted a Life Cycle perspective to reduce the organisation's carbon footprint and A behavioural-based reporting system is in place to reinforce positive behaviour and correct negative behaviour.

Source: Health and Safety Management Committee (2021: 3) minutes

Conceptual Framework

The conceptual framework of a research study portrays the exploration of the research problem and presents a visual representation of the ideas within the research study (Adom, Hussein, and Agyem 2018: 439). Figure 1 below illustrates the conceptual framework for this study.

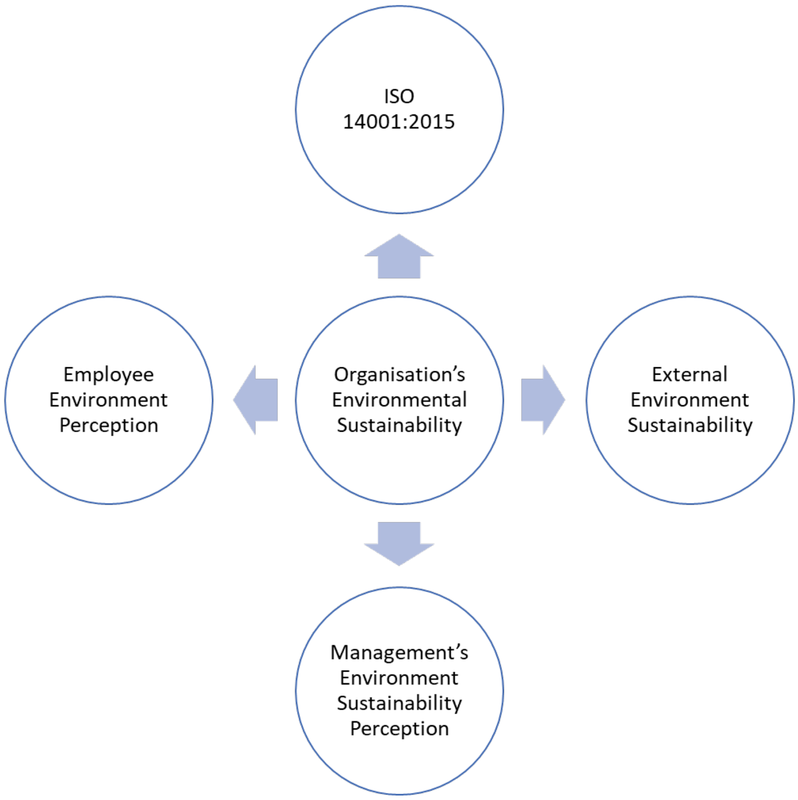

Figure 1: Conceptual Framework

Source: Author's own construct

Theoretical Framework

The theoretical framework in a research study functions as a filter or lens, offering direction on the research to prioritize, refining the focus on critical information articulating the meaning of existing theories and unveiling the strengths and weaknesses of the research study (Given 2012: 872). In this particular study, the theoretical framework was rooted in the ISO 14001:2015 environmental management system. Figure 2 below illustrates the theoretical framework for this study.

Figure 2: Theoretical Framework

Source: Author's own construct

Problem Statement

Traditionally, customers focused on the economic criteria for the selection of suppliers, however, more recently the recognition of the deterioration of the environment has compelled organisations to include green criteria in their supplier selection process as part of their green supply chain management strategy (Yazdani, Zavadskas and Zolfani, 2017). To address the typical depletion and waste of resources predominant in a linear economy, where resources reach an end of life, it is important to consider a circular economy where waste is viewed as a resource that is reintroduced into the economy (Franklin-Johnson, Figge, and Canning, 2016). Therefore, due to economic and environmental challenges, organisations have implemented production and supply chain systems to extend the product life from a linear, take, make, use, dispose chain, to a take, make, use, reuse circular value chain that extends the life of the product, that saves operational costs and reduces the environmental impact (Batista, Gong, Pereira, Jia and Bittar, 2018). A prerequisite and key contributor to an organisation's long-term profitable success is an organisation's demonstrated commitment to environmental sustainability (de Oliveira, 2013). The research organisation is required to maintain its existing and gain a greater marketing share to remain sustainable in the current global economic condition. However, the research organisation did not understand its current environmental management status, and hence, the research organisation needed to ascertain its current environmental sustainability status to inform strategies to demonstrate environmental responsibility. The study aimed to ascertain the environmental sustainability status of the organisation by ascertaining employee's and management's perceptions of the extent of commitment and the level of supporting resources, tools, and techniques in support of environmental sustainability.

Literature Review

The growth of international trade and an increase in domestic content in exports is considered an important factor of a country's involvement due to the growing importance of global value chains (Bjelic and Kastratovic, 2019). The South African manufacturing sector contributes 13% to the country's gross domestic product (GDP) and the sector contracted by 1.8 % during the fourth quarter of 2019 (Statistics SA, 2020). The metal packaging industry was valued at R5.9bn in 2018, accounting for 9.2% of the South African packaging market sector (Research and Markets Report, 2019).

Organisations often conduct business in a turbulent environment that is characterised by intense competition, changes in technology, new consumer markets, and limited resources (Basaran 2018: 1). Increased industrial development over the past two decades has resulted in environmental degradation that has become a social concern for organisations globally, resulting in these organisations implementing 14001:2015 environment management systems (Chowdhury, Prajogo and Jayaram, 2018). Incorporating environmental management system into the strategy of an organisation and including an environmental life cycle perspective assists an organisation in improving its environmental performance and reaping the environmental performance benefits as demonstrated in Figure 1 (Greenworld, 2016).

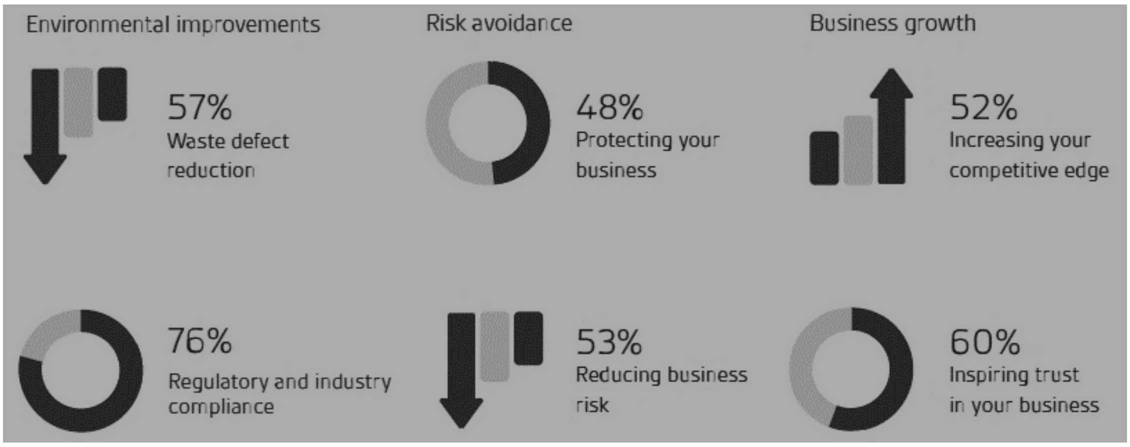

Figure 1: Benefits of ISO 14001:2015

Source: (Greenworld, 2016)

The scope of environmental management comprises the conservation of natural resources, protection of habitats, and control of hazards and involves the topics and considerations as represented in Table 2 (Kahraman and Sarı, 2017).

Table 2: Environment Topics and Considerations

	Environment Topic	Considerations
1	Carbon footprint	Carbon management aims to minimise carbon dioxide and other greenhouse gases that can have a negative impact on the environment
2	Soil degradation management	The impact of human and natural hazards creates a measurable loss of the potential of soil to produce plant material
3	Disaster Response and Management	The management of both human and natural disasters to mitigate, prepare, respond, and recover the environment
4	Solid waste management	Measures that address the prevention, recycling, treatment, and disposal from the generation to the disposal of solid waste
5	Wastewater management	Initiatives to maintain the sustainability of wastewater by collecting and treating wastewater that goes into the rivers or seas for reuse
6	Water resources management	Initiatives that pivot around the need for water preservation, availability, quality, and supply
7	Sustainable Transportation	Refers to the shaping of transportation to minimise the impact on the environment
8	Hazardous Waste Management	Initiatives that address the adverse impact of solid, liquid, or gas hazardous waste that has physical, chemical, or biological characteristics
9	Air Quality Management	Initiatives that address concerns over global warming and ozone layer depletion that have increased the concerns on air pollutants and air quality.
10	Energy Management	Initiatives that address the management for the growing demand and constraints for energy generation, energy distribution and energy consumption.

Source: (Kahraman and Sarı, 2017)

The reduction of an organisation's carbon footprint is not a destination but a journey to achieve a zero-carbon footprint and the ambitious environmental performance objective is to achieve a negative carbon footprint by removing carbon from the environment (Wilson, 2015). ISO 14001:2015 is the globally recognised environmental management standard that organisations implement to provide a framework for managing environmental sustainability (Barbosa, Oliveira, and Santos, 2018). Although ISO 14001:2015 Environmental Management System is not compulsory, it has a long history of structural and content development by global experts and it is used as a strategic tool to align the business with statutory, regulatory, and market requirements (Basaran, 2018). The ISO 14001:2015 ISO standard provides guidelines and requirements for an organisation to adopt a structured approach to implement, manage, and improve the environmental performance of the organisation (Johnstone and Hallberg, 2020).

(Ahidar, Sarsri and Sefiani, 2018), (Nunhes, Motta, and de Oliveira, 2016) and (The International Organisation for Standardisation, 2015) envisage that the following are the objectives of ISO 14001:2015:

1. ISO 14001:2015, EMS provides a framework for the protection of the environment and responding to changing environmental conditions to improve an organisation's environmental performance
2. Unlike ISO 9001:2015 QMS which is driven by customer satisfaction requirements, ISO 14001:2015 EMS is driven by stakeholder expectations including government statutory and regulatory requirements, and assists in the achievement of environmental compliance obligations
3. Communication of environmental information to relevant parties

4. Adopt a balanced approach between the environment, society, and the economy by enhancing and maintaining environmental sustainability to preserve current resources for future generations. Thus, enhancing the environmental performance of the organisation
5. Assess and reduce environmental risks and take advantage of environmental opportunities using a product life cycle perspective to analyse, review and minimise the impact on the environment at different stages of the product to achieve financial benefits by reducing and reusing

To continually improve an organisation's environmental performance and satisfy the environmental requirements of interested parties, organisations develop environmental policies, define environmental objectives, and implement supporting processes (Rebelo, Santos, and Silva, 2016). An organisation's ISO 14001 EMS can complement government regulations in the global environmental sustainability governance context (Wagner, 2019).

The traditional linear model of buy, consume, and dispose, has been replaced with an environment sustainability circular model that focuses on all aspects of a product's life cycle to maintain the sustainability of the environment for future generations (Tantau, Maassen, and Fratila, 2018). An organisation's environmental performance is multidimensional and extends beyond the boundary of the organisation, promoting international trade and achieving social, economic, and environmental benefits (Johnstone and Hallberg, 2020). Product life cycle assessment and circular economy have become a global strategy to improve environmental performance and achieve a sustainable economic system (Tantau, Maassen, and Fratila, 2018).

The (South African National Development Plan 2030, 2017), explains that the mapping of the transition to a low-carbon economy requires consensus on the challenges and trade-offs involved in implementing the South African climate policy. The (constitution of South Africa Act 108, 1996), accentuated that everyone has the following environmental rights:

1. To an environment that is not harmful to their health or well-being
2. To have an environment that is protected for the present and future generations through reasonable legislative and other measures to prevent pollution, and ecological degradation, to promote conservation, to secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

(Kasner and Edward, 2018), from Packaging SA, has identified environmental sustainability opportunities and challenges that are illustrated in Table 3.

The identified opportunities and challenges that are peculiar to the packaging industry, do provide the packing industry with valuable markers to inform environmental sustainability strategy development.

Table 3: Environment Sustainability Opportunities and Challenges

Opportunities	Challenges
Adopting circular economy philosophy, that is a regenerative system. Setting up of Producer Responsibility Organisations (PRO). Application of Extended Producer Responsibility (EPR) where a producer's responsibility is extended to the post stage of the product life cycle. Set targets for waste reduction, recycling and re-use, and implementation of industry waste management plans, that involve planning of waste generated actions by an organisation. Creating waste pickers job opportunities, Waste prevention policy that involves taking measures to produce or reduce waste generation, Recycling involves the recovery process of waste for reuse whether for the original product or alternate products. Introduction of refillable packaging that can be re-used, Separation of waste for recycling. Implementation of environment-sustainable goals	Growing population and economy result in a higher volume of waste generated. The increased complexity of waste streams. Inadequate waste collection services for informal areas. Unreliable and contradictory waste data because the submission of waste data is not obligatory resulting in limited understanding of waste flows. Waste management is not actively promoted by the policy and regulatory environment, There is a lack of infrastructure to support waste separation at the source. Declining levels of capital investment and maintenance on waste management. Preference of waste disposal against other options due to the low appreciation of waste management resulting in underpricing. Few waste management options are available resulting in being more expensive than landfill cost. Too few compliant landfills. and hazardous waste facilities hindering the safe disposal of waste. Additional tax burden with the introduction of environment levy for paper and packaging.

Source: (Kasner and Edward 2018:7)

Research Methodology

(Hair, Page and Brunsveld, 2020) state that the objective of business research is to predict and explain phenomena in an ever-changing business environment. (Bairagi and Munot, 2019) and (Saunders, Lewis, and Thornhill, 2016), define research as the systematic investigation to understand existing knowledge and to establish the contribution of new knowledge based on continual improvement. This study adopted a mixed qualitative and quantitative method that was cross-sectional, using the case study research design approach to provide a more in-depth understanding and a more balanced perspective.

Quantitative Research Study

The quantitative research method encompasses the collection and analysis of data using the results of closed-ended questionnaires (Dudovskiy, 2015). A 5-point Likert Scale questionnaire was administered to gather data from participants. The requirements of ISO 14001:2015 environmental management standards were used as a framework in developing the quantitative questionnaire statements. The researched organisation's human resource records (Human Resource Management Committee, 2021) depicted a population of 500 operational, middle, and senior management employees, and the sample comprised 217 employees, which was deemed to be appropriate as indicated in (Sekaran and Bougie, 2016) population sample table of calculations. The quantitative data was then analysed using the SPSS (version 26) statistical package using descriptive and inferential statistics. The descriptive statistics were presented in the form of charts and tables. The quantitative data reliability was ensured by targeting Cronbach's alpha's recommended value of 0.700 (Gliem and Gliem, 2003).

Qualitative Research Study

The responses from the quantitative part of the study were used to develop the interview questions for a clearer understanding and confirmation of the quantitative data responses. Qualitative data is collected using unstructured interviews or observation to probe deeply into an issue and rather than collecting numbers the data is collected by recording words or phrases (Hair, Page, and Brunsveld, 2020). Interviews were conducted with the senior management of the organisation to obtain a clearer understanding and an in-depth perspective. Nine participants, comprising of three Senior Production Personnel, one Senior Safety, Health, and Environment Person, three Senior Quality Personnel, and two Senior Engineering Personnel were interviewed. Notes were extracted from the interview recordings and confirmed with participants before data analysis, to ensure trustworthiness. Thematic data analysis was conducted.

Research Ethical Protocols and Research Independence

To ensure that the study was conducted ethically, the anonymity and confidentiality of participants was maintained. The participant's identity was not disclosed in the research and the data and the information that was provided by the participants was used for the sole purpose of this research. DUT Institutional Research Ethics Committee approval was obtained prior to the commencement of this study

Discussion of Results and Findings

Figure 3 depicts the staff position composition of the population.

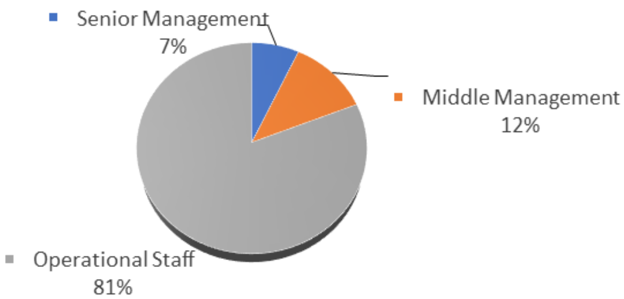

Figure 3: Staff Position Composition of the Population

Source: Researcher's own construction

The sample was drawn using stratified random sampling, as depicted in Table 4.

Table 4: Stratified Sampling by Employee Level

	Gauteng		KZN		Cpt		Total	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Senior Management	4	4	6	6	4	4	14	14
Middle Management	8	7	10	11	9	10	27	28
Operational Staff	52	52	77	80	47	47	176	179
Total	64	63	93	97	60	61	217	221

Source: Researcher's Own Construction

Figure 4 illustrates the distribution of the ages of the respondents

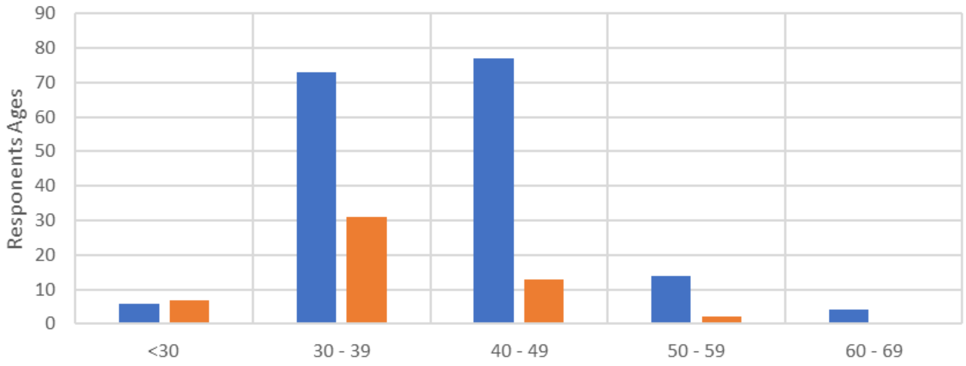

Figure 4: Distribution by Respondents Ages

Source: Researcher's own construction

The disproportionate representation of males to females is reflective of the disproportion in the population. The predominant age grouping of respondents is 30-39 years, followed by 40-49 years, reflective of a middle-aged staff complement.

Table 5 depicts the scoring patterns for the Environmental Management Survey questionnaire.

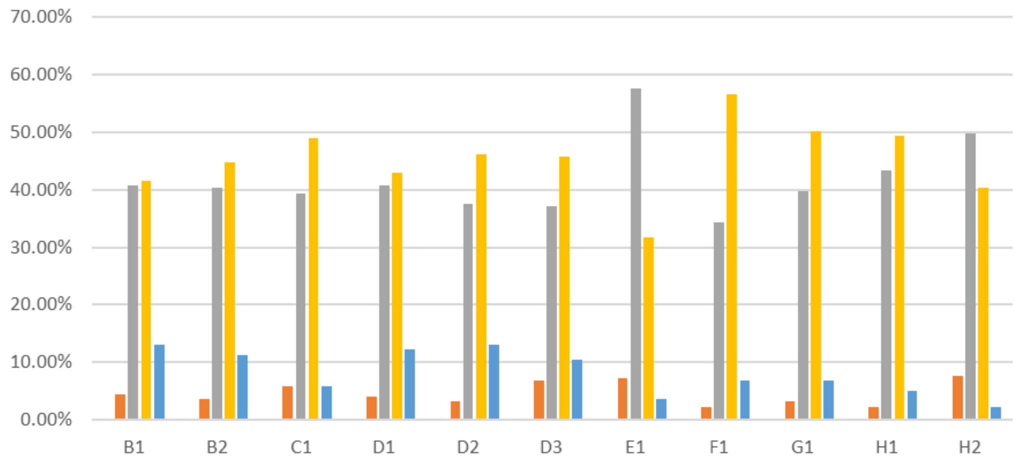

Figure 5: Scoring Pattern of the Environment Management Survey Questionnaire

Source: Researcher's own construction

Table 5: Scoring Patterns for Environmental Management Survey Questionnaire

		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Chi Square p-value
Statements		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
My organisation's management has determined the external factors (Political, Economic, Social, Technological, Legal and Environmental) that may impact on the strategic direction of the organisation's environmental management system.	B1	0	0.00%	10	4.50%	90	40.70%	92	41.60%	29	13.10%	< 0.001
My organisation understands the environmental needs and expectation of stakeholders (Customers, suppliers, employees, legal & regularity compliance bodies)	B2	0	0.00%	8	3.60%	89	40.30%	99	44.80%	25	11.30%	< 0.001
Top management demonstrates committed leadership with respect to the environmental management system.	C1	0	0,0%	13	5,9%	87	39,4%	108	48,9%	13	5,9%	< 0.001
My organisation has completed an environmental risk assessment	D1	0	0,0%	9	4,1%	90	40,7%	95	43,0%	27	12,2%	< 0.001
My organisation has determined its environmental objectives	D2	0	0,0%	7	3,2%	83	37,6%	102	46,2%	29	13,1%	< 0.001
My organisation has communicated its environmental objectives to employees	D3	0	0,0%	15	6,8%	82	37,1%	101	45,7%	23	10,4%	< 0.001
My organisation provides the necessary resources needed for the operation of the environmental management system	E1	0	0,0%	16	7,2%	127	57,5%	70	31,7%	8	3,6%	< 0.001
My organisation has measures in place to manage (Plan, organise, lead and control) the processes relating to the environmental management system	F1	0	0,0%	5	2,3%	76	34,4%	125	56,6%	15	6,8%	< 0.001
My organisations reviews (monitors, measures, analyses, and evaluates) its environmental performance	G1	0	0,0%	7	3,2%	88	39,8%	111	50,2%	15	6,8%	< 0.001
My organisation identifies opportunities for the improvement of the environmental management system	H1	0	0,0%	5	2,3%	96	43,4%	109	49,3%	11	5,0%	< 0.001
My organisation provides resources for the improvement of the environmental management system	H2	0	0,0%	17	7,7%	110	49,8%	89	40,3%	5	2,3%	< 0.001

Source: Researcher's own construction

The significance of the differences in scoring was tested as shown in Table 5 and the following patterns are observed with the statements as depicted in Figure 4:

1. There were no statements with strong disagreement;
2. Statements B1 and B2 are, have similar scoring patterns. The levels of agreement and the levels of neutral are also similar;
3. Statement C1 is based on leadership's commitment to the environmental management system. The percentage of respondents who agreed and strongly agreed with this statement was greater than those who disagreed and those who were neutral
4. Statements D1, D2, and D3 were based on the organisation's environmental risk assessment, determination of environmental objectives, and communication of environmental objectives. The percentage of respondents who agreed and strongly agreed with these statements was greater than those who disagreed and those who were neutral
5. Statement E1 was based on the organisation's provision of resources for the environmental management system. The percentage of respondents who disagreed and who were neutral was greater than those who agreed and strongly agreed with the statement
6. Statement F1 was based on the organisation's planning, organising, leading, and controlling of the organisation's environmental management system. The percentage of respondents who agreed was higher compared to those who disagreed or who were neutral
7. Statement G1 was based on a performance evaluation of the organisation's environmental management system. The percentage of respondents who agreed was higher compared to those who disagreed or who were neutral
8. Statements H1 and H2 were based on the provision of resources for the improvement of the organisation's environmental management system. There was a higher percentage of respondents that agreed compared to those that disagreed or who were neutral
9. The neutral repsonses for E1 and H1 and H2 were notable high

Discussion of Quantitative Research Findings

1. An understanding of the context of the organisation and the requirements of interested parties enables an organisation to develop and align the strategic intentions of the organisation (Barbosa, Oliveira, and Santos, 2018). The research findings indicate that the research organisation has achieved this objective. There was a high level of agreement that the management of the organisation contextualised the external factors that impacted the organisation and understood the needs and expectations of all stakeholders.
2. The leadership of an organisation must be committed and accountable for the success of an organisation's management system (DNVGL, 2016). Statement C1 of the survey measured respondent's perception of the leadership's commitment to environmental sustainability. There was a high level of agreement that the management of the organisation was committed to environmental sustainability.
3. The organisation needs to define the plan of the management system's objectives and the associated risk (DNVGL, 2015). Statements D1, D14, and D17 of the survey questionnaires measured respondent's perception of the organisation's planning of the environmental management systems. Risk assessment and environmental objectives, the two important requirements of planning are measured. There was a high level of agreement that the organisation has conducted risk assessments and set objectives for environmental sustainability.

4. The foundation of a management system is the provision of resources (Abuhav, 2016), therefore, to achieve the intended outcome of the management system, the organisation needs to provide the required resource support (British Standards Institute, 2015). For the section E1 on the provision of resources, there was a higher level of disagreement and neutral than agreement. The reason for the responses was further explored during the qualitative interviews.
5. Overall for section F1 on the organisation's planning, organising, leading, and controlling, there was a higher level of agreement than neutral and disagreement. The quantitative survey results indicate that there was a strong agreement that the organisation has measures in place to manage plan, organise, lead, and control the management systems.
6. Section G1 of the survey questionnaires measured respondents' perception of the organisation's performance evaluation of management systems and the response was further clarified during the interviews. There was a high level of agreement that the organisation's management monitors measures, analysis, and evaluates the performance of the management systems. Overall for the section on performance evaluation of the organisation's management systems, the level of agreement was higher than neutral and disagreement.
7. Statements H1 and H2 measured respondent's perception of the organisation's improvement of management systems and the response was further clarified during the interviews. The reason for the lower levels of agreement and higher level of neutral was further explored during the qualitative interviews in the next section.

Table 6: Summary of Qualitative Research Findings

Areas of enquiry	Summary of responses
Internal and external factors that impact on the organisations environment management systems that the organisation has considered and what measures have been taken?	There is a growing requirement from customers as part of their supplier selection criteria for the organisation to ensure that the organisation adopts an environmental product life cycle perspective to minimise the impact on the environment and provide safe and quality products. The organisation differentiates itself from competitors by maintaining its' ISO 14001:2015 certification and continuing to minimise the impact on the environment. The organisation culture of employees and the commitment of senior management of the organisation impacts the organisation's environment management system. The organisation has a behavioural-based reporting system that reinforces positive behaviour and corrects negative behaviour.
Organisations leadership commitment to environment sustainability.	The organisation's senior management's commitment to environmental sustainability is evident in the compliance with the National Environmental Management Act which is demonstrated in the legal audits and certification to ISO 14001:2015.
Environmental risks consideration when setting SHEQ objectives?	Environment objectives are set based on environmental risks and this is done to ensure that these risks are tracked and managed. Objectives and risks are reviewed and tracked during audits, management meetings, and annual management reviews.
Organisations' environmental operational challenges	There are new environmental requirements that the organisation needs to keep abreast with and ensure compliance with these requirements. The organisation has annual environment legal audits that are conducted by an external legal advisor and are a member of the Metal Packaging Association, (MetPac) and the Institute of Packaging South Africa (IPSA). Any new environment, health, or safety requirements are communicated to the organisation via these channels. Management provides the support required for the management system; however, these were not effectively communicated. The organisation has identified opportunities for improvement; including opportunities arising from the fourth industrial revolution, and reduction of raw material usage, however, these were not communicated to all stakeholders

Source: Researcher's own construction

The results of the quantitative and qualitative study dovetail towards similar results, except for the area around operational challenges, where communication seems to be the greatest challenge.

Recommendations

Based on the results of both the quantitative and the qualitative phase of the study, the following recommendations have emerged:

1. The organisation must aim to maintain ISO 14001:2015 environmental management system certification status by addressing and closing off audit findings timeously.
2. The organisation must continue with internal audits to ensure adherence to regulatory and statutory requirements;
3. The organisation must conduct an annual environmental management review to strategically position the organisation to remain competitive and maintain market share;
4. The organisation must clearly communicate the various environmental initiatives to all stakeholders.
5. Senior management must demonstrate commitment by identifying and supporting new initiatives and clearly communicating the resources that are made available to enhance the environmental culture of the organisation;

The organisation must improve its environmental sustainability position by embarking on initiatives to reduce raw material usage by considering, for example, thinner gauge raw material.

The significance of this study lies in its value in bringing to the fore that although an organisation may be ISO 14001:2015 certified, progress towards environmental sustainability can gather greater momentum if organisations keep on focussing on areas that they are doing well in and identify and improve on areas that they are not doing well in. A case study of this nature, that elicited data from the cross-section of employees made it possible to identify areas for improvement that otherwise would have gone undetected. Other organisations may find the results of this study useful to signpost their own journey towards improving their own environmental performance. An area for further research could be the development of measures for the scale and intensity of initiatives, levels of resources deployed, and effectiveness of communication channels, for environmental sustainability in the packaging industry. Such research could be undertaken under the auspices of the Institute of Packaging South Africa.

Conclusion

The concept of environmental sustainability emerged in the early twentieth century where there was a shift from concentrating on just profit because of the need to sustain resources for the future generation. The growth of, population, economy, and industrialisation and the right to an environment that is not harmful to well-being was the main drivers of environment sustainability. This was primarily driven by the market that organisations serve and became an essential supplier selection criterion to conduct business. Thus, environment sustainability has become a strategic initiative that organisations must implement using an environmental life cycle, circular economy perspective to reduce their carbon footprint. Organisations are required to understand their environmental sustainability position and develop strategies to improve their environmental sustainability position. This research provided insight into the current environmental sustainability topics and strategies that organisations can adopt to demonstrate their commitment to improving their environmental performance. Improvement in environmental performance can result in maintaining or achieving a greater market share and positioning the organisation more competitively.

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Prospective Solar Energy Technologies for Sustainable and Inclusive Development in BRICS Countries

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Abstract

The climate change scenario observed in the last few years calls for immediate attention and planned action. One of the major factors responsible for climate change is fossil fuel-based energy consumption patterns which leads to increased greenhouse gas emissions. Energy availability is important for economic development and improved quality of life, therefore transition to clean renewable energy options is required without compromising on energy availability. According to sustainable development goal number seven, for sustainable and inclusive development it is important to focus on clean and affordable energy for all with consideration for the environment. Here the role of solar energy technologies becomes extremely important, as their carbon footprint is low and can be used for a wide variety of applications. This paper discusses the potential of solar resources for the BRICS countries and the prospective solar thermal and solar PV technologies for each country according to the region-wise resource. BRICS countries represent around 40% of the world's population. The methodology for identifying the prospective solar technologies for the BRICS countries is based on an analysis of the solar resource potential for each country. It is found that all the BRICS countries have good solar potential and can utilize several solar energy technologies to enhance green technology practices. Further, the challenges in the implementation and promotion of solar projects are discussed with suggestions for collaborative research and development in this area. Policy requirements to overcome the limitations of the technologies and their penetration are also pointed out.

Keywords: Solar resource, SDG 7, solar thermal, solar PV, solar technologies, climate change, sustainable development.

Introduction

In today's scenario, energy is one of the basic requirements for growth and development of communities and countries. Sustainable development goal number seven focuses on making available affordable and clean energy for everyone as access to energy is linked to economic growth, enhanced productivity, and improved quality of life (Bhuiyan et.al., 2022; Makieta et al., 2022; Makarova et al., 2020).

The availability of clean energy positively impacts health care services, availability of clean water, education, information, communications, environment, agricultural growth, and industrial productivity. Thus, access to affordable, clean, and reliable energy is essential for the reduction of poverty, the promotion of welfare, improving living conditions, and meeting the goals of climate change mitigation (Sengar et al., 2017).

The BRICS (Brazil, Russia, India, China, and South Africa) countries are the emerging economies of the world which share 30% of the global land and 40% of the global population (Abbas et al., 2022). These countries contribute more than 25% to the global GDP, and as a result of economic growth and industrialisation they are major influencers in energy intensity (Agarwal & Kumar, 2023; Liu et al. 2022).

Over the past few decades, the BRICS countries have witnessed rapid economic growth and population rise which resulted in increased use of fossil fuel leading to increased greenhouse gas emissions. The BRICS countries with more than 40% of the world's population are responsible for about 36% of global energy production and consumption (Xinzhu, 2021; Hasan, 2022). The energy sector plays an important role in CO_2 emissions leading to rising temperatures and the threat of climate change. The UN COP 26 conference suggested that it is important to take action now in order to limit global temperatures to 1.5°C or below by the end of this century. The present scenario of carbon emissions from fuel consumption shows that BRICS countries are in the major emitters list as presented in Table 1. China, India, and Russia are the first, third, and fourth largest greenhouse gas emitters globally, followed by Brazil and South Africa.

Table 1: Carbon emissions from fuel consumption for BRICS countries

Country	$MtCO_2$
China	10,398
India	2,251
Russia	1,795
Brazil	450
South Africa	447

Source: Enerdata, 2023

Energy is essential for sustainable development so instead of cutting down on energy use, it becomes important to make a transition towards clean options of energy and enhanced energy-efficient technologies. BRICS countries play an important role in the global population, economy, and environment, therefore the steps taken by them in mitigating climate change will result in positive global impacts (Paul & Patra, 2022; Khare et al., 2023). To address the increased emissions and climate change issues, the BRICS countries are making a transition from fossil fuel to renewable energy sources and green energy technologies (Abbas et al., 2022; Miranda et al., 2021). Studies show that renewable energy can minimize CO_2 emissions for every BRICS country and electricity consumption increases CO_2 emissions in all BRICS countries, and the coefficients are significant (Voumik & Sultana, 2022).

Amongst the clean energy options, solar energy is a promising choice to provide pathways for social and economic development without triggering climate change. Solar energy technologies are suitable for a wide variety of applications for different sectors such as residential, industrial, commercial, and even transportation (Kabir et al. 2018; Hernandez et al., 2019). BRICS countries receive ample amounts of solar energy and can play an important role in the widespread penetration and use of solar energy technologies (Liya et al., 2021). Further, BRICS countries with their varying strengths in manufacturing, research, and development can contribute towards the development of improved and efficient technologies through mutual cooperation.

The present paper discusses the solar energy potential of the BRICS countries based on the availability of global horizontal radiation (GHI) and the photovoltaics (PV) output values. Solar resource potential for each of the BRICS countries is presented in section 3 and the feasible solar technologies are discussed in section 4 of the paper. Solar energy technologies can be classified in two major application areas -thermal and electrical. Solar thermal applications fulfil the needs for heating/cooling whereas solar photovoltaics provides electricity (Kabir et al. 2018; Hernandez et al., 2019). In the present study feasibility of both the major areas of solar thermal and solar PV are discussed with their sub-areas such as Agrivoltaics, Floatavoltaics/Aquavoltaics according to each member country's potential. Further, in section 5 of the paper, the challenges in the promotion and penetration of these solar technologies are discussed and suggestions are pointed out for mutual cooperation in this field by BRICS countries to move forward towards sustainable and inclusive development.

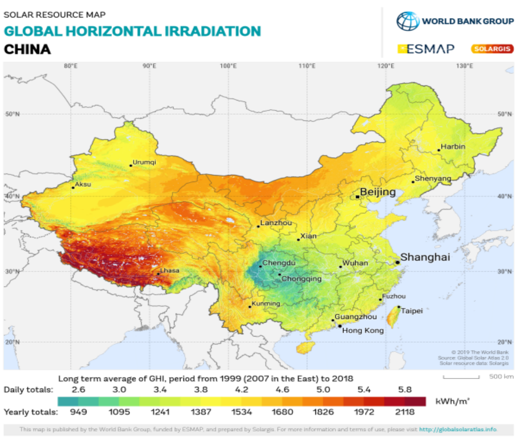
Methodology

The methodology for identifying the prospective solar technologies for the BRICS countries is based on an analysis of the solar resource potential for each country. The global horizontal irradiation and PV power potential for each of the BRICS countries is presented in section 3. Global horizontal irradiation (kWh/m^2) is indicative of the solar radiation availability in different areas. Higher values of global horizontal irradiation are favourable for solar energy technologies, especially solar thermal applications. PV power potential (kWh/kWp) maps show the potential of solar photovoltaic power generation in different areas for each of the BRICS countries. The contribution of solar energy to the total electricity generation of each BRICS country is also discussed. Analysis and comparison of the resource data gives an insight into the prospective solar technologies. The feasible solar thermal and photovoltaic technologies with their sub-areas are presented and reviewed in section 4 of the paper. The challenges in uptake and suggestions for cooperation amongst the BRICS countries in the area of solar technologies are discussed in section 5 of the paper.

Potential of Solar Resource

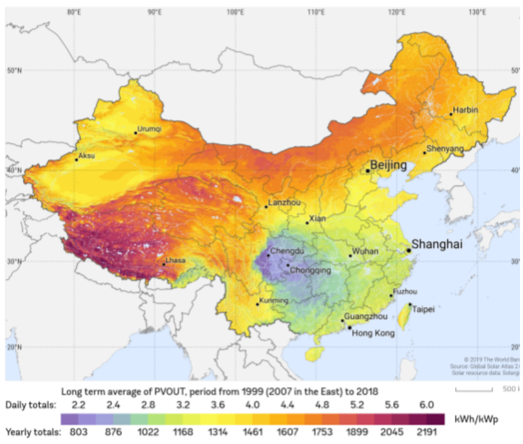
Amongst the BRICS countries China India, Brazil, and South Africa have a good amount of solar radiation potential as can be seen from the solar resource maps presented in figures 1-10. Russia has slightly lower solar potential but still, it holds the promise of supplying useful energy in a clean manner.

Figure 1: Solar resource map for global horizontal irradiation for China



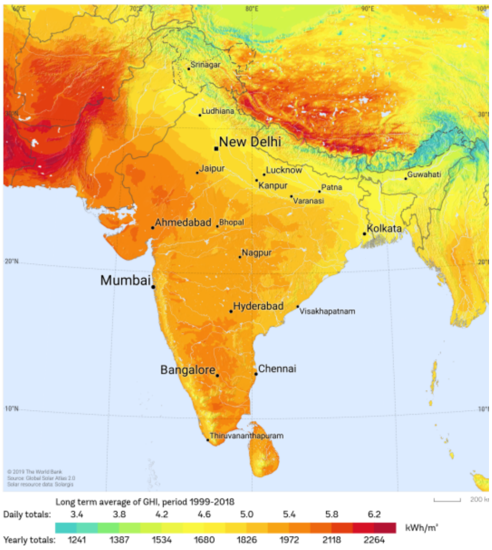
Source: Solargis

Figure 2: Solar resource map for PV power potential for China



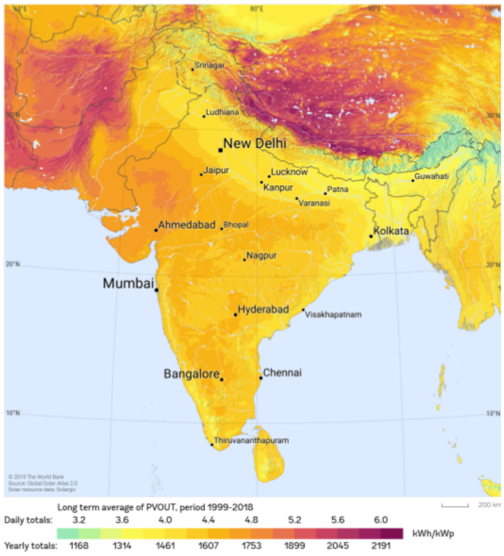
Source: Solargis

Figure 3: Solar resource map for global horizontal irradiation for India



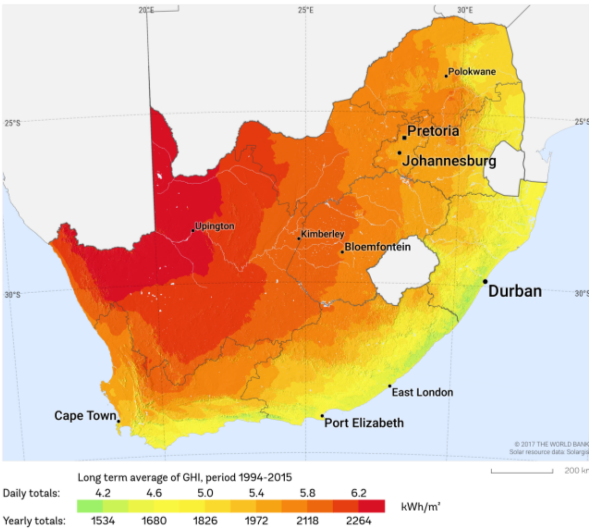
Source: Solargis

Figure 4: Solar resource map for PV power potential for India



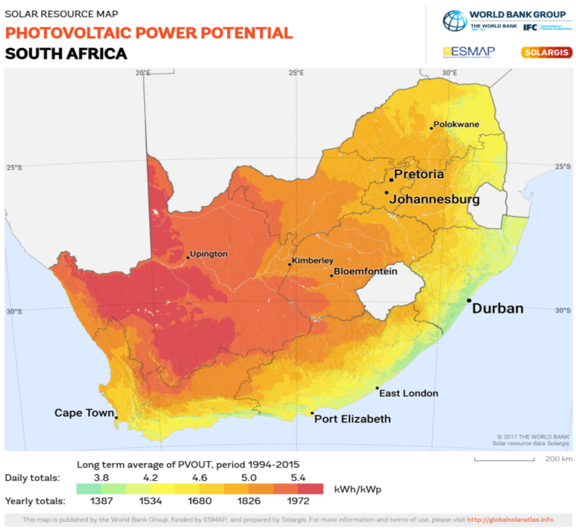
Source: Solargis

Figure 5: Solar resource map for global horizontal irradiation for South Africa



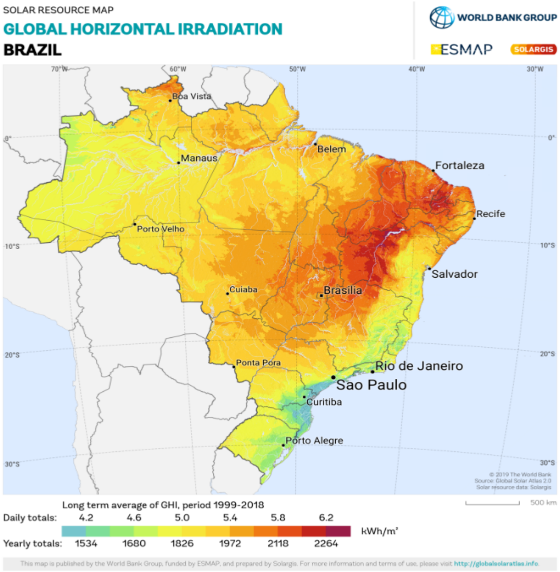
Source: Solargis

Figure 6: Solar resource map for PV power potential for South Africa



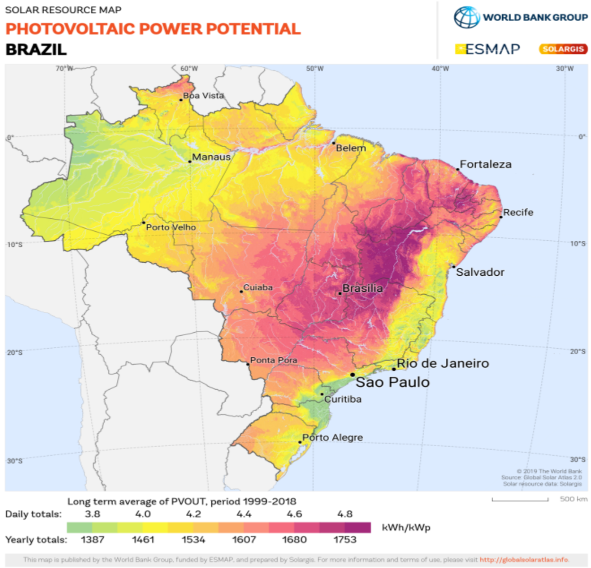
Source: Solargis

Figure 7: Solar resource map for global horizontal irradiation for Brazil



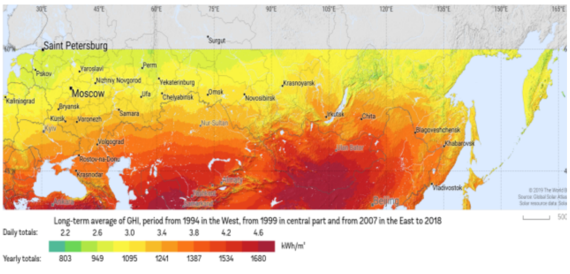
Source: Solargis

Figure 8: Solar resource map for PV power potential for Brazil



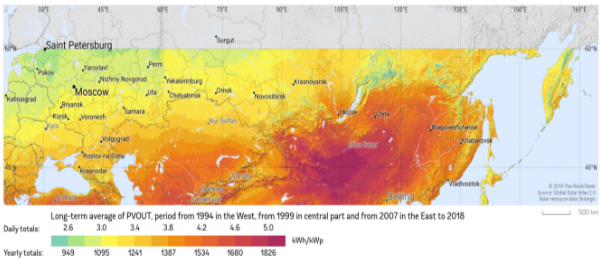
Source: Solargis

Figure 9: Solar resource map for global horizontal irradiation for the Russian Federation



Source: Solargis

Figure 10: Solar resource map for PV power potential for the Russian Federation



Source: Solargis

From Fig. 1 it can be seen that the global horizontal irradiation for China is in the range of 4 to 5 kWh/m², the values are slightly lower for some middle parts (Chengdu and Chongqing) whereas the irradiation is higher than 5 kWh/m² for some western regions in China. The daily total photovolatic power output potential for the entire country of China as can be seen from Fig. 2 is in the range of 4 to 6 kWh/kWp and yearly it lies in the range 1400 to 2000 kWh/kWp. For India the global horizontal irradiation lies between 5 to 6 kWh/m² for major parts of the country except for some areas in North and North-East as shown in Fig. 3. The daily total photovolatic power output potential for India is in the range of 4 to 5 kWh/kWp and on yearly basis, it lies in range 1400 to 1900 kWh/kWp as can be seen from Fig. 4. The values of global horizontal irradiation for South Africa lie in the range 4.2 to 6.2 kWh/m² (Fig.5) and the PV output potential is 4 to 5.4 kWh/kWp on daily basis with values around 1400 to 2000 kWh/kWp for yearly totals (Fig.6).

For Brazil the global horizontal irradiation lies between 5 to 6.2 kWh/m² for major parts of the country as shown in Fig. 7. The daily total photovolatic power output potential for Brazil is in the range 4 to 4.8 kWh/kWp and on a yearly basis it lies in range 1400 to 1800 kWh/kWp as can be seen from Fig. 8. The values of global horizontal irradiation for Russian Federation lie in the range 2.8 to 4.6 kWh/m² (Fig.9) and the PV output potential is 3 to 5 kWh/kWp on daily basis with values around

1000 to 1800 kWh/kWp for yearly totals (Fig.10). The values of solar irradiation vary over a larger range for Russian Federation as compared to the other BRICS countries but still it can be seen that the PV output potential is quite close to other countries for major parts of the Russian Federation. International Energy Agency (IEA) data for electricity production shows that the contribution of solar energy is in the range of 0.2% to 4.6% for BRICS countries (IEA, 2024).

The total electricity production in China in 2021 was 8598977 GWh with 3.8% contribution from solar energy as per IEA. For India in 2021, the total electricity production was 1635165 GWh with 4.6% contribution from solar energy. The IEA data for Brazil shows total electricity production of 677173 GWh with a 4.4% contribution from solar energy in 2022. The total electricity production in Russia was 1159416 GWh with 0.2% contribution from solar energy whereas the total electricity production in South Africa was 244383 GWh with 2% contribution from solar energy in 2021 as per IEA. Therefore, from the above data it can be seen that the contribution of solar power is still quite less in the total electricity generation in BRICS countries. From a look at the solar resource maps (Fig. 1 -10), it is evident that solar potential is available which is still underutilised. Thus, based on the solar resource potential analysis and IEA data it can be said that all the BRICS countries hold the promise of utilization of solar energy technologies for sustainable development.

Feasibility of Solar Energy Technologies

BRICS countries have resolved to increase the share of renewable sources of energy and working towards the adoption of green technology practices in various areas. Fig. 11 summarizes the findings of an interesting study on green technology practices by BRICS countries in the form of intersections to deliver a clear picture of options for mutual cooperation (Miranda et. al., 2021).

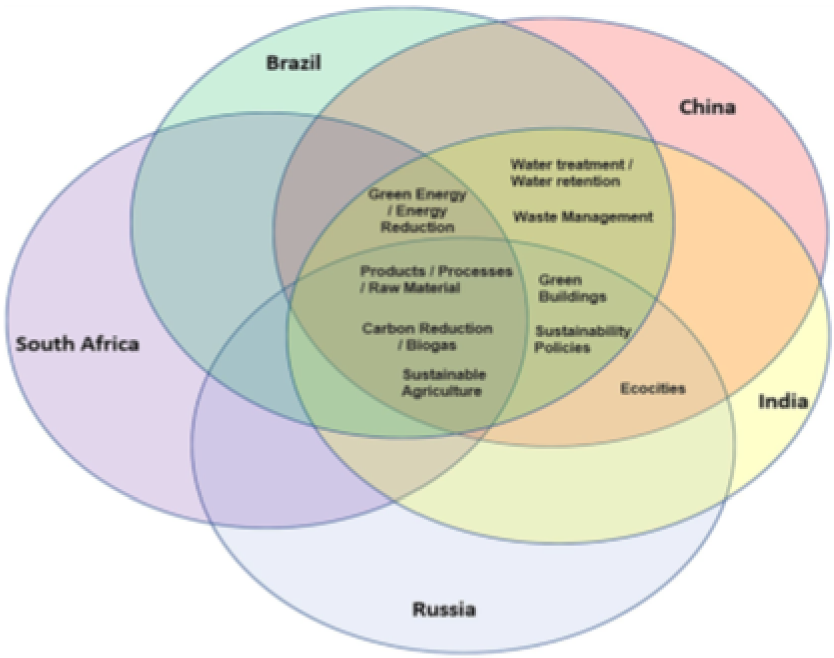


Figure 11: Intersection of Green Technology practices from BRICS countries

Source: Miranda et. al., 2021

From Fig. 11 it can be seen that BRICS countries are focusing on the adoption of green technology practices in the major areas of green energy, products/processes/raw material, carbon reduction, sustainable agriculture, water treatment, waste management, green buildings, eco-cities, and sustainable policies. From Figure 11 it is clear that China and India are trying to adopt all the green technology practices mentioned in the figure whereas Russia, Brazil, and South Africa are focusing on some of the practices. From the point of view of the available solar energy technologies, it is possible that a number of these green technology practices can be met through solar energy.

Presently there are many solar energy technologies and this field is rapidly growing. With sustainable and inclusive development in mind, the main solar energy technologies can be classified as shown in Fig. 12 for different application areas.

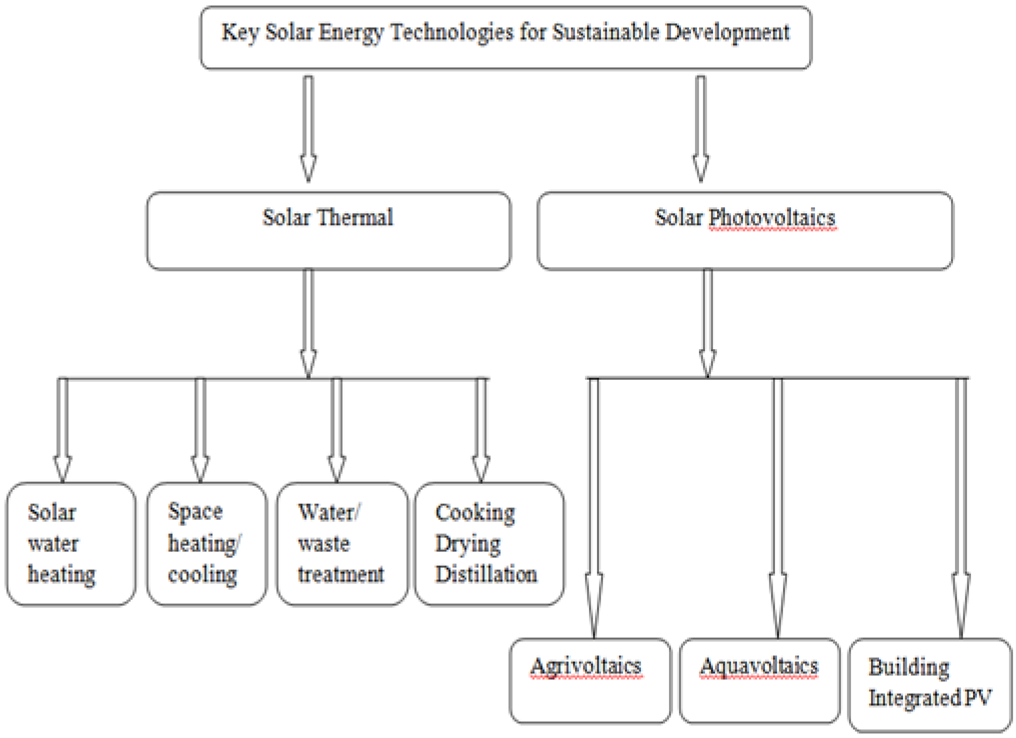


Figure 12: Key solar energy technologies for sustainable development

Source: Compiled by Author

Solar energy technologies can be broadly classified as solar thermal and solar photovoltaics and then these can be sub-classified in divisions according to application areas and technology type. Solar thermal technologies focus on the utilization of solar energy directly for heating or cooling applications. Globally, a major application of fossil fuels is for heating purposes, which can be easily partially met through solar thermal technologies thus reducing carbon emissions. From Figure 12 it can be seen that major application areas of solar thermal technology can be for solar water heating, space heating/cooling, water/waste treatment, cooking, drying, and distillation. There are other applications of solar thermal technology such as power generation but it has not been included here in the figure because due to challenges of its high cost and operation and maintenance requirements, it is not feasible presently (Maka & Alabid, 2022). These solar thermal technologies can be developed further through mutual cooperation by BRICS countries and used in industrial, residential, and commercial sectors for a wide variety of applications. China, India, Brazil, and South Africa can benefit by solar thermal technologies for the adoption of green practices, whereas Russia with a focus on green buildings and ecocities can take solar passive architecture and solar space heating to its advantage.

Solar photovoltaics is growing in its diverse forms such as agrivoltaics, aquavoltaics, and Building Integrated PV (BIPV) to cope with sustainability (Hernandez et al., 2019). Agrivoltaics is a technology that focuses on producing electrical power with agricultural yield so that land area is optimally used and communities are provided with an option of better income and yield. Aquavoltaics is the use of water bodies with solar PV panels for producing power along with aquaculture. These two above-mentioned technologies try to address several issues related to large-size solar power plants and present promising solutions for sustainable and inclusive development of communities, societies, and countries. Buildings are major consumers of electricity, therefore the field of BIPV is developing rapidly to address the issues of carbon footprint by buildings. BIPV offers an opportunity for moving towards energy-efficient and net zero energy buildings which is a main focus area for Russia, India, and China (Miranda et al., 2021). The above-mentioned key solar energy technologies can provide several options for fulfilling energy-related requirements without compromising the environment. Further, these technologies present opportunities for jobs, income, enhanced productivity, and meeting social needs contributing to an increased pace of socio-economic development.

Challenges and Suggestions for Cooperation

Solar energy has the advantage of being widely available, clean with low running cost but there are some challenges also. The main challenges associated with solar energy technologies are that solar energy is diffuse and intermittent in nature and is difficult to store. Due to its intermittent nature, solar energy is not available all the time for fulfilling the requirements therefore backup systems or storage systems are required. With the widespread growth of solar energy, there will be challenges to the existing grid system as it is not prepared to handle the varying power from the solar systems. As discussed in section 2 the contribution of solar energy in total electricity production in BRICS countries is still quite less in the range of 0.2% (Russia), 2% (South Africa) to around 4% (China, India, and Brazil). To increase the contribution of solar energy it is important to work on the challenges related to widespread awareness, policies, incentives, and regulations.

These above-mentioned challenges present opportunities for mutual cooperation of the BRICS countries in research and development in this area. BRICS countries with strengths in research & development, manufacturing, policymaking, and promotion, can effectively cooperate to develop efficient solar technologies for different worldwide regions. The following are the recommendations for cooperation:

- Mutual cooperation in designing solar thermal technologies can save a substantial amount of fossil fuel with a major reduction in carbon emissions for various industries where hot water or steam is required.
- Researches and studies on solar passive architecture combined with BIPV can solve problems of building energy consumption to a large extent.
- Comprehensive study and growth of agrivoltaics and aquavoltaics systems can provide employment opportunities with power generation.
- Water/waste treatment and management through the use of solar energy is an upcoming area that can be further developed through mutual cooperation by BRICS countries.
- Further, for community needs such as cooking, drying, and distillation better systems can be designed and promoted by the BRICS energy experts.
- Solar energy storage and grid renewal with improved transmission and distribution networks are major areas that require strong mutual cooperation and in-depth study and research.
- BRICS can offer a global platform for sharing advanced energy knowledge, designing energy-based educational programs, information on best practices, exchange of data and plans for energy-based sustainable development (Paul & Patra, 2022).

- Mutual cooperation in the form of future research is required to study the viability and feasibility of a consolidated BRICS Just Energy Transition policy. BRICS member countries should be motivated to make a transition to zero carbon through the policy with the option for shared renewable energy resources and components (Ramluckun et al., 2024).

The initiation of BRICS Energy Research Cooperation Platform in 2017 is a welcome step in the direction of cooperation in the energy area which has a major influence on socio-economic development and climate change (Mujumdar & Shadrin, 2021).

Conclusions

The paper presented a study of the solar resource potential and the feasibility of key emerging solar energy technologies for the BRICS countries to address the climate change issue with reduced emissions without compromising on socio-economic development. It is found that all the BRICS countries have good solar potential and can utilize several solar energy technologies to enhance green technology practices. Various solar thermal technologies, agrivoltaic, aquavoltaic, and BIPV technologies can provide promising solutions for reducing carbon emissions, and also at the same time provide opportunities for economic growth, jobs, social security, and improved living conditions. For effective development of these technologies as per the region's requirements, the BRICS countries must cooperate mutually in study, research, design, and manufacturing. It will be a win-win situation for everyone to cooperate in the energy area to promote sustainable and inclusive development of all.

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The Impact of COVID-19 on Educational Entrepreneurs in India with Special Reference to Central State: M.P.

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Abstract

After the historic disruption of the COVID-19 pandemic, no sector remained unaffected across the world, and similar to other critical sectors, the education sector too has been hit hard. Universities, colleges, schools, teachers, and the most vulnerable were the students who were deeply impacted. This calls for Governments, society, and specifically educational entrepreneurs, to re-think and put serious efforts into developing long-term strategies to meet the needs of education and ensure continued learning in unpredictable futures. In light of rising concerns, educational entrepreneurs have to redefine their way of working and have to include -online learning or e-learning as an integral part of their teaching process that too consistent basis. This exploratory research paper proposes that educational entrepreneurs must adopt the latest technology and technological gadgets to sustain themselves in the market and grow. The inclusion of online learning or e-learning facilities along with the offline mode of teaching is a necessity in today's dynamic environment. However, in its adoption, numerous factors play a vital role and must be considered to motivate educational entrepreneurs. This research study has identified factors to be considered that not only have an impact on the adoption of technology but also support its consistent use. Findings also reveal that apart from the identified factors, student's and teachers' digital readiness and motivation also play important roles in technological integration in the teaching process.

Keywords: COVID-19 impact, Education Entrepreneur, technology adoption, online learning, e-learning

Introduction

As is evident and experienced by the whole society, every sector has been deeply affected by the recent COVID-19 pandemic. The education system is not an exception and is the most affected one. The recent times called for some of the unprecedented changes/paradigm shift, in the entire education system across the globe. Face-to-face experiential education was replaced by participative education using online digital platforms. This change called for a systematic and strategic change in the delivery of education by educational entrepreneurs. The online education system has to be designed by entrepreneurs, to make it participative and effective for teachers and at the same time understandable and adaptive by the students. The process involved many challenges to be considered to make education simple. During the COVID-19 pandemic times, virtual or online education platforms were widely used in continuing education in all educational institutions. As entrepreneurs, teachers, and students were not used to adapting to virtual digital platforms, the early pandemic times faced numerous issues in getting aligned to the new way of imparting education. The research studies so far have focused on challenges and factors influencing the adoption of online teaching methods by teachers and students however there is a need to diversify the analysis, by studying vital factors such as technological, organizational, and environmental factors, to narrow down the gap between the education delivery system adapted by the educational entrepreneurs and the effectiveness of imparting the education to the students through classic experiential methods. These are three dimensions of the technology-organization-environment (TOE) framework, created by Tornatzky and Fleisher. It describes factors that influence technology adoption and its likelihood (Tornatzky and Fleisher, 1990).

Online education is now a core part of any education system and hence educational entrepreneurs need to focus on improvising on the hurdles of online education delivery, to sustain in the changed environment without losing their credibility on high standards of teaching. Simultaneously they need to overcome the challenges of teachers, study patterns, and students learning ability to ensure the adaptability of the changed education environment. To make it more smooth, the remaining bottlenecks of the digital education delivery need to be improvised further studying the factors involved from the entrepreneur's side. This will further improve the knowledge distribution through virtual platforms strengthening the sustainability and effectiveness on both sides (entrepreneurs as well as the students).

Literature Review

Babbar and Gupta (2022) in their research study on the response of educational institutions to COVID-19 aimed to explore different modes of education during the pandemic time and provided a holistic view of efforts taken by the Government and universities to face that crisis. They concluded that there is a necessity for a shift to digital pedagogy, which was very challenging at that COVID-19 time. The COVID-19 outbreak highlighted Institutions' flexibility, sustainability, and readiness to accept change. The researchers recommended the adoption of Online learning in all educational institutions.

Wang et al (2022) explored the impact of COVID-19 on the Sustainable Development Goals (SDGs) that the United Nations approved in the year 2015. The researcher studied how the education institutes developed their e-learning systems overnight and collected relevant data from middle school students and developed an integrated model with five dimensions Learner, Design, Technology, Instructor, and Environment, to measure their satisfaction with the e-learning system. They found that learner's attitude towards computers, their self-efficacy, computer usefulness, instructor's attitude, and response have a positive impact whereas learner's anxiety, ease of use, availability of computer systems and internet, learning environment, and support, have a negative impact on their satisfaction with e-learning system. They concluded that developing countries can achieve sustainable development goals by improving learner satisfaction.

Malik et al (2021) studied the role of environmental factors which includes competition intensity, government support, trading partners' readiness, and standards uncertainty, technological factors which encompass perceived benefits, compatibility, information transparency, and disintermediation), and organizational factors like organization innovativeness, organizational learning capability, and top management support, in the adoption of technology(Blockchain) in Australia and found that these factors significantly affect the technology adoption, further moderated by " perceived risk."

Foulger et al (2021) studied the influence of contextual knowledge on teachers' intention to integrate technology in their teaching into the classroom. They applied Decomposed Theory of Planned Behavior (DTPB) to study the influence of contextual knowledge on teacher's intentions and developed model IT2(Intention to Teach with Technology) which included contextual factors like behavioral, normative, and control beliefs and also incorporated factors like attitude, subjective norms, and perceived behavioral control. The researchers tested the IT2 model and found it quite plausible, accounting for a 75% variation in intention.

Qasem et al (2019) carried out a systematic literature review (SLR) to analyze existing research on the adoption and usage of cloud computing technology in Higher Education Institutes (HEIs). In this study, they identified contributing factors and barriers in the adoption of cloud computing technology in HEIs at both, individual and organizational levels. Based on a systematic approach, the researcher identified organizational-based category factors as Innovation factors (Relative advantage, Complexity, and Compatibility), Technological Factors (Risk and Security), Contextual Factors (Infrastructure), and Usability Factors (Usefulness and Ease of Use). The research study also emphasized on the need for more academic attention to identify factors that influence the adoption of different technologies in HEIS from the organization's perspective.

Taherdoost (2018) offered a succinct summary of 14 models that have been employed to examine variables that influence the use of technology and/or intention to use technology such as Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB) and Diffusion of Innovation theory (DOI), Theory of Reasoned Action (TRA), Model of PC Utilization, Motivational Model Unified Theory of Acceptance and Use of Technology (UTAUT) and Social Cognitive Theory (SCT). Researchers found that different adoption models are rooted in a diversity of theories for example, the Diffusion of Innovation theory (DOI) is from sociology, the Theory of Reasoned Action (TRA) is from social psychology, TIB, TPB and SCT are psychosocial theories. In their study, they said that all three theories have proven their effectiveness in predicting and explaining a variety of human behaviors in differing contexts. They also found in their study that Theory of Reasoned Action- TRA and Theory of Planned Behavior -TPB differ from Diffusion of Innovation theory-DOI in the sense that the former focuses on explaining the behavior of individuals and the latter concentrates on adoption decisions in which the organizational characteristics play a key role, not the individual.

Mokhtar et al (2014) studied the usefulness and importance of adopting cloud computing technology in organizations. The researcher identified several issues to be addressed while integrating technology which encompasses environmental factors, technological factors, and organizational factors. Researchers in this study found that organizational dimension is one of the most important factors for an education institute when adopting such new technology. These factors which include: needs assessment, readiness assessment, organizational change, budgeting, and return on investment (ROI), are aspects that must be taken into account before shifting to new technology, especially e-learning. Further, the authors also recommended further studies on organizational context as limited studies exist regarding the adoption of technology specifically in the education sector.

Picoto et al (2014) analyzed the importance of mobile- business for organization. The researcher's conceptual model to analyze the value and usage of technology in the post-adoption phase study is based on Resource Based theory, Diffusion of Innovation theory, and Technology-Organization-Environment theory. The study is done from an organizational perspective. The results of the research showed that relative advantage, technology competence, technology integration, managerial obstacles, competitive pressure and partner pressure are found significant antecedents of technology adoption together they explain a substantial variance in technology usage.

Fidani A and F Idrizi (2012) conducted a study on investigating the student's acceptance of IT-enabled Learning Management System (LMS)in University education. LMS was found to be an important education tool with strong effectiveness and interactive study modules. The study analyzed the factors affecting the acceptance of LMS education modules by University students. Factors like Performance expectancy, Effort expectancy, Attitude, Facilitating Conditions, Social Influence, and Behavioral Intention were tested for their validity utilizing the Unified Theory of Acceptance and Use of Technology (UTUAT) model. They used SPSS for reliability coefficients and explanatory factor analysis and Structural Equation Modeling (SEM) approach for confirmatory factor analysis (CFA) on sample data collected from first year university students. the findings implicate that students' perception of the performance expectancy is crucial in fostering their behavioral intention to accept and use of technology, similar to prior findings that the strongest driver of technology use is perceived usefulness. They also stated that Students' intentions to use the ICT-enabled LMS modules need to be further researched using other variable factors affecting the perceived usefulness by students and adaptability of technological advancements by the students and instructors.

Costello P. and Moreton R. (2009) studied the adoption of Information Communication Technology (ICT) by the Small and Medium-scale enterprises (SMEs). They applied the Diffusion of Innovation Theory and Technology Acceptance Model to the data collected from 200 SMEs, whose core business was ICT. The research studied the technological adaptability issues and the required skills by SMEs to engage positively in the business community, increasing productivity. The research involved the analysis of Government Initiatives for the Adoption of advanced technology by SMEs / EDI e-business and Internet Adoption Models, Methodology, and Development of a new Model.

Timothy Teo (2008) conducted a study to identify the attitudes of computer usage and adaptability by Pre Service Teachers, in educational institutes involving computer education systems. The attributes /factors studied were focused on the usage of computers in education delivery. Four factors: affect (liking), perceived usefulness, perceived control, and behavioral intention to use the computer, by the pre-service teachers, were analyzed to examine the pre-service teacher's readiness and effectiveness towards using computer-based education delivery. In their study, they suggested that there is a need for teacher educators to provide a conducive and non-threatening environment for pre-service teachers to experience success in using the computers, intending to allow pre-service teachers to gain competence and confidence in using computers for teaching and learning. This study provides a glimpse of selected variables that affect the computer attitudes of pre-service teachers. Future research may include a comparison of the results of this study against a larger sample using a longitudinal design to examine computer attitudes over time. Other variables could be added to examine their impact on computer attitudes.

Numerous studies have been done on the factors influencing the adoption of technology in organizations but from the user's perspective. But need for study from the organization's perspective towards consistent use is still lacking and the need for research from the organization's owner's perspective is thus required.

Research Methodology

Research Method: Online survey method was employed to collect data for this study, taking the benefit of its cost and time-effective nature as well as manageable efforts of its collection.

Population: There are numerous higher education institutes HEIs in Madhya Pradesh which include universities, medical colleges degree colleges, nursing colleges, engineering colleges, pharmacy colleges, management colleges, law colleges etc. As per the All India Survey on Higher Education, a total of 2124 colleges (including government, government-aided, private), 314 stand-alone institutions, and 52 universities are located in Madhya Pradesh.

Respondents were representatives of Indian higher educational institutes (HEIs) to know the consistency in technology adoption of online teaching from an organizational perspective, and the unit of observation was the individuals who were working as Heads (Director) and earned a minimum of three years of experience. This selection of seniors was selected because they remain well-informed about the organization's strategies and decisions such as adopting new technology.

Madhya Pradesh is a central state and its major cities Indore, Bhopal, Gwalior, and Jabalpur, all together, can all be taken as its representatives. In these cities, we approached Higher Education Institutes to find out whether they have used technology i.e. online teaching process during Covid 19 pandemic time, and continuing its use or not. They were asked about different aspects of TOE framework to identify the most influential factor in the adoption and usage of technology-based teaching.

Sample and Sample Size: Samples were taken using purposive non-probability sampling techniques, as those owners or directors of institutes, both Govt. and private, were taken under study who agreed to respond and fit into criteria. A total of 213 HEIs agreed to respond and among them, 162 were those who used technology-based teaching processes during COVID-19 and many of them continued it during regular courses even after the pandemic. Out of 162 only 107 HEI's Directors (Head) completely filled our questionnaire. Data of these respondents were then analyzed for the result.

Data collection and measurement of variables: A structured questionnaire was designed based on TOE theory, to identify factors that impact this motivation of consistent use of technology in teaching. The variables were measured on a 5-point Likert-type scale from 1- completely disagree, to 5- completely agree, with respondents having to indicate their degree of agreement with the statements presented. Completely filled questionnaires were first checked for their understandability and reliability by two Directors, one Private and one Government HEI, and two research experts from the education field. This was carried out from 16 May 2022 to 15 June 2022, aiming to identify any failure to understand the questions and their main purpose, issues with interpretation, or any improvements that needed to be done. The suggestions proposed by the respondents were considered and incorporated in the questionnaire. The revised final format of the questionnaire was then sent to the email ID of the Directors (Heads), also shared on their WhatsApp number. A brief note on the purpose of the study was also shared with them. Around 15 October 2022, we stopped collecting the filled questionnaire and decided to take one hundred and seven (107) completely filled questionnaires received so far, for analysis.

Theoretical Background

This research is based on Technology-Organization-Environment (TOE) framework, created by Tornatzky and Fleisher (1990). TOE framework identifies three aspects, namely the technological, organizational, and environmental contexts that affect an HEI in implementing, adopting, and making consistent use of technology based concepts like online teaching. By using the TOE framework, it can be identified which factors play a vital role in motivating HEI to use technology in the teaching process consistently. Therefore, three aspects of the TOE are introduced to suggest influential factors that could be beneficial to higher educational institutions.

The determinants of variables under the TOE framework include:

I) Technology factor (TF): this dimension is measured by finding i) the perception of comparative advantage of technology usage, ii) complexities involved in its usage, and iii) identifying whether the key personnel can assess the benefits of adopting the online teaching method. II) Organizational Factor (OF): this factor refers to i) Education Culture comprised of Vision, mission, plans, and standards followed by top management, staff, and students ii) the support extended by the management committee members who take all crucial strategic decisions which are demonstrated by providing supportive regulations and decisions, ii) organizational readiness in terms of awareness related to its usage and skills, III) Environmental Factor (EF): this factor consists of environmental characteristics that surround the HEIs which includes affiliating bodies like UGC, AICTE, Government, society, etc. and compliances. These stakeholders may either support or prevent technology adoption (Pudjianto, 2011).

Statistical Methods

Statistical analysis was conducted by using factor analysis first which was performed to identify the most relevant determinant statements influencing the respective observed variable eigenvalue, the percentage of variance, and the cumulative percentage of variance. Then, a matrix of factor structure was made after Varimax rotation. This process confirmed the construct validity of the various factors. This result led to the identification of 7 variable groups (3 variable groups comprise the technology dimension, 2 variable groups comprise the organizational dimension, and 2 variable groups comprise the environmental dimension). In the second step, Cronbach's alpha analysis was calculated for each of the 7 variable groups within the technology, organization, and environmental dimensions. Since Cronbach's alpha values came to 0.971, this confirmed the reliability of the research.

Result and Analysis

Demographic view:- Out of 107 HEIs, 27 universities (16 out total 25 Private and 11 out of 16 Government) and 80 colleges (52 Private and 28 Government). Almost all the different disciplines were covered for study like medical colleges, nursing colleges, pharmacy colleges, engineering colleges, law colleges, management colleges, etc

Table 1: Demographic Profile

Variable	Type	Frequency	Percentage
Experience	: <5 years 5 years to 10 years More than 10 years	53 38 16	49.5 35.5 14.9
Ownership	Government Private	32 75	29.9 70
Respondent profile	Owner Employed: Director/HOD	45 62	42 57.9

Source: Data collected from HEI (Higher education Institutes) of M.P. India, compiled by Author

Reliability Analysis

The reliability of the research instrument was measured with the help of the Cronbach Alpha method, which is a widely used method for reliability testing.

Table 2: Reliability Analysis of Questionnaire

Description	Alpha value	Number of statements
Questionnaire	0.971	28

Source: Data collected from HEI (Higher education Institutes) of M.P. India, compiled by Author

Interpretation: It was found that the alpha value for the questionnaire used for the individual telecom users was 0.971, which is near or close to one which shows that the questionnaire was reliable and there is a consistency in the responses of the respondents. Hence, the questionnaire can be used for further analysis.

Factor Analysis

Exploratory factor analysis has been used to find out the relevant factors under three components using the Varimax rotation and the Principal component method in the study.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin (KMO) Value		.933
Bartlett's Test value	Chi-Square Value	43862.780
	Degree of Freedom	990
	p-value	.000

Source: Data collected from HEI (Higher education Institutes) of M.P. India, compiled by Author

Interpretation: The above data shows the results of KMO and Bartlett's test. The value of the KMO test was 0.933, which shows that the data is adequate for applying factor analysis and the number of variables is adequate along with the sample size (Fabrigaret al., 1999). Similarly; the value of Bartlett's test was found to be significant as the value of chi-square was 43862.78 at a p-value of 0.000, which shows that there is an unequal variance in the sample used for factor analysis

Table 4: Total Variance Explained

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Variance	Cumulative % of Variance	Total	% Variance	Cumulative % of Variance	Total	% Variance	Cumulative % of Variance
1	20.050	44.555	44.555	20.050	44.555	44.555	9.019	20.042	20.042
2	6.185	13.745	58.300	6.185	13.745	58.300	6.405	14.232	34.275
3	4.063	9.029	67.329	4.063	9.029	67.329	6.063	13.473	47.747
4	3.161	7.025	74.354	3.161	7.025	74.354	5.319	11.821	59.568
5	2.189	4.865	79.219	2.189	4.865	79.219	5.296	11.768	71.336
6	1.983	4.406	83.625	1.983	4.406	83.625	3.608	8.019	79.355
7	1.621	3.602	87.227	1.621	3.602	87.227	3.543	7.872	87.227
8	.465	1.033	88.260						

Source: Data collected from HEI (Higher education Institutes) of M.P. India, compiled by Author

Interpretation: Eigenvalues and the variance table show that there are a total of seven factors whose eigenvalues are more than one, hence total factors extracted during the study were seven factors. The total variance explained by these seven factors was 87 percent and the rest of the 13 percent variance can be explained by other chance factors. The total variance explained by the first factor is 20.042 percent, the second factor explains the variance of 14.232 percent, variance explained by the third, fourth, fifth, and sixth factors was 13.473, 11.821, 11.768, and 8.019 percent respectively. The lowest percentage of variance was explained by the last factor which was 7.872 percent.

Table 5: Factors Loadings using Varimax Rotation

S. No.	Description	Factor Loadings
Factor 1: Technology Usage Factor TF1		
TF1_1	Using Technology in your institute/department can help you to save cost and time.	.915
TF1_2	The cost-effectiveness of online teaching is higher than that of other mode of teaching.	.903
TF1_3	The use of online teaching helps you make better. quick and correct decision.	.900
TF1_4	The use of online teaching enables faster execution of actions and decision-making.	.900
TF1_5	Online teaching method simplifies the administrative tasks of an institute making most of the information available on a digital platform	.892
TF1_6	The use of online mode allows you to have better control over the business.	.890
Factor 2: Complexities with the usage of Technology		
TF2_1	Understanding and working with Online Teaching System is complex and requires certain ICT skills.	.809
TF2_2	Implementation and introduction of an Online Teaching System is difficult.	.806
TF2_3	Online Teaching System requires user training for its effective use.	.797
TF2_4	As Online Teaching System usage is complex it attracts primary resistance to its introduction.	.786
Factor 3: Assessment by Key Personnel		
TF3_1	The return of investment in implementing an Online Teaching System is known to key personnel.	.879
TF3_2	Key personnel clearly understand the importance of implementation of the Online Teaching System.	.866
TF3_3	The market value and existence of the Online Teaching System are known to Key Personnel.	.857
TF3_4	Key Personnel evaluate the importance of Online Teaching System usage in other organizations.	.849
Factor 4: Management Support		
OF1_1	Implementation of the Online Teaching System is well supported by the Management Committee	.860
OF1_2	Management Committee formulates the strategy for working with Online Teaching System	.849
OF1_3	The risks involved in implementing the Online Teaching System are known to Management Committee and they are ready to go with them.	.836
OF1_4	The Online Teaching System implementation in the organization is given strong backing by Management Committee personnel by highlighting its importance.	.828
OF1_5	Personnel at the Management Committee strongly advocate the importance and benefits of Online Teaching System adoption in the organization.	.821
Factor 5: Organizational Readiness		
OF2_1	Management Committee and all users (teaching, non-teaching staff, and students) in the organization are aware of the usage of the Online Teaching System.	.892
OF2_2	Online Teaching System is well understood by the faculties and students both, in the organization.	.886
OF2_3	Management Committee and all users (teaching, non-teaching staff, and students) have the required technical and managerial skills for using the Online Teaching System.	.850
OF2_4	The organization is well equipped with the required financial and technological resources for effective implementation of the Online Teaching System.	.789
Factor 6: Competitive Pressure		
EF1_1	The competition in the education sector brings pressure to adopt the latest means of teaching	.887

S. No.	Description	Factor Loadings
EF1_2	To maintain a competitive advantage in the sector, we have adopted a digital mode of teaching	.873
EF1_3	Organization have knowledge that most of the competitors in the market are already using Online Teaching Systems.	.847
Factor 7: Compliances		
EF2_1	The organization knows that the adoption of technology-based teaching is a part of the requirements for accreditations like NAAC, NBA	.902
EF2_2	To fulfill the AICTE and UGC requirements, organizations have to keep the provisions of technology-based teaching.	.900

Source: Data collected from HEI (Higher education Institutes) of M.P. India, compiled by Author

Interpretation: There are a total of seven factors that represents, seven major factors influencing technology adoption in HEIs. The first factor represented by six statements, all related to technology usage advantage , Second factor represented by four statements reflects the related complexities with the online teaching system, Third factor is related to assessment of online teaching system by Key personnel and comprises total four statements all shows the realization of importance of system by key personnel's like Directors, HODs, faculties etc, Fourth factor is related to the management support which include support from committee members who takes all major policy related decisions and includes five statements, Fifth factor is related to the Organization readiness; it includes four statements which shows to what extent all the stakeholders are prepared to accept and use this mode of teaching and this factor have four statements , Sixth factor is related to the competitive pressure which includes total three statements and all are related to the pressure to compete and prove one's excellence and Seventh factor includes two statements, one is related to the Compliances like NAAC, NBA, AICTE, UGC etc . as in today's time, accreditations like NAAC / NBA makes HEIs to stand in front line and other reflects the role of AICTE, UGC in motivating the institutes to use technology in teaching.

Conclusion

The research study so carried found that Education entrepreneurs have strong realization of importance of technology in terms of cost, time and can achieve efficient working by making quick decisions and executing them timely and with effectiveness. Technology supports them to have better control over the working of their Institutes. Further, the majority of the respondents agreed that working with Technology is a bit complex and requires skills, training, and interest and all this creates initial resistance by its users. Further, the financial aspects matter a lot as they are directly responsible for its successful implementation. This all can be taken as overall benefits of technology considering its challenges, which is one of the dimensions of the TOE framework that influences Technology adoption. Our research study finds that being the owner or director of a HEI one has to realize the relative advantages, compatibility, and complexities associated with the technology so adopted for teaching.

Our research also found that the success of the adopted technology lies in its smart implementation. Members of the Management Committee, who play a key role in all strategic decisions themselves support it and formulate strategy such that it can be successfully implemented at the operational level. They understand the risk involved but strongly advocate its advantage. The reason may be that HEIs have redefined their vision and mission accordingly, looking to the need of time. There was acceptability found on the teaching, non-teaching, and student front. Appropriate skills were developed for its use which was well supported through financial and technical resources. These factors all together talk of the second factor of TOE ie organization.

Further, in our research study, the environment which is formed by the education regulatory bodies like AICTE and UGC under which all HEIs work, has a strong impact on its adoption of technology. Accreditations like NAAC and NBA further provide a platform to prove their excellence in the education sector and stand ahead of their competitors. This formed the third dimension of the TOE framework ie Environment.

We have seen that the above factors had sufficient loadings and thus found effective in studying the adoption of technology specifically in the education sector by education entrepreneurs.

Limitation

One of the limitations of our research study is that a limited number of adoption factors have been empirically tested here. In reality, there can be more contextual variables and potential factors that can explored. We recommend that future researchers explore further potential factors of technology adoption and test whether their effects vary in different contexts.

This study is limited to a standard sample size considering all the HEIs in a particular state however, further research can be carried out with sample data from different HEIs, post their classification on various factors based on Education Level (UG/PG), Stream/Disciplines (Science/Arts/Technical/Medical), Authority (Autonomous/Govt Aided/Govt Owned/Private). This will further enhance the study covering more specific dependent variables.

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Challenges in Teaching and Learning during COVID-19 Pandemic on Sustainable Development Goals in South Africa (A Systematic Review)

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Abstract

During the COVID-19 pandemic, South Africa implemented lockdown and social distancing measures, resulting in the closure of all schools and higher education institutions in the country. Despite the challenges posed to both educators and learners, education systems have been forced to transition from traditional face-to-face pedagogical classroom methods into remote virtual platforms, which allow sustainability in the continuity of teaching and learning in traditional methods. This study adopts a systematic review approach to examine challenges in teaching and learning during and after the COVID-19 pandemic in South Africa. Evidently, the findings from the study depict that, in the wake of the pandemic, the transition in education in South Africa was hampered by educational inequality and insufficient digital literacy among instructors in many South African educational institutions. However, post-COVID-19 evidence reveals that much progress has been made as there is an increased focus on adoption training and the use of digital tools and technology. The conclusion of this study is that traditional education should be blended with online teaching and learning to achieve sustainable development goal number four.

Keywords: teaching and learning, Coronavirus, COVID-19 pandemic, sustainable development goals, pedagogy.

Introduction

On March 12, 2020, the coronavirus (COVID-19) was designated a global pandemic, and social separation was implemented in many regions to limit the situation. Indeed, many governments around the world opted to close schools countrywide to avoid or control the spread of the virus, disrupting the education of millions of children and adolescents (Das & Kusakabe, 2021; Suppawittaya, Yiemphat & Yasri, 2020).

Since the initial discovery of COVID-19 in Wuhan, China in 2019, the virus has affected a staggering amount of people, with over 600 million confirmed cases and 6 million deaths reported worldwide (Bacher-Hicks, Raaper & Brown 2020; Flores & Gago, 2020; Johnson, Lee, & Kim, 2020; Raaper & Brown, 2020). The pandemic has had a profound impact on society and the global economy, with no nation remaining untouched by its effects (Flores & Gago, 2020; Johnson et al., 2020; Raaper & Brown, 2020). Developing countries, however, during the COVID-19 pandemic, countries faced many lack health medical infrastructure and were disproportionately affected by the pandemic, due to a lack of resources (Hossain, Abdulla & Rahman 2022; Blundell et al., 2020).

In response around the world have implemented various protocols and limitations in an effort to mitigate the widespread impact of the virus. These measures have often included implementing a state of national lockdown, which includes limiting social gatherings and encouraging individuals to practice physical distancing (Josephson, Kilic, & Michler, 2021; Kinnucan-Welsch, 2020). As a result of these measures, most places of public assembly, including schools, have been closed, as well as other places of entertainment and commerce (Kinnucan-Welsch, 2020).

The educational system has also been significantly impacted by the COVID-19 pandemic. The full extent of these disruptions is still being investigated, but it is clear that there have been significant challenges brought on by the widespread adoption of online learning (Bacher-Hicks et al., 2020). Despite these challenges, the potential for driving innovation in higher education should not be overlooked (Bacher-Hicks et al., 2020). Online learning has provided opportunities for new pedagogical approaches and has opened up education to a wider audience, including those who may not have been able to access traditional in-person classes (Kinnucan-Welsch, 2020).

Aside from its economic influence, the COVID-19 has greatly impacted the education system in many countries. In South Africa, previous researchers revealed that schools were closed entirely during the period of the pandemic, which resulted in online learning during the COVID-19 pandemic (Mukuna & Aloka,2020; Maphosa, 2021).). South Africa implemented lockdown and social distancing measures, resulting in the closure of all schools and higher education institutions in the country (Mncube, Mutongoza & Olawale, 2021; Mahaye, 2020). Despite the challenges posed to both educators and learners, education systems have been forced to transition from traditional face-to-face pedagogical classroom methods into remote virtual platforms during the lockdown in South Africa.

In addition to its economic impact, the COVID-19 pandemic has greatly affected the education system in many countries. Studies have shown that in South Africa, schools were closed down entirely during the pandemic, leading to a shift towards online learning (Mpungose, 2021; Makgala, 2020; Mhlanga & Moloi, 2020). In response to the pandemic, South Africa implemented lockdown and social distancing measures, which resulted in the closure of all schools and higher education institutions across the country (Department of Basic Education, 2020).

The transition to remote learning has presented numerous challenges for both educators and learners in South Africa. Educators have had to quickly adapt to new teaching methods, such as virtual classrooms and online instruction, while learners have had to navigate the difficulties of learning from home, including lack of access to technology and resources (Makgala, 2020). Despite these challenges, education systems have been forced to transition from traditional face-to-face pedagogical classroom methods into remote virtual platforms (Department of Basic Education, 2020). However, studies such as Bacher et al 2020 noted that the Covid 19 had expedited the digital transition of higher education, forcing universities to establish virtual cultures. Higher education institutions in South Africa have had to ensure learning continues through transitioning to virtual classes.

Although several studies have argued that the COVID-19 has led to increased adoption of digital tools and digitization, there are concerns about the inequality this transition created (Amankwah-Amoah, Khan, Wood & Knight, (2021). according to Martin-Berbero (2020), students with and without resources are greatly impacted negatively. This poses a threat to the 4th goal of the United Nations'

Sustainable Development Plan which aims to "provide inclusive and equitable quality education and encourage lifelong learning opportunities for everyone." Even before COVID-19, concerns were raised that SDG 4 was moving at too slow of a pace, putting the attainment of its objectives by 2030 at risk.

Based on the foregoing, this study therefore aims to examine challenges in teaching, learning, and SDG 4 during and after the COVID-19 pandemic in South Africa. The latest framework of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework was adopted for this research. The PRISMA paradigm is widely used to perform systematic reviews due to its adaptability in leading searches and synthesis of literature. To find relevant prior studies, a systematic literature search was conducted across 9 databases which include; AJOL, JSTOR, SA ePublications, ScienceDirect, SciVal, Scopus, South African National Bibliography (SANB), SpringerLink, Taylor and Francis Online Journals, Web of Science. Recent articles from 2020 were included in the search results. The keywords used in COVID-19 OR SARS 19, higher education, pedagogy Education and online learning, or e-learning and Sustainable Development Goal 4 (SDG) on Education or Education Equality and South Africa.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were established to help choose the best papers for the comprehensive evaluation. Included were studies conducted during and after the COVID-19 period and assessed its impact on higher education learning and teaching, Databases pertinent to the search were located using the DUT online library and are shown in Figure 1 below.

We chose published peer-reviewed articles that were available up to December 2022. A total of 50 articles were retrieved from electronic databases. The selected articles were screened based on the following: titles, abstracts, and full-text. The selection of relevant studies all met the following inclusion criteria: (1) written in English or having English translations; (2) peer-reviewed; and (3) published during and after the outbreak of SARS COVID-19 (4) The study focused on South Africa education.

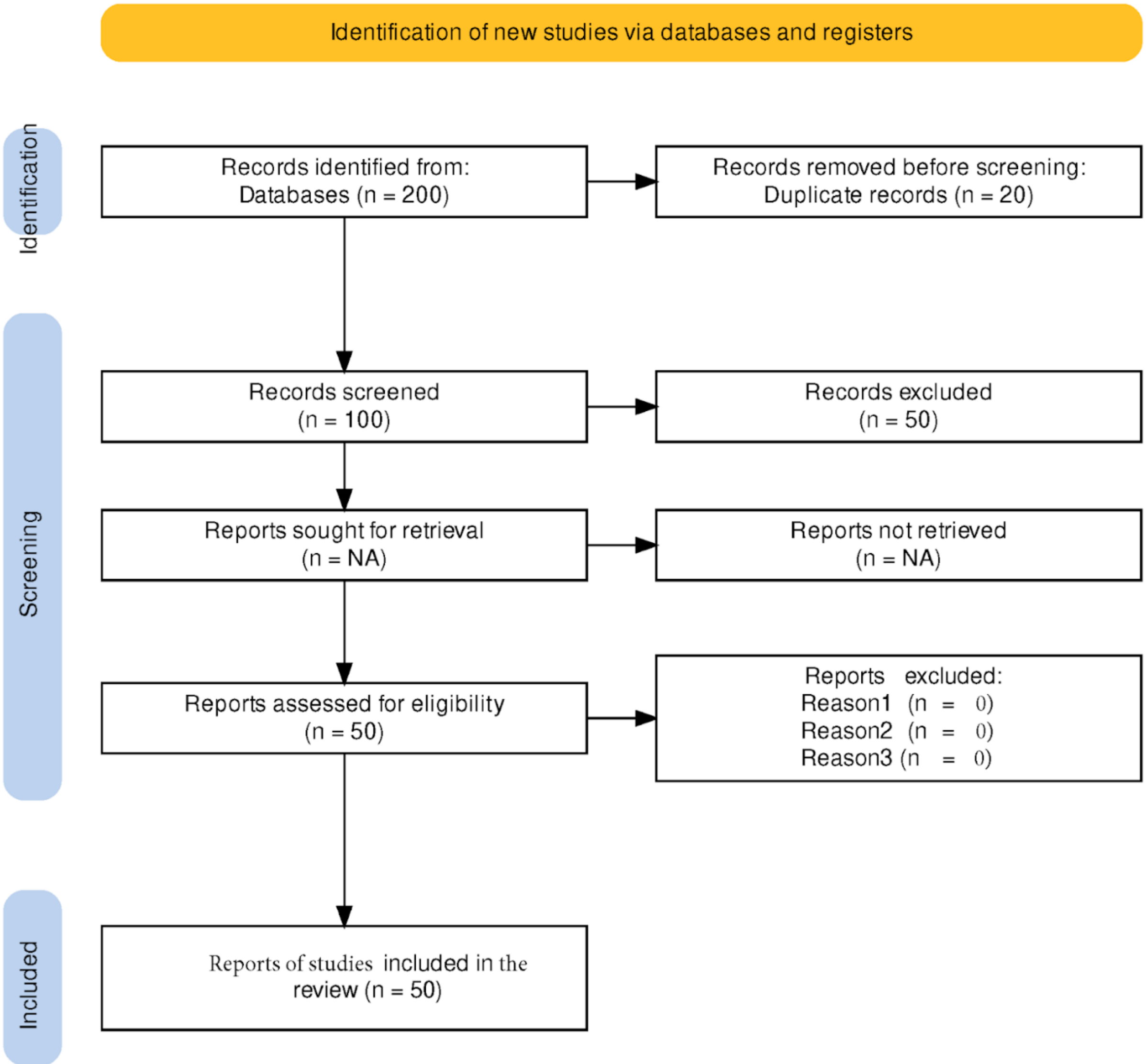

Figure 1: Identification of New Studies via Databases and Registers

Source: Author's Representation – based on Prisma

Study Selection and Data Extraction

Articles that were not peer-reviewed or were not available in English were also not included. The authors ran a citation chain for each retrieved article to ensure that all relevant publications were included. After culling 103 duplicates and other articles with similar content, the writers were left with 197 unique pieces. In addition, 97 pieces were either not full or were reprints, letters to the editor, or were not peer-reviewed by the authors. We looked over the abstracts more thoroughly and took out 34 that did not make the cut. All the writers double-checked the remaining 66 articles and the ones that did not make the cut were disregarded. The abstracts of the selected publications were then separately evaluated by the authors, who ultimately determined that 34 of the articles met the criteria for inclusion in the review. Ten articles were disqualified after we reviewed their entire texts to determine their eligibility. In all, only 24 papers met the inclusion criteria for this analysis. Digital health technology for remote medical assistance was the primary focus of the COVID-19 research plans. The PRISMA flowchart shown in Fig. 1 outlines the procedures that must be followed when reporting the total number of publications. All writers independently evaluated the studies included. The complete texts of the studies were read, and information was gathered on the digital health technology used, healthcare services provided, geographic region or province of study, goals, obstacles, and dangers.

Discussion of Result

The findings of this research are based on an examination of previously published studies related to teaching and learning during the COVID-19 Pandemic, especially in South Africa. The majority of the studies examined in this study focused on how educational institutions responded to the pandemic and lockdown difficulties faced during virtual teaching and learning. However, there were a limited number of studies that examined the potential benefits and academic outcomes arising from the pandemic. The results of the literature review have been organized into four main themes:

- Teaching Challenges in South Africa During the Pandemic;
- learning Difficulties During the Covid 19 Pandemic;
- higher education institutions' response to the COVID-19 Pandemic; and
- Post Covid 19: blended approach to teaching and learning in South Africa.

Teaching Challenges in South Africa During the Pandemic

The sudden escalation of the COVID-19 pandemic has presented numerous challenges for academics and educators in South Africa. Recent studies looked at the experiences of teacher educators in the shift to remote teaching and learning, highlighting the challenges and barriers faced in the transition. (Mhlanga, Denhere & Moloi, 2022; Glietenberg, Petersen, & Carolin, 2022; Chasi & Quinlan, 2021). Overall, these studies suggest that while the pandemic has presented significant challenges to the higher education sector in South Africa, it has also served as an opportunity for digital transformation and innovation.

Many studies revealed that the pedagogy shift to online learning required educators to rapidly adapt to the new normal in teaching and learning, often with limited support and resources (Burgess & Sievertsen, 2020; Chen et al., 2020; Wang et al., 2020). In South Africa, the challenges faced by educators have been further compounded by inadequate access to IT infrastructure and internet access in many communities.

Another challenge educators face is the lack of IT expertise and knowledge of online instruction which further compounded these difficulties (Chen et al., 2020). These challenges include difficulties in organizing online classes, implementing online teaching plans, selecting appropriate teaching platforms, and assessing the quality of online instruction (Chen et al., 2020; Goh & Sandars, 2020; Teras et al., 2020). Additionally, academics have reported concerns about their ability to connect with students in an online setting as effectively as in traditional, in-person classrooms (Jegede, 2020; Ratten, 2020). Bryson and Andres (2020) argue that attempting to replicate in-person instruction in an online environment is not only impossible but also detrimental to student learning.

The sudden shift to online learning has also resulted in a lack of familiarity with online tools among faculty members, which can impede their ability to effectively deliver instruction (Chang & Fang, 2020; Donitsa-Schmidt & Ramot, 2020). Technical difficulties, such as network congestion, can also pose challenges for online instruction (Chen et al., 2020). Furthermore, instructors with limited experience in online education may struggle to address common student issues, such as lack of self-discipline and negative learning attitudes (Bao, 2020).

Learning Difficulties During the COVID-19 Pandemic

The COVID-19 pandemic has brought about significant challenges for students in South Africa (Mhlanga & Moloi, 2020; Maree, 2022). The sudden shift to remote learning and the closure of educational institutions have disproportionately affected students from low-income households, who may not have access to the necessary technology or resources to participate in online learning (Department of Basic Education, 2020). Additionally, the economic impact of the pandemic has led to increased poverty and food insecurity, further exacerbating the challenges faced by students (Statistics South Africa, 2021).

The COVID-19 pandemic has led to a significant shift in higher education institutions in South Africa, with many turning to online technologies such as Microsoft Teams, Zoom, and Blackboard to continue instruction remotely (Mhlanga et al., 2022). However, this shift has highlighted the digital divide that exists in the country, with students in remote and rural areas facing significant challenges in accessing the necessary technology and resources for online learning. According to a report by the Department of Basic Education (2020), many rural schools in South Africa have limited or no internet connections and no access to electricity, making it difficult for students to engage in online learning.

This digital divide has the potential to exacerbate existing issues of marginalization, particularly for black and colored students who already struggle to access mainstream education. To prevent this, efforts must be made to include rural youth in online learning and address the lack of infrastructure and resources in these areas (Department of Basic Education, 2020). In addition to issues of access, students also faced difficulties in adapting to online learning methods. Reports such as have noted that students struggled to adjust to the new format, with many having trouble completing tasks at home and inadequate communication between them and their instructors (Aboagye et al., 2020; Chung, 2020; Rapanta et al., 2020).

The literature suggests that students' access to digital devices such as smartphones, tablets, and laptops, as well as a dependable network infrastructure, are critical for effective online instruction (Mamun et al., 2020; Naciri, 2020; Aboagye et al., 2020; Rose, 2020; Wargadinata et al., 2020). Studies such as Chang and Fang (2020) have found that between sixty and seventy percent of educators feel that "network speed and stability are inadequate," which creates barriers to students' use of digital resources for education. Overall, the literature implies that to effectively support students in online learning during and after the pandemic, efforts must be made to address issues of access and adaptability, particularly for students in remote and rural areas.

Higher Education Institutions Response to COVID-9 Pandemic

To mitigate the spread of the virus and keep students and staff safe, many universities and colleges in South Africa have transitioned to online learning platforms (e.g., Nkuna, 2020). This has allowed institutions to continue providing educational opportunities to students despite the challenges posed by the pandemic.

For example, studies found that the majority of universities in South Africa have adopted online learning platforms to keep education going in the aftermath of the COVID-19 pandemic (Johannes, 2022; Ntombozuko et.al, 2022; Samantha et.al, 2022; Mokgoro, 2022). This shift towards online learning has allowed students to continue their education despite the challenges posed by the pandemic, but it has also highlighted the need for further research and development in this area to ensure that these platforms provide high-quality virtual education. This shift forced higher education institutions in South Africa to rapidly adapt and shift to online learning and digitalized curriculum, with varying degrees of success (Ntombozuko et.al, 2022; Samantha et.al., 2022; Mokgoro, 2022). The pandemic has also highlighted the need for academic researcher coaching, curriculum adjustments, and inclusive considerations for different groups of students and academic activities virtually.

Other studies according to Ratten (2020) have shown that universities and colleges typically respond by closing their campuses and calling off all in-person classes. Face-to-face graduation ceremonies, workshops, conferences, sports (both intra and inter-university), and other activities on campus were all postponed or canceled as a result (Crawford, Butler-Henderson, Rudolph, Malkawi, Glowatz, Burton, & Lam, 2020). However, most educational institutions face several obstacles in implementing online teaching and learning, such as network concerns, a lack of resources, student and academic difficulties in adjusting, etc. The difficulties associated with online education are elaborated upon in the next section. Research like this shows that most educational institutions throughout the world took the same approach to dealing with the COVID-19 crisis.

The Impact of the Covid 19 on the SDG 4

The United Nations Sustainable Development Goal 4 (UN SDG 4) strives to provide all individuals with inclusive and equitable access to quality education and to promote opportunities for lifelong learning (United Nations, 2015). However, in South Africa, the ability to achieve this goal has been greatly hindered by the outbreak of COVID-19. The pandemic has resulted in widespread school closures (Department of Basic Education, 2020), which has disrupted education for millions of students (Moloi, 2020). Additionally, many students in South Africa, particularly those from low-income families, lack access to the technology and resources needed to participate in remote learning (Chisholm, 2020). Furthermore, the socio-economic disparities that existed before the pandemic have been exacerbated (Department of Basic Education, 2020), making it even more difficult for marginalized communities to access quality education. Consequently, the pandemic has highlighted the need to address the digital divide (Moloi, 2020) and other systemic issues that impede access to education in South Africa and other countries. The shift to online learning has highlighted the disparities in access to technology and resources, particularly for marginalized groups such as black and colored students and students in remote and rural areas (Department of Basic Education, 2020). According to a report by the Department of Basic Education (2020), many rural schools in South Africa have limited or no internet connections and no access to electricity, making it difficult for students to engage in online learning. This digital divide has the potential to exacerbate existing issues of marginalization and impede the achievement of SDG 4.

Post-COVID-19: Blended Approach to Teaching and Learning in South Africa

One approach that has been suggested as a solution to the challenges posed by the pandemic is the blended approach to teaching and learning (BTL) (Makgala, 2020).

The BTL approach combines traditional face-to-face teaching with online and digital elements to create a more flexible and personalized learning experience for students (Garrison & Vaughn, 2008). This approach has been found to be particularly effective in addressing the needs of diverse student populations, such as those found in South Africa (Garrison & Kanuka, 2004).

In South Africa, the BTL approach has been advocated by the Department of Basic Education as a way to address the challenges posed by the pandemic, such as the lack of access to technology and internet connectivity, which affects many students in the country (Department of Basic Education, 2020). However, the implementation of the BTL approach in South Africa has been met with some challenges, such as a lack of teacher training and support, as well as inadequate infrastructure and resources (Department of Basic Education, 2020).

Studies such as Sven et.al (2022), Johannes (2022) Charity et.al (2022) Enoch (2022), Ramashego (2022) Mohale et.al (2022) Nomzamo et.al (2022), and Ramashego et.al (2021) suggests that the shift to remote teaching and learning in South African higher education institutions during the COVID-19 pandemic has had both positive and negative impacts on the teaching and learning experiences of teacher educators and students. While blended learning is seen as having long-term value, the lack of access to technology and internet connectivity, as well as the unique demands of teacher education, pose challenges to the implementation of online education. The authors recommend more emotional support for teacher educators, and more investment in technology and internet infrastructure to improve the quality of online education.

For students living with disabilities, Dube and Baleni (2022), explore the experiences of higher education students with disabilities in online learning during the pandemic. the study finds that online learning has both advantages and disadvantages for students with varying disabilities and that students with mobility and visual disabilities prefer online learning, while students with intellectual disabilities prefer traditional, face-to-face methods. The study also highlights that most online lecturers are not aware of students' disabilities, leading to a lack of inclusivity in instruction and assessment.

In a comparative study, Isabella et.al (2022) Isabella et al. conducted a study in 2022 that examined various aspects of digital and network readiness in Hungary, South Africa, and Wales. The study found a correlation between a country's GDP and their network readiness and also discovered variations in digital access and trust among participating universities. These findings provide useful information for improving teaching methods and practices, particularly for universities that primarily offer on-campus instruction. The study emphasizes the importance of recognizing and addressing challenges and barriers to student learning experiences caused by uneven access to digital technologies and communication and provides recommendations for future educational policies and practices.

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Conclusion and Recommendations

There is no denying that the COVID-19 pandemic has hastened the shift towards digital education in higher institutions, as universities have had to rapidly create virtual learning environments to continue providing education to students (Choi, Robb, Mifli & Zainuddin, 2021). This has been particularly felt in South Africa, where higher education institutions have had to adapt to virtual classes in order to ensure continuity of learning (Motala & Menon, 2020). Though this transition has come with its own set of challenges, such as the need to quickly adapt to new teaching methods and technologies, it has also presented opportunities for innovation and has expanded access to education for a broader range of individuals. While this transition was seen as a potential solution for higher education during this time, our study has revealed that it has also brought a number of difficulties for both students and teachers. The research identified various obstacles to online education, including difficulties for educators and students to adjust, internet connectivity issues, unfavorable learning environments, mental health concerns, lack of necessities, and a lack of tools for teaching and learning. Despite these challenges, the study also highlights potential areas for improvement and growth in the field of online education in South Africa (Aruleba & Jere, 2022).

In recommending, as the COVID-19 pandemic has presented a number of challenges for educators and students in South Africa. The sudden shift to online learning has highlighted the digital divide that exists in the country, with many students from low-income households, rural areas, and marginalized communities facing significant difficulties in accessing the necessary technology and resources to participate in online learning. Educators have also faced challenges adapting to new teaching platforms and methods with limited support and resources, as well as difficulties in connecting with students in an online setting. The pandemic has also led to increased poverty and food insecurity, exacerbating the challenges faced by students. To address these challenges, efforts must be made to bridge the digital divide, capacity building in training and retraining of students and educators in technological tools in education including rural youth in online learning, and address the lack of infrastructure and resources needed in ICT pedagogy in traditional education.

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A Critical Analysis of the Role of the Accredited Social Health Activists in Managing Health-Care Services in Pre-COVID and Post-COVID India

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Abstract

The paper investigates and critically analyses the contribution of Indian healthcare workers 'ASHA' that is (Accredited Social Health Activists) ASHA program was introduced by the Indian government and is a vital component of community process intervention. ASHA program is one of the largest community health worker programs; it is considered an important contributor to enabling people's participation in healthcare. This paper examines the crucial role ASHA workers play in India's community healthcare system and broader society. It also addresses the current working conditions, job security concerns, and wages associated with ASHA workers. We focus on the experiences – struggles, and hardships of ASHAs who have been at the forefront of fighting the COVID-19 pandemic in India for the last two years. We try to provide a historical review of the specific category of women health workers called ASHA. Through a brief analysis of the working conditions of the ASHA workers in contemporary India, we reveal the increasing inequalities and exploitation in the context of privatization and corporatization of healthcare work at multiple levels, contributing to gradually eroding the rights of women's healthcare workers. The paper aims to examine the changing responsibilities of ASHA workers, assess their contributions before and after the COVID-19 pandemic, and delve into the experiences of ASHA workers during the COVID-19 crisis.

Keywords: Accredited Social Healthcare Activist, Wages, Healthcare, Exploitation, job security, Community healthcare, Covid-19.

Introduction

In this paper, we investigated the vital role ASHA workers play in managing healthcare services in India. The paper tries to analyze how ASHA workers contributed to the state-run healthcare machinery and study the significance of it during the pre and post covid pandemic period.

This paper acknowledges the redefined role of the ASHA workers that have emerged during the COVID-19 pandemic compared to the pre-pandemic era. We try to focus on the experiences – struggles, and hardships of women health workers (ASHA workers) who have been the frontline force in India's fighting the Covid-19 pandemic for the past two to three years. We study the historical perspective specific to ASHA workers. By briefly analysing the working conditions of the ASHA workers in India, try to investigate the inequality and exploitation faced by these healthcare workers during the COVID-19 pandemic and how these ASHAs contributed to the Indian healthcare system. The objective of the paper is to create an enhanced understanding of the current situation of ASHA workers and reassess their contributions. Taking into consideration the current conditions there is an urgent need to regularize their work with better wages, empowering them with better equipment and most importantly rewarding them with the dignity and respect that they deserve. ASHA the Accredited Social Health Activists initiated in 2005 under the National Rural Health Mission (NRHM). Although employed under a government scheme ASHA workers are designated as 'activists' and they are not considered as the professional workforce. Their work is considered voluntary and temporary though they are employed on long-term open contracts

Transforming Roles, and Addressing Crisis during the Covid-19 Pandemic in India:

Public/community health professionals have a very important and direct role in coping with the epidemic. During the lockdown, ASHA workers have been collecting data on COVID-19 patients, offering counselling, and raising community awareness. They were doing door-to-door surveys in confinement zones/hotspots. The job they conduct puts them at risk of being boycotted and assaulted by certain locals in some instances, as well as being accused of spreading the virus. Not unexpectedly, these female professionals are growing sensitive to COVID-19, as do health workers in other countries (Amnesty International, 2020).

It changed the role of the ASHA worker as a life-protector rather than a profit (Siegman, 2020). The experiences of Indian health professionals during the epidemic are affected by the country's already fragile and overcrowded public health system. There is a significant disparity in infrastructure between rural and urban India. The healthcare system is becoming increasingly privatized and corporatized (Qadeer, 2019). India experienced a significant and unprecedented exodus of migrant workers from the cities back to the villages during the early stages of the Covid 19 pandemic in 2020 (Breman, 2020) . This is a reversal of the earlier processes of various types of internal migration that have occurred in the nation over the past few decades from rural to urban areas. This exodus increased worries and queries about the pandemic's spread, accessibility to basic healthcare, and containment in the immediate context. The majority of migrant workers who relocate from rural areas to urban areas in search of work depend on welfare professionals like ASHAs or Anganwadi workers to assist them with basic needs like childcare, education, or healthcare. This circumstance also generated greater concerns about the safety, security, and vulnerability of migrant workers in the context of what is known as pandemic citizenship (Chowdhory & Poyil, 2021).

The story has radically changed after the arrival of the COVID-19 epidemic. A second wave of the COVID-19 epidemic attacked the country in April 2021, with daily deaths reaching 3,600 by the end of the month. With the country's inadequate healthcare facilities flooded with patients, hospitals ran short of oxygen and ICU beds (Shivji, 2021). There is no official data on how many health personnel perished in the country as a result of COVID-19, but state-wide estimates indicate that the figure is large (Madhav & Gurmat, 2021). While the country's health system struggled to deal with the pandemic's strains, these ASHA workers in India were at the epicenter of a crisis and played an essential role in managing the crises. While many Indians have shifted to work from home during the lockdown, ASHA workers are performing additional Covid duties apart from their regular tasks. (Raina, 2020).

Public Healthcare System and ASHA workers

The public health industry in India is extensive (Sheikh & George, 2010) describe how rural health professionals in India deal with substandard accommodation, unreliable transportation, and unpredictably available prescription supplies. While discussing social welfare programs and their beneficiaries, legislators pay little attention to the state of healthcare professionals. Additionally, because of the nature of their employment, health professionals' personal and professional lives are entwined even while they participate actively in the community. Although these connections are more informal, Sheikh and George contend that they also establish boundaries and hierarchies that place limitations on public health employees as they attempt to balance their dual responsibilities as healthcare providers and public health workers.

In the past, women's volunteer local groups like Mahila-Mandals have aided networks of community/village health workers in the social welfare sector. Many women in local volunteer organizations participated in social welfare initiatives as workers or as assistants to the workers, whether they were Auxiliary Nurse Midwives (ANM), Anganwadi workers, community/village health workers, or other types of workers. Power and hierarchy issues are entwined with the interaction between the women worker and helper in these programs, and these issues are further formed by caste- and class-related roles in society (Sreerekha, 2017). Many of these female employees have participated in these programs as temporary or contract workers for years. Most of these women were employed as contract or honorary employees, and they were expected to contribute to every aspect of public health, incorporating it into several social welfare schemes.

The Auxiliary Nurse Midwives (ANMs) in India serve in the same capacity as ASHAs today. They are expected to supervise ASHAs as they work. ASHAs have recently taken on a more prominent role in India's community health workers as more ASHAs have joined the mission. ANMs still play a significant part in public health, particularly in India's rural areas. The Auxiliary Nursing Service was established in India in 1942 in response to the severe nursing shortage that existed there during World War II. Over time, they evolved into ANMs and eventually became permanent employees of the public health system. The role of ANMs gradually evolved from that of a midwife to that of a "multi-purpose" public health worker in the 1970s, expanding their work to a multi-purpose' public health worker who works in multiple industries. Between 2014 and 2019, the current government also created a few schemes, such as Beti Bachao Beti Padhao in 2015 while the majority of the new schemes do not directly address concerns relating to care or health work, and the majority of schemes and policies are implemented by women welfare workers, such as Anganwadi or ASHA workers.

While ASHA employees are paid an incentive solely based on the duties they complete, ANM employees receive better pay, better and longer employment contracts, and direct support from the central government. It's interesting to note that ANMs employed men, whereas modern ASHA employees do not. ANMs were regarded as having greater technical training in the nursing sector, making them more skilled and professional. Planning different training programs for midwives that last from six months to two years involves a large number of universities in India (most of which are privately held) that offer degrees in nursing or midwifery, as well as recruitment firms and trainers at various levels. ASHAs with comparable qualifications may occasionally receive similar training. The Indian National Advisory recommended that the work of Anganwadi Workers (AWWs), ANMs, and ASHAs be combined. The community networks working to address public health in India include volunteers and self-help groups at the state and local levels working in the fields of care, sanitation, etc., in addition to the scheme workers who are formally a part of the community health projects. (Kalne, Kalne, & Mehendale, 2022)

In my research on Anganwadi workers in India, it was noticed that many women who work in community service come from underprivileged communities, and they perceive themselves as part of a collective group, working for the community rather than just for themselves. A strong conviction in communal existence motivates many women to engage in welfare work to move beyond the individual and the family and devote themselves to society, even when they have few means and no support structure on which to rely. However, in certain cases, desperation due to poverty and a lack of a source of income drives women to take up this labor (Sreerekha, 2017). It is advantageous and beneficial for governments always benefit from hiring cheap, unemployed women workers since it forces them to willingly serve their own communities (Ibid).

The line between voluntary and forced workers is largely blurred in the case of women who work in healthcare. The history of public health workers in India is a long and complex one that includes both voluntary work and forced labor, largely performed by women in various contexts and forms. The term health workers can also be expanded to encompass a variety of forms of healthcare labor, much like the definition of essential workers, which can be applied to numerous occupations in the informal sector. In fact, forcing women workers to participate in voluntary, honorary, or contract employment in the social welfare sector under initiatives launched by the Indian government has helped redefine and restructure what is regarded as acceptable.

The disparity in contribution against compensation of ASHA workers during the Covid-19 pandemic

They work for an incentive and even if they work on weekends, there is no additional income. In most states, there is no certainty that work will pay or that it will pay fairly. Only women between the ages of 25 and 45 are engaged as ASHAs, and they are compensated based on the services or activities they do. For example, getting a new-born vaccinated helps them to earn ₹150, a medical check-up for a pregnant woman ₹200, accompanying her to a hospital for delivery fetches them ₹400, and assisting with birth control₹ 500. Each public health center has approximately 10 ASHA employees, with one worker for every thousand people, and there are over nine hundred thousand ASHA workers in India now (Sathi, 2021).

In dealing with the COVID-19 problem, ASHAs have displayed exceptional courage strength and dedication. According to a paper published in September 2020 as part of the Global in Women's Health series (Down to Earth, 2020), many employees pay for their own gloves, masks, and hand sanitizers. In fact, many of them lack access to many other protective measures and are out in the field without masks and hand sanitizers. In the present COVID-19 environment, health professionals in India are overworked and fighting to make ends meet due to growing workloads and attacks on their labor rights. Every day for the past year, ASHA workers have been out in the field, risking infection. They do not come from wealthy families where they can afford to isolate themselves in their homes. The pandemic has reduced their incentive to treat a smaller number of cases. The incentive given to women employees in India under state welfare schemes like ASHA is far less than the minimum wage or living wage required by law. The ASHA scheme paid a minimum incentive of ₹1300 per month when it first started in 2005. In the majority of states, they are still paid between ₹2000 to ₹8000 per annum after fifteen years. These payments frequently come months later, even while battling COVID-19 (The Logical Indian, 2020). They must provide documentation proving their responsibility for doing and finishing each activity in order to be compensated.

Attending any other illnesses, including chronic ones unrelated to COVID-19, must be prioritized. With the spread of the pandemic, many of these health workers' regular activities have been halted furthermore, no one else is responsible for those responsibilities. As a result, their services to those in greatest need, particularly the poor, remain halted. Poor women have no options, unlike women from middle- and upper-income groups who can afford private hospitals and do not necessarily require the assistance of these health workers. They are completely reliant on public health care centers and health workers. The pandemic has created a massive void. Many low-income working-class women who require assistance with pregnancies and childbirth do not have it, resulting in maternal mortality.

During the pandemic, ASHAs are supposed to assist persons who are isolated at home or in their homes. If the region is designated as a hotspot, ASHAs must check 50 neighboring residences for anyone exhibiting symptoms as a preventive precaution, and they are compensated ₹1,000 for their efforts. They assist persons experiencing symptoms with testing and gathering results reports. They occasionally assist in the distribution of masks, medicines, or even food to individuals in need, in addition to providing further advice for home isolation. In several locations, the epidemic shifted the burden of handling mental illnesses to ASHAs and Anganwadi workers. During the pandemic, public health was jeopardized due to the lack of a mental health care delivery system and access to needed medications. (Patley, et al., 2021).

ASHAs had to visit hospitals regularly during the pandemic, despite being risky ASHAs cannot avoid it if they have to attend to their work. While doctors or nurses are provided with masks, health workers are not. Home visits in the community put them at a higher risk; while back home from the field, neighbors complain of putting them at risk. Stories of physical attacks on ASHA workers and neighbors stopped ASHA workers from completing their tasks or even threatened them forcing them to ask for policed protection is common. As a result of the attacks, some of these women faced physical and psychological trauma along with an uncertain future ahead with no support system in place.

WHO honors ASHA workers for their crucial role in linking the community during the COVID-19 pandemic

As per a report (Chandra, 2022) WHO honors ASHA workers for their crucial role in linking the community during the COVID-19 pandemic "The country's frontline health workers or ASHAs were one of the six recipients of the WHO's Global Health Leaders Award-2022 that recognizes leadership, contributions to advancing global health and commitment to regional health issues. India's 10-lakh-strong health workers have been conferred the honor for their "crucial role in linking the community with the health system, to ensure those living in rural poverty can access primary health care services, as shown throughout the COVID-19 pandemic," said the WHO's press statement. An official of the Indian mission in Geneva collected the award. During the pandemic, ASHAs were entrusted with raising awareness about COVID-19 and safety standards, detecting and tracking COVID-19-positive cases, and conducting vaccination drives, frequently without the use of personal protective equipment. These programs were in addition to maternal care, child immunization, and community health care.

After being praised by the Prime-minister and health minister for the achievement 'The All India Co-ordination Committee of ASHA workers and facilitators affiliated with the Centre of Indian Trade Unions (CITU) reacted "Scores of ASHA workers sacrificed their lives succumbing to COVID-19 and the Government of India doesn't even have statistics on them. Their families are yet to receive the ₹50 lakh compensation for death due to COVID-19 for frontline workers." The organization further demanded that there should be payment of minimum wages, social security benefits, and pensions (Chandra, 2022).

Method

We investigated the involvement of ASHAs in the local health response to the COVID-19 epidemic in Maharashtra. Our goal is to provide a qualitative study to understand the participation of ASHAs and communities, particularly in the setting of a pandemic like COVID-19. In this research, we talked with ASHAs in the context of the pandemic and Indian public healthcare systems to learn how helpful the Indian public health system is. With the assistance of volunteers from different healthcare organizations and networks, semi-structured interviews and policy analyses were conducted.

Data Collection

Teams of trained local volunteers interviewed the respondents using a topic guide developed in English and translated local language. 45 ASHA workers and other stakeholders were interviewed from Jan 2021 – June 2021. The respondents were contacted and a suitable time was decided for the interview. The consent of respondents was taken before the interview began.

Result

Table 1: Distribution of Respondents by Position in the ASHA Program Stakeholder Survey (June 2021)

No	Position of Respondent	Number
1	ASHA Supervisor	5
2	ASHA Worker	45
3	Other Stake Holders(Government Officials, NGO Staff and Researchers and Academicians)	8
	Total	58

Source: Stakeholder Survey, ASHA Program, Maharashtra, June 2021

The exploratory approach of the study focuses on the different challenges and issues faced by ASHA workers during the COVID-19 pandemic in India.

Additional workload impacting the routine work and important tasks to be executed

Before the onset of the pandemic, ASHAs carried the majority of the healthcare system's load by helping ANM health workers provide critical healthcare services like infant and mother care, child nutrition, infectious and non-infectious disease management, and social mobilization on healthcare and related issues. Additional responsibilities in tracing and isolating visitors coming to the village from outside.

Village Health and Nutrition Days, a regular event, is a community-based health treatment package that includes prenatal care, regular antenatal care, and postnatal care. Care, growth monitoring, ill child referrals, health issue discussions to raise awareness, and convergence between nutrition and health are all provided on a fixed daily schedule, typically once or twice per month. During the lockdown, ASHA workers have been collecting data on COVID-19 patients, providing counseling and creating awareness in the community. They use to do door-to-door surveys, including in containment zones/hotspots

Lack of Personal Protective Equipment (PPE) for ASHA workers

Despite the sensitivity of their work, ASHAs are advised to wear a triple-layered mask and gloves and keep a one-meter distance. The other stakeholders mentioned that "PPE kit provided to ASHA personnel was basic, inadequate and inappropriate. We are putting their lives in danger only because their labor is voluntary. PPE kit provision has also been inconsistent among states."

Hailed as Corona worriers many ASHA workers carried out work with inadequate protective gear sometimes it was just masks and gloves. ASHAs were working at ground level and visiting several individuals every day; many of them were COVID-19-infected. It is putting ASHAs at high risk of contracting the Covid-19 virus and it was necessary that quality PPE (Personal Protective Equipment) should have been provided to them. In addition to regular duties additional tasks of contract tracing, spreading awareness on COVID-19 prevention, and keeping an eye on new visitors to ensure they follow quarantine protocol were delegated to them.

Inappropriate financial remunerations and irregularities in the payment of ASHAs

The incentive or remuneration paid to ASHAs is much less compared to the workload assigned to them. It is interesting that they get a monthly honorarium, not a salary plus employment is contractual. Ironically government-employed healthcare workers get a far better salary or remuneration compared to ASHAs with similar work loads. ASHAs are paid on assignment bases and they get incentive-based on the services or activities taken up by them. A particular fixed amount for attending specific assignments like vaccination of an infant, medical check-up of a pregnant woman, accompanying pregnant women to a public health center for delivery, reporting and taking TB patients to PHC, and helping women with birth control. It is observed that the payment is not on time and is at the mercy of officials at local bodies like Zilla Perished or grants sanctioned by the state government. While considering the vital, critical, and risky work carried out by ASHAs what they get in return as remuneration is meniscal and barely helps them to survive and support their families. " Despite being in service for the last 10 to 15 years and yet, most of us barely earn ₹8000 a month working 12-15 hours daily. We have to work hard as the majority of our earnings come as incentive base such as the fixed amount of money for reporting TB case, taking care of pregnant women, taking pregnant women to health care center PHC for delivery and so on" (ASHA 9)

Physical attack and hindrance in work by members of society

During the COVID-19 pandemic, ASHAs faced incidents of physical attack and people preventing them from completing work. Neighbors and relatives of COVID-19 patients tried to prevent ASHA workers from recording vital information and implementing the quarantine procedures. ASHAs were supposed to keep track of new visitors who visited a given locality to keep track and ensure that they followed the quarantine guidelines issued to prevent infection from spreading to a particular locality. To complete the task of contact tracing ASHAs were supposed to keep track of new visitors from outside. Unfortunately, the particular local community was not very happy with the activity and attacked ASHAs or prevented them from completing the work.

In some cases, neighbors of ASHA workers perceived the theme as a threat and feared that they might spread infection to them. This resulted in physical attacks on ASHA workers while some faced trauma like social boycotts. In some cases, members of the public forcefully restricted entry of ASHA workers in their locality treating them as outsiders. With no support system in place to deal with this kind of abusive treatment ASHAs were forced to take the help of the police force in completing the task at hand. "During the COVID-19 pandemic, we had to monitor and report new COVID-19 cases, track the new visitors in the locality from outside and other task such as collecting information on senior citizens who are more prone to infection. But we are treated as unwelcomed guests by locals. We were prevented from entering the locality and sometimes abused or threatened with physical assault. Even our neighbors considered us as a source of COVID-19 spread and tried to boycott us socially which is very disturbing" (ASHA 5)

Completing the technically complex task for which they are not fully trained:

In Maharashtra ASHAs are used to assist, ANMs in transferring data from the paper register to the Reproductive and Child Health (RCH) portal specifically designed to maintain records of pregnant women and mothers of young children in the villages. Aarogya-Setu was launched by the Government of India as a contact tracing app that could provide detailed information about people who have been in contact with Coronavirus-positive patients. All the above tasks were accomplished by ASHA workers without complete formal training. The Centre sent directives for the mandatory use of its contact tracing app, Aarogya-Setu by all government staff. Some ASHAs were asked to use the Aarogya-Setu app by their supervisors, but they were not able to articulate how it would help them.

ASHA workers use social networking sites like WhatsApp and Facebook to transfer daily reports and photographs to PHC. In the absence of smartphones owned by themselves, ASHAs relied on the smartphone of the family members to accomplish the task. It was clear that no formal training and equipment were provided to ASHA workers to complete the tasks assigned to them. ("All of us were instructed to download and setup the Aarogya-setu app in our phones. Many of us including ASHA workers do not own a smartphone; so we are forced to use phones owned by family members to complete important task like the Child immunization register, Birth and death register, Antenatal check-ups monitoring register, and Reproductive child health registers" (ASHA Supervisor 4)

Focus

It is evident from the analysis of information that India's response to the pandemic relied profoundly on ASHAs. ASHAs were at the forefront of preventing COVID-19 transmission in the community, managing quarantine centers, and generating awareness by preventing incorrect information from reaching at the community level. The findings clearly highlight that there is a requirement for mechanisms in place at the community level for continuous training and engagement through ICT.

ASHAs were promised in April 2020 that they would get 2000rs over the regular incentive they get for their work. The study clearly indicates that the financial remuneration of ASHA workers is the primary concern. Compared to the financial remuneration AHSAs are overburdened with work. There were discrepancies in paying what was promised to them for performing additional COVID-19 work. their honoraria are less than the minimum wages of unskilled workers. (Sundar & Shyam, 2020). It is ironic that ASHAs are not only face exploitation from the community they work for but also by their exploitative employers. With no appropriate remuneration, recognition, and job security it is completely inconvenient for ASHAs to cope with the stress and survive the current situation.

Although many politicians and policymakers are quick to appreciate ASHA workers' contribution during the COVID-19 pandemic and generously parse them. But none of the verbal promises reflected in the policy decisions that favor their demand of "including them within the cadre of permanent healthcare staff with a fixed pay of 18,000 per month along with social security and maternity benefits, fixed tasks and work hours" (Rao & Tewari, 2020). ASHAs are they are expected to do several other tasks which are categorized as non-compensatory activities such as community engagement to build rapport for achieving difficult goals of improving institutional delivery, reducing infant mortality, and controlling the spread of infection (Swaminathan, 2015).

It is essential that ASHA workers get appropriate remuneration along with the provision for other benefits. It is vital that these health workers who are hailed as Corona worriers should be empowered along with their families. Active participation of women health care workers in community health setup will be of utmost importance

Conclusion

Unfolding of different stories revealed different experiences of ASHA workers and community members. The analysis clearly indicates that ASHAs harbored the boat of the Indian community health care system very effectively during the turbulent time of the COVID-19 pandemic. ASHAs successfully accomplished the herculean task of COVID-19 control in spite of abusive treatment by members of society. ASHAs were exploited by employers by offering minuscule financial returns for performing risky and overwhelming work with no job security and support system. ASHAs played the role of superwomen; they risked their lives during the course of the pandemic pertaining to a lack of resources, and lack of community and state support. Excluding a few verbal praises and promises they received nothing substantial in return for their heroic performance during the COVID-19 pandemic. A simple request of minimal pay as per the law has been turned down by government officials giving reason that 'It may lead to complacency'. Such arguments by government officials are pointless and may lead to some uneasy counter questions about the competencies and work culture of policymakers. There is a danger of such policy decisions being perceived as government-sponsored 'exploitation of the weaker section of society, which is supported by the government itself.

Recommendations

After the impact of the COVID-19 pandemic communities must rethink on importance of basic public healthcare and how health workers like ASHAs play vital roles as life-givers by acting as the backbone of local communities. While performing this role many ASHAs paid a heavy price for the community's survival, now it is urgent and important that the community must introspect and answer what are we going to give in return? It is high time that members of society along with policy makers understand and acknowledge the contribution of ASHAs in the community healthcare system. The principle of reciprocation is expected from policymakers in terms of financial returns, job security, and support systems.

Future Research Directions

Investigate the impact of the COVID-19 pandemic on the mental health of ASHA workers, assessing the psychological toll by examining the long-term effects of stress, anxiety, and trauma. Evaluate the necessity for mental health assistance and interventions to safeguard the welfare of these frontline workers. Comparative Analysis with Other Countries: Explore the roles and challenges confronted by community health workers in different nations amid the COVID-19 pandemic.

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Comparative Analysis of the Government Structure and Policies to Disaster Response Adopted by the BRICS: Perspectives on the COVID-19 Pandemic

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Abstract

Disasters have increased in severity, diversity, and frequency over the years. Consequently, disaster response requires the involvement of different stakeholders, which makes managing disaster and humanitarian operations a challenge. Thus, the present research aims to compare the government structure and policies of the BRICS countries (i.e., Brazil, Russia, India, China, and South Africa) to disaster response operations, particularly during the COVID-19 pandemic. The research adopts the case study by investigating official government documents and public information. The results identified that the BRICS developed: (i) a vertical and centralized coordination approach within their territories in response to the COVID-19 pandemic, (ii) some cases of independence and misalignment between national and local governments in response to the COVID-19 pandemic, and (iii) creation and adjustment of particular policies and programs for the pandemic period with little consideration of government structures and policies for disaster response developed before the COVID-19 pandemic. Future research might compare the response to other disasters faced by all the BRICS countries and collaboration opportunities among them.

Keywords: disaster response; disaster management; humanitarian operations; stakeholder management.

Introduction

Over the years, disaster events have increased in number, severity, diversity, and frequency (Behl and Dutta, 2019; Lu, 2022). The last CRED report registers for the year 2021, 85 disasters more than the annual average of the previous two decades (CRED, 2022). This report does not account for the COVID-19 pandemic declared by the World Health Organization (WHO) as a disaster that has affected millions of people around the world since the identification of the SARS-CoV-2 virus in December 2019 in China (WHO, 2020a).

Since the WHO declaration, COVID-19 has infected more than 643 million people and killed more than 6.6 million worldwide (WHO, 2022a). The emerging countries Brazil, Russia, India, China, and South Africa, members of the BRICS, are among the most affected (Khambule, 2022). According to WHO (2022b), more than 115 million cases and 1.7 million deaths in the mentioned countries have been confirmed. However, these numbers might be considerably higher due to underreporting cases in developing countries with fragile medical systems (Djalante et al., 2020). Moreover, analyzing the dynamics of response in the BRICS countries to the COVID-19 pandemic is essential, initially because the disease started in China and, in addition, India, Brazil, and Russia occupied the first positions in the world ranking of cases of the disease, and South Africa was among the hardest-hit countries at the start of the pandemic (De Sá, 2021).

Based on several factors, such as the national health system, population structure, and pandemic situations, the BRICS countries and all other countries adopted different policies, including restrictive measures, control measures, border prevention, and critical population control measures (Jiao et al., 2022). In this sense, this research aims to answer the following question: "What were the government structures and policies adopted by the BRICS countries to respond to the COVID-19 pandemic?". The research adopts the case study to address this research question by considering official government documents and public information as the primary sources for the analysis.

The first section of this paper presents a brief introduction to the theme. The second section presents the theoretical foundation involving stakeholder management in the disaster context and an overview of COVID-19 pandemic policies. The third section describes the methodology adopted in the research. The fourth section presents the structure and policies for disaster response of BRICS countries before the COVID-19 pandemic. The fifth section presents the policies adopted by the BRICS countries to respond to the COVID-19 pandemic. The sixth section provides an overview analysis of the changes in the disaster response of BRICS countries before and after the COVID-19 pandemic. The seventh section offers the conclusions and suggestions for future research.

Theoretical foundation

This section is divided into two subsections that address Stakeholder Management in the disaster context and policies to respond to the COVID-19 pandemic.

Stakeholders Management in Disaster and Humanitarian Operations

Stakeholders are individuals or groups that are affected or that affect the business (Freeman, 2010). In this sense, Besiou and Van Wassenhove (2021) argue that the number and diversity of stakeholders in disaster and humanitarian operations (DHOs) have grown in recent years, which enhances the complexity of operations and makes management decisions difficult. Nevertheless, the collaboration between the different humanitarian stakeholders is essential due to the broad nature and extension of DHO (Bealt et al., 2016). Consequently, recognizing and understanding stakeholders in DHO (Fontainha et al., 2017) and attending to their satisfaction becomes vital for the success of the DHO (Fontainha et al., 2022).

Fontainha et al. (2017) identified 10 DHO stakeholders through a systematic literature review: Government, Military, Legislative and regulatory, Direct supplier, Private sector, Media, International aid network, Donor, Local aid network, and Beneficiary. These stakeholders can implement their response operations from the perspective of centralized or decentralized coordination (Balcik et al., 2010). Centralized coordination refers to partnerships formed between organizations, with the possibility of sharing resources and information, joint decision-making, and division of tasks (Akhtar et al., 2012; Balcik et al., 2010). Decentralized coordination refers to autonomous operations without the possibility of collaboration between organizations (Balcik et al., 2010). Coordination according to position in the supply chain can also be understood as vertical and horizontal (Balcik et al., 2010). Vertical coordination is established between the different levels of the chain, and operations are managed independently (Balcik et al., 2010). Horizontal coordination occurs in the relationship between organizations operating at the same chain level and sharing the same attributions and capabilities, that is, shared management (Balcik et al., 2010).

Policies to Respond to the COVID-19 Pandemic

The first case of COVID-19 was registered in December 2019 in the city of Wuhan, China (WHO, 2020b), and in March 2020, it was declared a pandemic (WHO, 2020c). Considering the effects of the pandemic and the rapid spread of COVID-19, a range of government responses needed to be taken. The primary and initial policies adopted by several countries worldwide were travel restrictions, restrictions on face-to-face meetings, school closures, case tracking, and emergency investment in health systems, among other actions (Hale et al., 2021). In addition, mass vaccination was an essential strategy to reduce hospitalizations and deaths (CDC, 2022).

Dergiades et al. (2021) demonstrated that government interventions are more effective and positively impact the reduction of deaths from COVID-19. In addition to the effects on public health from the hesitation to adopt such policies, data analyzed in the United States of America showed that populations that did not adhere to the vaccination were considered responsible for blows to the country's economy (Farrenkopf, 2022).

Research Methodology

The research adopted the case study methodology to meet the research objective. According to Yin (2014), this method is characterized as an empirical study in which the borders between the phenomenon and the context are generally not determined. In addition, the author argues that it is used when one wants to deepen an investigation of a phenomenon within its real context. This perspective is aligned with this research due to the need to deepen the understanding regarding the policies adopted in response to COVID-19 by the BRICS countries.

The six steps proposed by Yin (2014) were performed for this study as follows:

- Plan: consists of adapting the method to the research objective (Yin, 2014). For this research, the plan focused on investigating which measures were implemented by the BRICS countries to respond to the COVID-19 pandemic.
- Project: consists of defining the research question, the strategy to gather data, and the unit of analysis (Yin, 2014). For this research, the research question concerns the response to the COVID-19 pandemic. This study uses explanation construction and time-series analysis to assess pre- and post-pandemic disaster response policies. Considering that they are among the countries most affected by the pandemic (Khambule, 2022), the BRICS countries are selected as the unit of analysis for this research.
- Preparation: consists of elaborating a research protocol (Yin, 2014). In this research protocol, the focus was on the government structures and policies of disaster response of the BRICS countries in the pre and post-COVID-19 pandemic.
- Data collection: consists of gathering several sources of evidence (Yin, 2014). In this study, we used official documents and public information as sources of evidence.
- Data analysis: consists of verification, categorization, classification, or recombination of evidence (Yin, 2014). In this research, the explanation construction technique and time-series analysis were used for data analysis.
- Sharing: consists of presenting relevant information regarding the research by exposing the results (Yin, 2014). This step is contemplated in this research.

Pre-pandemic policies

This section will briefly present the disaster management system of the BRICS countries before the COVID-19 pandemic.

Brazil

In Brazil, the first record referring to assistance to disaster dates back to 1966 with the Civil Defense Master Plan that organizes the State System of Civil Defense in the extinct State of Guanabara (DCERJ, 2018). At the national level, it was only after the 1988 Federal Constitution that a national system was created – the National Civil Defense System. This System denotes the responsibility of acting in emergencies and states of public calamity to the Civil Defenses (Brazil, 2020).

In 2005, the National Center for Risk and Disaster Management (CENAD) was created, the body responsible for managing distributed resources (Brazil, 2005). Subsequently, the entire system undergoes successive changes initially affected by decrees, normative instructions, and laws, such as Law No. 12,608 of April 10, 2012 (Brazil, 2012).

Currently, the National Civil Defense and Protection System in Brazil (SINPDEC) is composed of the public administration of the Union, States, Federal Districts and Municipalities, and also civil society entities, namely: the National Council for Civil Protection and Defense (CONPDEC), National Secretariat of Civil Defense (SEDEC), State Civil Defense Coordinations (CEDEC), Regional Civil Defense Coordinations (REDEC), Municipal Civil Defense Coordinations (COMDEC), Community Centers for Civil Defense (NUDEC), public administration bodies at the three levels of government (sectoral) and public and private entities, non-governmental organizations, associations, and others (support) (Brazil, 2013).

The disaster management policy in Brazil sees events as unpredictable and natural phenomena, a perspective related to the paradigm of preparation and response, working reactively to disasters and emergencies as they occur (Ribeiro, 2018). In addition, Ribeiro (2018) points out that the large territorial extension makes communication between the different stakeholders of the SINPDEC difficult. In addition, the author points out that it is necessary to overcome significant vulnerabilities, better articulate civil society, organizations, and academia, and that the private sector must be more proactive to minimize the risks of disasters.

Russia

The absence of an efficient system for disaster management was identified after the high number of victims of the Spitak earthquake in 1988, which forced the signing of a decree for the transformation of the Russian Rescue Corps into a State Committee of the Russian Soviet Federative Socialist Republic (Presidential Library, 1990). In 1994, this committee was restructured and derived from the Ministry of the Russian Federation for Civil Defense, Emergencies and Mitigation of the Consequences of Natural Disasters (EMERCOM of Russia) (ADRC, 2019). EMERCOM is a federal agency that coordinates civil defense, disaster prevention, and response activities, and it cooperates with federal agencies, entities of the Russian Federation (regions and republics), and local community administration (ADRC, 2019).

The Russian System of Disaster Management (RSDM) is the first disaster prevention and response system that guides activities according to several principles and the current situation (ADRC, 2019). According to ADRC (2019), the system is composed of state bodies at different levels, local community administrations, various industrial and economic entities, and organizations whose activities are connected with problems of protecting the population against disasters and the units and facilities necessary for disaster responses.

Despite Russia's disaster prevention and response system, the Russian government claims to continue to work systematically to improve their protection and have effective management (Russian Federation, 2022). Furthermore, they claim that Russia's EMERCOM works on the principle that it is cheaper to prevent than eliminate disaster consequences, but there is still a need for additional efforts, such as consistently including disaster warning and early prediction elements (Russian Federation, 2022).

India

Disaster management is of paramount importance to the political structure in India because the predominant population in the country - the poor and most vulnerable - are the most affected by disasters (CEDMHA, 2018). According to CEDMHA (2018), the Indian government developed a new approach to disaster management at the beginning of the first decade of the 21st century.

The Government of India recognizes the lack of proactive pre-disaster approaches, including preparedness, mitigation, and prevention phases (CEDMHA, 2018). For this, the government has developed some policies, namely: enactment of the Disaster Management Law in 2005, the National Policy on Disaster Management in 2009, and adopted international agreements in 2015: Sendai Framework for Disaster Risk Reduction 2015-2030 and the Paris Agreement on Climate Change (CEDMHA, 2018).

According to research by Chakrabarti (2011), despite significant advances regarding disaster management in India, the country still faces significant challenges: for example, disaster management policies must incorporate programs for the most vulnerable (e.g., poor, women, and disabled), adopt governance and accountability issues to deal with left-wing extremism, must manage regional cooperation approaches, among others.

China

The main trigger for China's emergency management system reform was the Severe Acute Respiratory Syndrome (SARS) in 2003 (Zhe et al., 2016). Four years later, the government enacted the Emergency Response Law of the People's Republic of China, which has the main objectives: prevention and reduction of occurrences; control, mitigation, and elimination of social harm; regulation of response and emergency activities; protection of lives; and maintenance of national, public, environmental security and public order (Zhe et al., 2016).

Despite the reform, the Chinese government recognizes that the mitigation is neglected when compared to the response and recovery phases (Zhe et al., 2016). In this sense, the authors argue that creating a department to manage operations in all phases of the disaster life cycle might have several benefits, such as standardizing information and disseminating risk communication guidelines to improve the communication system. Some years later, in 2018, the Ministry of Emergency Management was created, which assumes powers and resources for disaster management, becoming the country's only agency responsible for emergency response (Yue, 2018).

South Africa

Disaster management in South Africa is the responsibility of the Department of Cooperative Governance (South Africa, 2016a). Among the various responsibilities of the department is the search for poverty alleviation, mainly with the creation of job opportunities, in addition to improving proactive planning to reduce the impacts of disasters (South Africa, 2021).

In 2003, the Disaster Management Law was enacted, establishing the National Center for Disaster Management (South Africa, 2016 a,b). This organization aims to promote the integrated and coordinated management of the disaster management system focused on prevention and mitigation, in addition to being responsible for the administration of the Fire Department (South Africa, 2016b).

South Africa's disaster management provides a legislative and political mandate to all levels of government; however, Van Niekerk (2014) suggests that policy and legislation implementation has yet to be entirely successful. The author adds that there is a need for new amendments so that disaster risk reduction becomes a reality for the most at-risk communities in the country.

Post-pandemic policies

This section presents the main changes in disaster response policies that BRICS countries have undergone to respond to the COVID-19 pandemic.

Brazil

Like all countries, Brazil has adopted urgent measures to respond to the COVID-19 pandemic. The main objective of these measures was to channel public bodies and intuitions towards efficient action (Brazil, 2020b). The Brazilian National Health System (SUS) - which offers access to free health care at the point of care, including primary care to tertiary services - is the main driver of the response to COVID-19 in the country (BRICS, 2020).

The Brazilian government responded to the WHO alert before declaring a Public Health Emergency due to COVID-19 (Cimini et al., 2020). On February 3, 2020, a Public Health Emergency of National Importance due to COVID-19 was declared through Decree MS No. 188 and approved Law 13,979, which provides measures to deal with the pandemic (BRICS, 2020). Both measures were adopted before the confirmation of the first Brazilian case (BRICS, 2020). The country established an Emergency Group in Public Health that aimed at developing preventive measures and monitoring cases in the country and adopted policies such as the law that guided authorities on isolation and quarantine to prevent the spread of the virus (Cimini et al., 2020).

According to BRICS (2020), Brazil established the Intersectoral Crisis Committee led by the Chief of Staff of the Presidency of the Republic to coordinate and monitor the impacts of COVID-19 in the country in active partnership with various ministries such as the Ministry of Health. Among the central policies adopted by the country, the following stand out: border control (BRICS, 2020), restrictions on entry into Brazil for passengers on international flights from countries with high sustained community transmission (BRICS, 2020), creation and amendment of laws and ordinances geared towards tackling COVID-19 (e.g. Law No. 14,458 - Provides for the establishment of protective sanitary barriers indigenous areas - Ordinance No. 678 - Provides for exceptional and temporary measures for entry into the country, according to Law No. 13,979 and Law No. 13,979 - Provides for measures to deal with the public health emergency of international importance resulting from the coronavirus responsible for the 2019 outbreak (Brazil, 2019)); distribution of financial aid to informal workers, individual micro-entrepreneurs, the self-employed and the unemployed (Brazil, 2020b); advance payment of the 13th salary of retirees (IMF, 2021); inclusion of more than 1 million beneficiaries of the Bolsa Família program (IMF, 2021); reduction of duty and import rates on essential medical supplies (IMF, 2021). As the primary fiscal measure, the creation of the COVID-19

Relief Fund stands out, which accounted for around 1.1% of the Brazilian Gross Domestic Product (GDP) to finance wage subsidies and training exemption (IMF, 2021).

Despite the response measures adopted, mainly aimed at reducing the spread of the virus, the country became, for a period, the main center of the disease, a fact that can be justified by the political crisis established after declarations of underestimation of the pandemic, as well as the incentive for the use of drugs without scientific basis made by the Brazilian president (Cimini et al., 2020).

Russia

The first cases of the disease in Russia were detected in February 2020, and only after this, the country decided to close its borders with China to avoid contagion (De Sá, 2021). The Russian government started activities in different directions to establish policies and actions to support the population (IMF, 2021). Russia changed its political strategy, which was previously focused on infrastructure investments, to focus on crisis management measures (Åslund, 2020).

In addition to adopting varied strategies to combat the virus, Russia also provided help to foreign countries, which was seen as actions for propaganda purposes (CSIS, 2020). The CSIS (2020) states that despite the varied response, measures were generally adopted late beyond inconsistency. In addition, the Russian government implemented a well-established system of measures for the detection and prevention of spread, which prevented the explosive development of the pandemic in the country (BRICS, 2020).

The Russian government instituted an interdepartmental working group for high-level operational decisions and adopted a national plan to prevent the importation and spread of the COVID-19 virus (BRICS, 2020). In addition, the Russian Ministry of Health has created a three-tier model for pandemic response: a ministry operational headquarters, headquarters working groups, and remote federal centers for counseling critically ill patients (BRICS, 2020).

At the same time, to prevent and contain the spread of COVID-19, Russia has taken other solid and timely measures, such as widespread testing combined with patient tracking and isolation, encouraging rapid manufacturing of pulmonary ventilators and other individual medical equipment, and launching education programs online with preventive measures (The World Bank, 2020).

The primary fiscal measures adopted by the country are payment of sick pay and paid leave for quarantined individuals; payment of unemployment insurance in the same amount as the salary for those who lost their jobs as of March 1, 2020, and sole proprietors; subsidy payment for families with children up to 3 years old; exemption from import tariffs on pharmaceutical products and medical supplies and equipment, among others (IMF, 2021). According to the IMF (2021), such measures adopted by Russia affected GDP by a reduction of 7.8% per year in the second quarter of 2020 and 3% in the year as a whole.

India

Even before reporting the first case of COVID-19, India implemented immigration control to block the import, supply, and export of medicines, to guarantee the country's internal needs (Jiao et al., 2022). On February 3, 2020, a group of High-Level Ministers (GoM) - Ministries of Health & Family Welfare, Civil Aviation, External Affairs, Home Affairs, Shipping, Chemicals, and Fertilizers - was constituted to review, monitor, and evaluate the measures of country preparedness and response to the COVID-19 (BRICS, 2020). At the same time, "Empowered Groups" were created to speed up decisions on managing the pandemic (BRICS, 2020). The government also created the Committee of Secretaries under Cabinet Secretary to monitor and review the public health response to COVID-19 (BRICS, 2020).

India has a high population density, and its challenges are proportional; so after the confirmation of the first cases, the country implemented policies to close factories and public transport with a continued focus on containing the disease while the government sought to develop safe and effective vaccines against COVID-19 (Jiao et al., 2022; Lancet, 2020).

Another problem was the dissemination of untrue information in India, which caused a wave of Fake News, negatively impacting the population's ability to face the effects of the pandemic (De Sá, 2021). In this way, more than 400 Indian scientists led an initiative to combat misinformation (Lancet, 2020). The Indian government has focused on showing that the pandemic, especially the number of infections and deaths were under control, even though the country was considered "home to the worst outbreak of COVID-19" (Távora and Távora, 2020).

India's GDP has suffered a historic decline marked by two months of national confinement to combat the coronavirus pandemic (IMF, 2021). GDP fell 23.9% in the first quarter of the fiscal year of 2020-2021 (IMF, 2021). In response to fiscal actions, the government released an economic stimulus package of 20 trillion rupees (US$ 266 billion) to help the sectors most affected by the crisis caused by the COVID-19 pandemic, which focused mainly on workers, farmers, the middle class, and small and medium-sized companies, and industries affected by the pandemic (IMF, 2021). In addition, India launched a package of 1.7 trillion rupees, including cash payments to the poorest part of the country's population (Ahmed and Alam, 2021).

China

On December 31, 2019, the local authority of Wuhan, China, announced a group of infected people (De Sá, 2021). In early January 2020, Chinese authorities determined that such an outbreak of pneumonia in Wuhan was caused by a new coronavirus (IMF, 2021). To efficiently respond and control the virus's contagiousness, the Communist Party of China created the Central Leading Group for COVID-19 Prevention and Control (BRICS, 2020). According to BRICS (2020), the Council of State established the Joint Prevention and Control Mechanism, and the provincial, municipal, and district levels established their own command mechanisms.

The government immediately imposed strict containment measures, such as large-scale nationwide mobility restrictions and social distancing (IMF, 2021). After some months of research, the country granted conditional market approvals for four COVID-19 vaccines and approved three vaccines for emergency use (IMF, 2021). The country also adopted a strategy called Zero-COVID, which aims to reduce the consequences of the pandemic on health to an "insignificant" status, representing a limited or non-existent local transmission (Su et al., 2022).

Emergency prevention actions directly impacted the country's economy, which contracted 6.8% in the first quarter of 2020 (IMF, 2021). In this way, the Chinese government has taken several measures to limit the local financial shortage to the point of providing financial relief to affected households, businesses, and regions facing payment difficulties (IMF, 2021). An estimated amount of RMB 4.9 trillion (or 4.7% of GDP) of discretionary fiscal measures was announced, of which RMB 4.2 trillion was implemented in 2020. The main measures include: (i) increased spending on epidemic prevention and control, (ii) production of medical equipment, (iii) accelerated disbursement of unemployment insurance and extension to migrant workers, (iv) tax relief and exemption from social security contributions, and (v) additional public investment (IMF, 2021).

Despite being considered the birthplace of the disease, China, the most populous country in the world, managed to manage the contagion and reduce the number of cases in its territory compared to other BRICS countries (De Sá, 2021). However, after the relaxation of containment measures and the end of the Zero-COVID policy at the end of 2022, the country faces a significant increase in cases and deaths from COVID-19 (EURONEWS, 2022; Palmer et al., 2022).

South Africa

South Africa reported its first confirmed case of COVID-19 in March 2020, and the government automatically declared a state of national calamity. The South African government adopted containment measures, including social distancing, travel bans on visitors from high-risk countries, screening at ports of entry, school closures, and the introduction of mobile technology to track contacts of infected people (IMF, 2021). In addition, the government established the National Coronavirus Command Council (NCCC), which, together with the National Joint Operations Center (NATJOINTS), facilitated decision-making and resource mobilization to respond to COVID-19 (BRICS, 2020). At the same time, it established the Ministerial Advisory Committee (MAC) and created the Establishment of Incident Management Teams to support policy decisions (BRICS, 2020).

Faced with the violent economic impact of the pandemic, the country's GDP suffered an annualized contraction of 51% in the second quarter of 2020, the most significant drop in GDP in at least 100 years (IMF, 2021). In March 2020, the Department of Commerce and Industry introduced regulations against price manipulation and measures to control the exporting of essential goods, respectively (IMF, 2021). The government has also outlined measures for COVID-19 emergency procurement, including specifications for essential health items and maximum prices for personal protective equipment (IMF, 2021). The government also helped struggling businesses and workers through the Unemployment Insurance Fund (UIF) and special programs from the Industrial Development Corporation (IMF, 2021). Workers with income below a certain threshold received a small tax subsidy for four months, and the most vulnerable families received temporarily higher social contributions until the end of October 2020 (IMF, 2021). The number of food baskets for distribution has been increased, and additional funds have been allocated in the 2021 budget for public works programs (IMF, 2021).

Overview Analysis

When comparing the structure and government policies of the BRICS countries to disaster response operations, especially the response to COVID-19, it is noted that no country in the BRICS was guided using a specific emergency policy for cases of response to global level disasters (IMF, 2021; De Sá, 2021; Oliveira et al., 2021). The government of the BRICS assumed centralized coordination within their territories; despite some misalignments observed in Brazilian and Russian strategies. The BRICS countries developed their own emergency political, economic, and social strategies to deal with the violent impact of COVID-19. However, few of the robust structures and policies for disaster response developed previously to the COVID-19 pandemic were considered in the pandemic response.

Faced with the interruption of the trade flow, all countries immediately presented a drop in GDP, evidencing the economic dependence of the BRICS, which faced challenges as they found themselves compulsorily "isolated" and disconnected from the globalized flow (IMF, 2021). In this sense, one of the first response actions adopted by the BRICS countries was the release of funds and other financial resources to subsidize the population's basic needs on an emergency basis. This might represent horizontal coordination as defined by Balcik et al. (2010); nevertheless, such actions were not directly discussed by the BRICS combined. Nevertheless, the specific policies and programs created and adjusted for the pandemic period represented vertical coordination in the supply chain as the BRICS governments directly supported several other national stakeholders, as indicated by the IMF (2021).

Conclusions and suggestions for future research

Disasters are complex events that require the engagement of several stakeholders and strategic policies in response. The COVID-19 pandemic, as a biological disaster, has affected various areas and sectors of society worldwide (Carvalho, 2020). Due to different cultural, economic, and other factors, the BRICS and all countries differed in their strategies when facing the pandemic scenario, and these differences range from control and prevention measures to restrictions aimed at the population (Jiao et al., 2022). Therefore, the research aimed to compare the government structures and policies adopted by the BRICS countries in the COVID-19 pandemic response.

The case study revealed that all BRICS countries suffered an immediate impact on the value of their GDP (FMI, 2021), a lack of capacity to manage the response to a disaster of global impact (Jiao et al., 2022), a lack of alignment between governments, identified because of the structural independence of countries (FMI, 2021), and finally, creation and adjustment of policies and programs specifically for the pandemic period (IMF, 2021). Moreover, only some previous government structures and policies for disaster response were considered in the COVID-19 pandemic scenario, which reinforces the need for an all-embracing and complete perspective for disaster in BRICS countries.

The consequences and impacts of the COVID-19 pandemic also point to the need for the BRICS to develop more robust economies, focusing on the development of horizontal coordination strategies and local development. In addition, there is a need to create specific government policies for the global-level response to disasters and the best political alignment between the BRICS countries (Garcia et al., 2020; Oliveira et al., 2021; Chapungo et al., 2022).

Due to the focus of this research on the COVID-19 pandemic and consideration of official documents and public information, future research might discuss the government structure and policies for other specific disasters such as floods, famine, and refugee crises. Moreover, future research might also develop a deep investigation into the current and possible new horizontal coordination action by BRICS countries in terms of disasters and humanitarian context.

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Operational Improvements and Sustainable Air Transport Development in the Global South

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Abstract

There is a clear inequality between air transport systems development in Global North countries from the Global South ones. It is possible to observe this inequality when analyzing each region's route network and the total number of flights. This article aims to analyze how the adherence to The Carbon Offset Scheme for International Aviation (CORSIA) which comprises a market-based measure to stabilize emissions from 2020 onwards by international civil aviation can restrict growth and impact air transport expansion in developing countries, focusing on the BRICS countries. Considering a bibliographical review, the article highlights how ICAO developed measures to reduce CO2 emissions, including operational, technical, and alternative fuel measures, consisting of CORSIA in a complementary market measure. Additionally, based on the methodology developed by ICAO, the estimated reduction in CO2 emissions from implementing operational measures in Brazil was calculated using the annual number of arrivals and departures at airports. Operational measures are more in line with developing countries' United Nations' sustainable development goals, which have a broader sustainable development view of society. They are the best short-term option since Technological measures have a high implementation cost, and their incorporation into aircraft fleets takes a long time using SAF strongly depends on reducing associated production costs and developing a supply chain that allows its production to scale. As BRICS countries implement operational measures in their air transport systems, there is an increasing gain in efficiency and a reduction in CO2 emissions. Market measures such as CORSIA can restrict the expansion of air transport infrastructure in developing countries, consequently impacting their economic growth.

Keywords: BRICS, Reduction of CO2 Emissions, Air Transport, Tourism

Introduction

Until the end of the 1990s, bilateral agreements dominated the aviation market, but the American liberal wave, which emerged in 1997, influenced the entire world. This wave resulted in liberalism in the national aviation markets that escaped the traditional and merged concept of sovereignty and paved the way for new companies, international routes, and airports' privatization, among other actions. (Singh, 2019). Even in developing countries, commercial air transport has a noticeable development, abandoning the closed borders vision. These countries have become active players in the global economy and the air transport network.

The maturity level of its air transport system is crucial for the economy of a country. It is well known that there is a bidirectional correlation between air transport development and economic growth, especially in developing countries. Air transport development is essential for, among other purposes, facilitating world trade, promoting tourism, attracting foreign investment, generating direct and indirect employment and income from the airports' construction, and, later, during the operations of these airports, which favors economic growth. (Pisa, 2018). In addition, it generates "spill-over effects" such as increased employability for metropolitan regions where efficient air services are available (Zhang; Graham, 2020). The International Civil Aviation Organization (ICAO) recognizes that the development and expansion of air transport are crucial for economic growth and social inclusion (Hasan et al., 2021). Regulators and policymakers need to ensure that regulating the air transport industry also serves the interests of society and local communities to promote the mentioned social inclusion (Marazzo; Scherre; Fernandes, 2010).

Despite the remarkable growth of the air transport system in developing countries, influenced by the liberal wave that influenced the aviation market around the world, its maturity level is still much lower than that of the air transport systems in developed countries. An indicator associated with the economic development of countries is air connectivity. It comprises the route networks' concentration and ability to interconnect origin and destinations and transport passengers since these characteristics create more expressive economic benefits for tourism and other activities. (Dimitrios; Maria, 2018). There are many routes and a high flow of air traffic between the Global South and Global North countries. Among the Global South countries, the number of routes and traffic flow is much lower. This stronger connection through a more robust route network between countries in the Global South and Global North reproduces historical ties linked to colonialism, migration patterns, and sources of significant tourism markets with former countries that had colonies (Njoya; Knowles, 2020).

The causes of the difference in air connectivity between developing and developed countries are mainly the high operating costs, the influence of governments, low-quality standards, and some inefficient state-owned companies hamper the even more significant growth of the sector (Njoya; Knowles, 2020). Despite several economic uncertainties, air transport activity has grown about 2.5 times more than the Gross Domestic Product (GDP) in the last two decades. However, the air transport infrastructure has grown at a different rate, which has caused congestion and delays. Developing countries, in particular, need to build a more robust aeronautical infrastructure to mitigate capacity issues to meet demand needs (Dimitrios; Maria, 2018). Despite these infrastructure problems, developing countries have grown above the world average in air transport activities because regulatory reforms have expanded access to markets' investment flows and reduced costs (Njoya; Knowles, 2020).

The demand consideration for air transport is vital. It depends on social and economic factors and not just the price of services. Therefore, an increase in GDP and changes in society's consumption patterns can increase demand for air transport. (Park, Seo, Ha, 2019). Still, according to Park, Seo, and Ha (2019), the more outstanding the debt of developing countries, the less investment in air transport infrastructure since there is a reduction in public capital investment, which leads to the cancellation or postponement of projects. In addition, as in these countries, several areas, such as health and education, need more infrastructure, and competition for investments exists. Often, the money planned for investment in infrastructure ends up spent on other demands considered more urgent. This *modus operandi* creates a vicious circle that undermines long-term economic growth.

Tourism, as mentioned above, is one of the crucial economic activities favored by air transport development, and that can contribute to economic growth. Even for developed countries, tourism is an essential source of foreign exchange to generate a positive balance of payments and revenue rates for guest nations. In addition, tourists allocate resources to purchase goods and services that generate spill-over benefits in other sectors of the economy and generate seasonal and permanent jobs for unskilled labor. Several studies have shown that tourism promoted economic growth in Europe, South America, Bahrain, Pakistan, Asia, and Africa (Pisa, 2018).

The development of air transport impacts tourism, but it is not the only factor. Other factors contributing to promoting tourism at a specific destination are the economic conditions of the origin and destination locations, logistical costs, commercial regulations, and the capacity and performance of the supply chain. The passenger's profile can influence passengers' decisions in choosing a particular destination, the distance to the final destination, the modes of transport, and the price of services (Pisa, 2018).

Additionally, it is essential to highlight that it is not just investment in air transport infrastructure and a significant number of flight arrivals in a country that impacts economic growth, but a lot of other factors like the expenses tourists make, political instability, anti-terrorist wars, direct and indirect regulatory barriers, inadequate infrastructure, underdeveloped human capital, non-transparent business policy, neglect of export-oriented sectors, poor situations concerning law and order (Usmani; Akram, 2021). Other relevant factors are the underutilization of the infrastructure because of the lack of auxiliary services and adequate support and the geographic, political, governance, and technological development situations (Park; Seo; Ha, 2019).

Despite the economic growth, fostering air transport activity globally promotes increased greenhouse gas (GHG) emissions. The Intergovernmental Panel on Climate Change (IPCC) estimates that Carbon Dioxide (CO2) emissions from air transport account for about 2% of total emissions from the use of fossil fuels. When considering the emissions of other GHGs, this percentage rises to 6%. Although this percentage seems low, its impacts are intense since emissions occur at high altitudes, between 25,000 and 41,000 feet, where most commercial aviation flights operate (Lee, 2017). Besides CO2 emissions, air transport activities generate nitrogen oxide (NOx) emissions, contributing to ozone formation when emitted at high altitudes (ICAO 2019, a). In addition, the condensation trail formation can induce Cirrus-type cloud formation that intensifies the effects of global warming (ICAO 2019, a). The CO2 impacts are well understood; however, there is uncertainty about the non-CO2 emissions impacts. Therefore, it is necessary to develop methodologies to assess the effects of GHG and polluting gases and understand how these gases interact (Van Fan et al., 2018).

The environmental impacts of air transport activities intensify in the long term since growth forecasts for commercial aviation operations were to triple between 2020 and 2050, which may no longer occur because of the impacts of the COVID-19 pandemic (Gössling; Humpe, 2020). The reduction in the number of flights in Europe reached 89% in April 2020, compared to the number of flights in the same month of the previous year (Nizetic, 2020). In the United States, there was a reduction in passenger flights by 96% in April 2020 compared to April 2019 (USDT, 2020). The CO2 emissions by international aviation were reduced by 45% because of this sharp decrease in flights worldwide during the COVID-19 pandemic. Considering only the reductions related to international civil aviation activities, this reduction reached 72%. However, the number of flights grew again worldwide after the critical phase of the COVID-19 pandemic and has now surpassed 80% of movements in the pre-pandemic period in most parts of the world (Liu et al., 2020).

ICAO developed the Carbon Offset Scheme for International Aviation (CORSIA), a market measure to complement the basket of measures for offsetting CO2 emissions not reduced through implementing technological, operational, and sustainable fuel (SAF) measures. There are three phases in CORSIA implementation. Entry into the program will be mandatory in the second phase, in 2027, for all states with a share of over 0.5% of the world's revenue tonne kilometer (RTK) or that are part of 90% of the accumulated worldwide RTK. The BRICS (Brazil, Russian Federation, India, China, and South Africa) countries that should enter the mandatory phase of the scheme are Brazil, China, India, and Russia. The program should last until 2035 when alternative fuel production likely scales and allows extensive use in aviation. One hundred fifteen countries have joined CORSIA (ICAO, 2022b).

This article analyzes the differences between air transport infrastructure and the expenditures and receipts from international tourism activities in the BRICS and G7 countries (Canada, United Kingdom, France, United States, Italy, Germany, and Japan). It also aims to show the impacts that adherence to CORSIA by BRICS countries can have on the air transport development in these countries and on their economic growth. In addition, it points out that implementing operational measures by the BRICS in the Global Air Navigation Plan improves the efficiency of air transport in these countries. Implementing these operational measures makes air transport activities more sustainable and aligned with the "United Nations' sustainable development goals." Lastly, this article details the following methodology established by ICAO, the CO2 emissions reduction estimates in Brazil, by implementing operational measures.

Following this introduction, Section 2 presents the research methodology used. Section 3 presents, based on World Bank Data, some features comparing the BRICS and G7 countries regarding air transport infrastructure, international tourism activities, and air transport seat supply. Section 4 shows the measures undertaken by ICAO to mitigate GHG gas emissions from international civil air transport, including operational, technological, and market measures. Section 5 highlights the basket of ICAO measures for reducing CO2 emissions by international civil aviation. It points out how the ICAO Global Plan for Air Navigation (GANP) has favored implementing the operational measures of the BRICS air transport activities as members of the ICAO Council, helping to reduce CO2 emissions. It also shows a CO2 reduction estimate in Brazil and the implementation of air-side operational measures provided for in the GANP. Section 5 discusses the research data and analysis and resumes the conclusions.

Methodology

The methodology used in this article consisted of, first, using data from the World Bank, comparing some features related to the expenditures and receipts from international tourism, air transport infrastructure, and air connectivity between BRICS and G7 countries to highlight the existing differences between the two sets of countries and evidence the need for improvements in the air transport system of the BRICS countries. Afterward, a bibliographical review was done to evidence how the ICAO developed operational, technical, alternative fuel measures and a complementary market measure named CORSIA to reduce international aviation CO2 emissions. Finally, the calculation presented of the estimated reduction in CO2 emissions from implementing operational measures in aerodromes in Brazil used a methodology developed by ICAO, contained in Doc 9988, that uses annual departures and arrivals in the aerodromes as input.

Comparative features between BRICS and G7 countries

There is a noticeable difference in the air transport infrastructures of the Global North and Global South countries. Differences between BRICS and G7 countries show that. It is important to emphasize, however, that only the infrastructure provision, as already mentioned, may not be a guarantee of promoting economic growth. Because of this, it is also essential to analyse businesses' revenues and expenses. International tourism is an example. The number of seats available on flights departing and arriving from the countries is another. These examples help to understand the displacement patterns at international airports. All the analyses in this section used data extracted from the World Bank database. Figure 1 shows the results obtained by dividing the number of international airports by the population of each country. The figure shows that, except for Russia, all other BRICS countries have fewer international airports per million inhabitants than the G7 countries. This reduced number of airports shows that even in large countries in the Global South, as is the BRICS case, there are few cities able to attract international flights. Another feature to explore further is that the Global South countries' international airports' connections are mainly with Global North countries' international airports. The lack of direct air transport connections between Global South countries reduces the potential for people-to-people exchange, making travel between Global North and South more accessible.

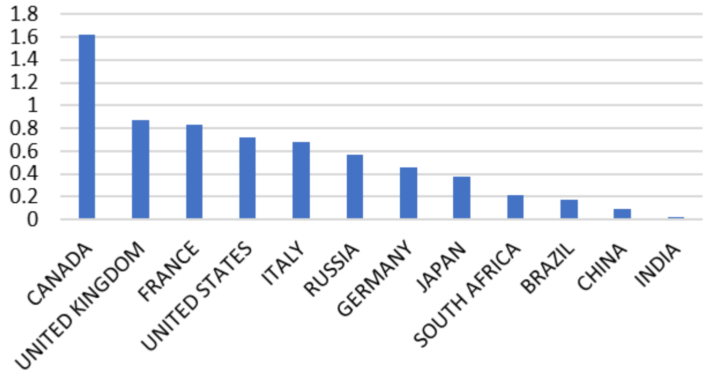

Figure 1: Number of International Airports per Millions of People

Source: Data Adapted from World Bank, 2023

Analysing the amounts spent and received concerning international tourism activities by the G7 and BRICS countries shown in Figures 2 and 3, it is possible to see that the G7 countries handle 56% of expenditures on international tourism and get around 84% of total revenue from activities related to international tourism. The unbalance shows the need for improvements in understanding people's reasons for spending much more resources in the Global North than in the Global South. Further research about media, infrastructure, business strategy, and other related topics may help Global South countries to improve their international tourism, considering Global South countries' partners.

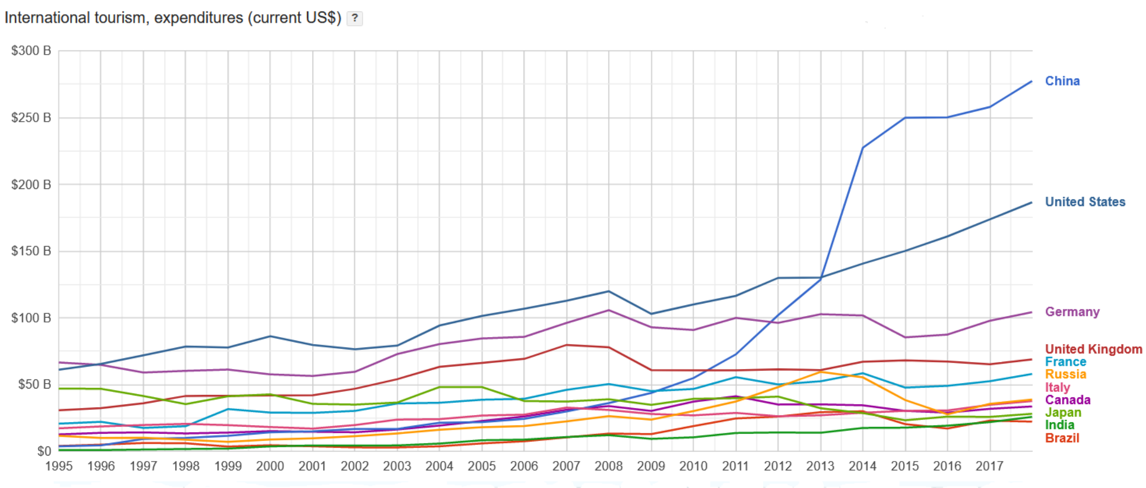

Figure 2: Expenditure on International Tourism: G7 and BRICS Countries

Source: World Bank, 2023

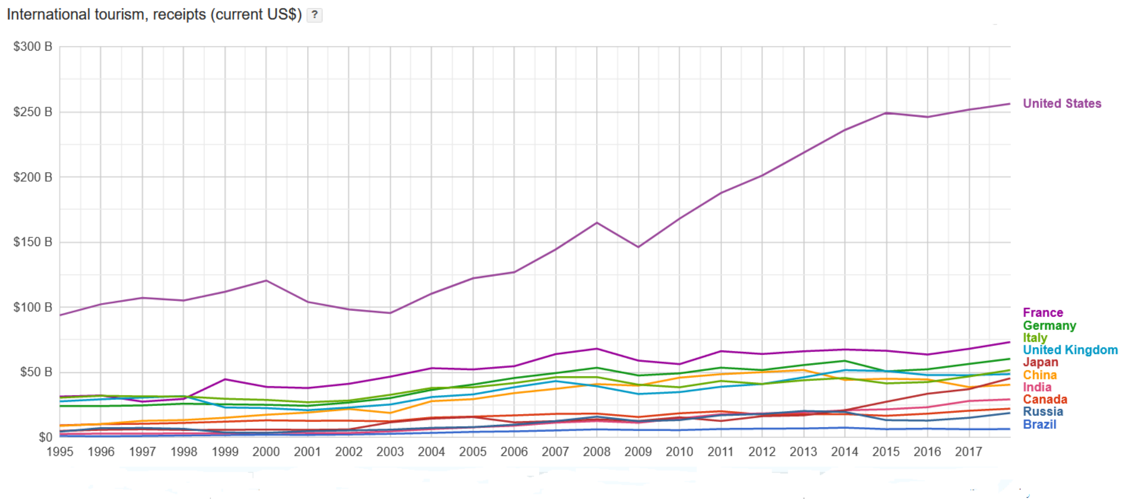

Figure 3: Receipts from International Tourism: G7 and BRICS Countries

Source: World Bank, 2023

Considering the number of seats available in 2019 on direct flights between BRICS and G7 countries, it is possible to see in Figure 4, that the number of seats on flights from BRICS countries to G7 countries corresponds to 68,049,553, about 89% of the total seats. The number of seats available on flights between BRICS countries was 7,693,155, with only 11% of the total seats. Considering that one of the BRICS arrangement pillars is "people-to-people exchange and cultural integration," this feature shows the need for deepening the knowledge about what makes people choose the destination and what we can do to improve the international air transport between Global South countries.

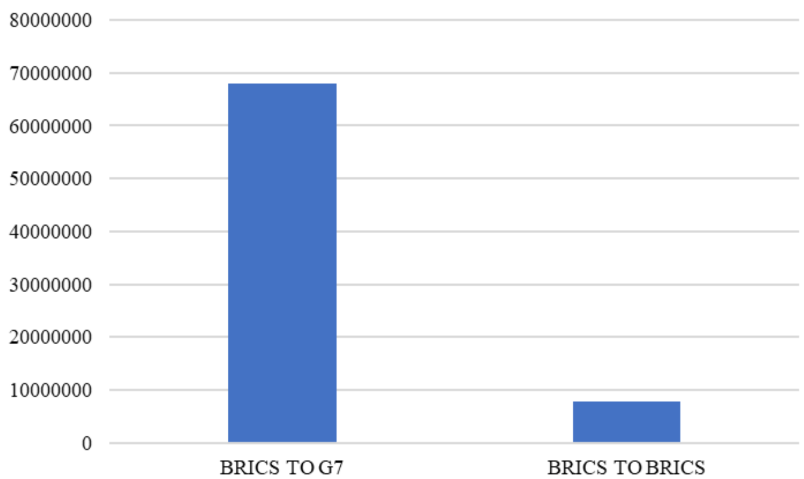

Figure 4: Total Number of Seats Available in 2019 for Flights between G7 and BRICS Nations

Source: Data adapted from World Bank, 2023

These few features, having BRICS and G7 countries as examples, show an unbalanced global scenario between Global North and Global South countries. This paper explores measures around air transport related to the BRICS in the direction to air transport sustainability in this unbalanced scenario.

ICAO basket of measures to reduce CO2 emissions and the implementation of GANP operational measures on the BRICS countries

Several international agreements seek to mitigate GHG emissions. Among them, the Kyoto Protocol and the Paris Agreement stand out. They consider principles of justice. Countries with higher per capita GHG emissions may contribute more to emission reductions. Paris Agreement signatory countries must address the problem of greenhouse gas emissions from their domestic aviation activities through Nationally Determined Contributions (NDC). On top of all, the GHG emissions reduction by International Civil Aviation is the responsibility of ICAO (Gössling; Humpe, 2020).

ICAO Basket of Measures to Reduce CO2 Emissions

The development of CORSIA by ICAO complemented the basket of measures to offset the amount of CO2 emissions not reduced through operational and technological measures and the use of sustainable fuels. The implementation of CORSIA, which is a market-based measure, is taking place in three phases, and entry into the program will be mandatory from 2027 for all States that have a share of 0.5% of the world's revenue tonne kilometer (RTK) or that are part of the 90% of RTK accumulated globally. The expectation is that this program will last until the year 2035 when the production of alternative fuels will scale and be used ostensibly in aviation. Currently, 115 countries have joined CORSIA (ICAO, 2022b).

The operational measures proposed by ICAO are related to optimizing operational procedures, and air traffic management (ATM) measures to reduce GHG emissions (Lyle, 2018). The Global Air Navigation Plan (GANP) contains most of the existing operational measures and will be available soon. The operational implementations in the GANP aim to achieve an interoperable global navigation system that guarantees acceptable levels of operational safety and ensures more environmentally sustainable and economical operations. ICAO estimates that GANP implementations will generate an emission reduction of millions of tons of CO2 (ICAO, 2019b).

The availability of resources by the States and their operational needs will guide the implementation of operational measures. Additionally, multisectoral plans and agreements between various public and private stakeholders are required, such as regulatory bodies, aircraft operators, air navigation service providers, and aircraft manufacturers (ICAO, 2019b). However, the straightforward implementation of operational measures *per se* does not guarantee the reduction of CO2 emissions because as air traffic grows, congestion levels intensify, ATM efficiency decreases, and GHG emissions intensify due to increased fuel consumption by the aircraft. This decrease in efficiency is especially true around airports with a high volume of arrivals and departures, inside terminal airspaces, and along congested flight corridors. Therefore, in addition to operational measures, ATM efficiency should be optimized by implementing performance monitoring mechanisms with defined goals for each flight›s phases (ICAO, 2014).

The implementation of technological measures is essential for the reduction of CO2 emissions by aviation. Extraordinary advances have been taking place over the last few decades. About 80% of the aircraft in operation are more efficient in fuel consumption per passenger kilometer than the aircraft in operation in the 1960s. The ongoing advances include engines that improve the bypass ratio and lighter and more heat-resistant materials to compose the aircraft fuselage. In addition, advances in electric and hybrid aircraft technology will allow for lower consumption of fossil fuels and, consequently, a reduction in CO2 emissions (ICAO, 2022a). Although technological measures contribute significantly to reducing emissions, their costs are high, and incorporating these technologies in aircraft fleets may take time (Hasan et al., 2021). As for measures associated with using SAF, they are the most important for reducing CO2 emissions by aviation. However, although technologies for producing these fuels are already available, they are produced in small quantities, and the production costs still need to be lowered. Producing SAF on a scale can mitigate environmental issues and improve social and economic issues in developing countries, as long as this production does not impact food security (ICAO, 2022a). According to a conservative but optimistic point of view, about 5.7% of all arable land in 2050 will be available for biofuel production worldwide, which will be enough to supply about 92% of the estimated demand for 2100 (da Cunha Dias et al., 2021). However, to promote an increase in SAF production, it is necessary to promote the use and regulation, through policies and laws, in addition to financial and technical support from governments, for the production and certification of these fuels (ICAO, 2022a).

Regarding market measures, CORSIA stands out as a relatively simple global compensation scheme for emissions related to international air transport. In its original conception, the emissions baseline would be the measurements undertaken in 2019 and 2020. However, due to the drastic reduction in flows related to international air transport, ICAO readjusted CORSIA by removing measurements from the emissions baseline relating to 2020, considering only those relating to 2019 (Zhang et al., 2021). However, the program may last until 2035, when SAF production will likely scale and production costs will be significantly reduced, making its use viable in international air transport (Lyle, 2018). None of the BRICS countries volunteered to enter the program's first phase. However, except for South Africa, the other BRICS countries will enter the mandatory phase of the program as they are part of 90% of the (revenue tonne-kilometers) accumulated in the world. Figure 5 shows the participation of countries in CORSIA.

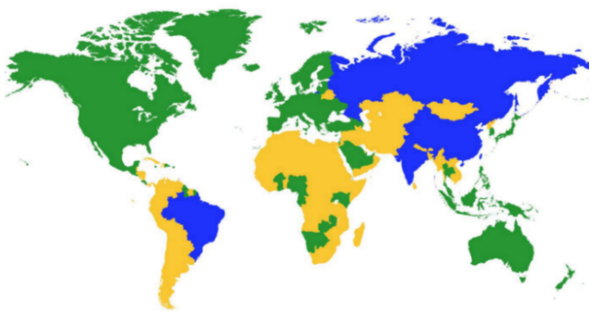

Figure 5: Countries Participating in CORSIA's First Phase (green), Second Phase (blue), and Non-Participants Countries (yellow)

Source: ICAO, 2023

In CORSIA, each country is responsible for monitoring, verifying, and reporting its operators' offset data and emissions. Some countries, particularly developing countries, however, feel that the principles of carbon-neutral growth should not apply to them. There is also some apprehension in the aviation community that existing restrictions due to inadequate or inefficient air transport infrastructure added to new environmental restrictions may severely restrict the growth of the air transport sector in these countries (Lyle, 2018). Adequate air transport infrastructure favors the movement of people and goods between different regions. So, restrictions that limit the growth in the number of international flights in developing countries will also impact the development of air transport infrastructure in these countries and, consequently, their economic growth (Polyzos; Tsiotas, 2020).

It is important to note that according to a 2022 IPCC report, more than the implementation of CORSIA is necessary to effectively reduce CO2 emissions and achieve the targets defined by the Paris Agreement. To achieve the aspirational goals of neutral carbon growth, the CORSIA eligibility criteria need to be improved, and airlines need to be encouraged to invest more in technologies that will allow the reduction of emissions (Wonzy et al., 2022). The ICAO Council is currently reviewing the feasibility of developing a Long-Term Aspirational Goal (LTAG) for international aviation. This analysis considers an assessment of proposed targets considering impacts on the growth of countries and the costs of their implementation for the States (ICAO, 2018). A working group composed of professionals from all over the world and of recognized competence is gathering information from internal and external sources for ICAO. This work will help identify and evaluate existing, planned, and innovative operational, technological, and SAF use measures in international air transport that may contribute to reducing CO2 emissions. Based on this collected information, the ICAO specialists will create scenarios combining technological, operational, and use of SAF measures to analyze the data and make forecasts of future demands, considering the target of increasing energy efficiency by 2% per year and carbon neutron growth from 2020. The specialists will also estimate the costs and economic impacts of implementing the measures mentioned above on the growth of the air transport sector, especially for developing countries (ICAO, 2022c).

The development of GANP and the Implementation of Operational Measures by BRICS Countries

After the end of World War II, civil aviation began a vertiginous expansion, especially in the United States. Aircraft became bigger and faster. As a result, it became necessary to incorporate new technologies to allow air traffic control to maintain an efficient and safe flow of aircraft (Wickens, Mavos, and Mcgee, 1997). However, in Europe and the rest of the world, the regulation of the air transport sector was very rigid, and airlines needed government subsidies to function, which made the civil aviation market commercially inefficient and uncompetitive, favoring the formation of cartels (Dobson, 2017).

The American liberal wave strengthened in the late 1990s and influenced aviation markets worldwide. New airlines and international routes emerged in the European Union, and airports began privatizing (Singh, 2019). Due to these changes, the growth of European air transport activity was very intense. However, the challenge arose to integrate European airspace to make air traffic management more efficient and reduce frequent delays (Dobson, 2017).

The air transport industry then grew more intensely than most other industries. Because of this, the ICAO Council created the FANS Committee (Future Air Navigation Systems) to study, identify, and evaluate new technologies with potential use in civil aviation and to make recommendations for future developments in air navigation for the next 25 years. The works developed by this Committee were the basis for developing the Global Air Navigation Plan (GANP). This plan consists of recommended implementations of new technologies and operational concepts intending to create the most homogeneous and interoperable global airspace possible (ICAO, 2002). The implementations recommended in this plan are related to the Air Traffic Management area. Its implementation methodology consists of gradual and harmonized implementations that allow for achieving greater global harmonization, increasing the capacities of airports and airspace, and simultaneously reducing environmental impacts (ICAO, 2019b).

All the BRICS countries develop implementations of operational measures foreseen in the GANP. The Ministry of Transport of Russia and South Africa, the Airport Authority of India, the Civil Aviation Administration of China, and the Department of Airspace Control in Brazil (DECEA) carry out several initiatives.

Implementation of Operational Measures on the Air Transport in Brazil and CO_2 Emissions Reduction Estimates

In Brazil, the Department of Airspace Control (DECEA) regulates civil aviation activities regarding the use of airspace. In 2012, DECEA created the SIRIUS Program, aligned with GANP, to present a strategic vision for the evolution of the National Air Traffic Management Systems (ATM) to meet the local peculiarities. Several projects contemplate the implementation of airside operational measures. Among them are the Optimization of the National Airspace, Evolution of Air Traffic Flow Management, and Flexible Use of Airspace (DECEA, 2022). Regarding the National Airspace Optimization project of the SIRIUS Program, Brazil implemented and continues to implement the performance-based navigation concept (PBN). This concept envisages the use of Global Satellite Navigation Systems (GNSS) and systems embedded in aircraft that allow them to fly freely between any coordinates, allowing more direct and efficient routes with this, a reduction in CO_2 emissions (ICAO, 2016).

Along with PBN, implementing two other concepts is frequent: Continuous Climb Operations (CCO) and Continuous Descent Operations (CDO). They consist of the elaboration of PBN arrival and departure procedures that allow aircraft to climb and descend without stopping in intermediate steps, whenever possible, using engine thrust and speed regimes that reduce fuel consumption and, consequently, CO_2 emissions. (ICAO, 2019a). Although little data refers to actual flights that perform arrival trajectories with CDO in the literature, there is a consensus understanding that descent trajectories with greater angles of descent are more efficient for reducing fuel consumption. Some data show a strong correlation between the fuel flow of aircraft in general and the angle of descent when it varies between 2.5° and 3.0°. However, an opposite correlation trend occurs for greater descent angles, and the fuel flow decreases (Turgut et al., 2018).

As for the concept of CCO when applied in airport departure procedures, accurate data from operations demonstrate a reduction of up to approximately 30% in fuel consumption due to the non-leveling of the aircraft in intermediate segments that allow the use of optimal powers and speeds until they reach cruising levels (Villegas Díaz et al., 2019). Despite the individual advantages of applying the concepts of CCO and CDO, their joint use needs to be carefully analyzed, especially for congested airports. It is crucial to ensure an optimal distribution between procedures using the CDO and CCO concepts to reduce impacts on airport capacities (Pérez-Castán et al., 2018). In Doc 9988, "Guidance on the Development of States' Action Plan on CO_2 Emissions Reduction Activities," ICAO presents a methodology that makes it possible to estimate the reduction in CO_2 emissions from implementing operational measures. This methodology allowed calculating the estimate of CO_2 emissions reduction obtained by the implementation of operational measures contemplated in the projects of the SIRIUS Program, considering the year 2021 as a base.

The calculations required using an estimate of aircraft fuel consumption and the annual movement of aircraft at airports with airside operational measures implemented. The information about the status of the implementation of operational measures in the Brazilian aerodromes is available on the website AISWEB. CGNA provided the number of airport movements in the year 2021. Calculations of CO_2 emission reduction estimates considered the variety of aircraft operating in Brazilian airspace and, due to this, vary between low and high ends. Several operational measures implemented in Brazil, provided for in the GANP, have a calculation methodology established in Doc 9988 and contribute significantly to reducing CO_2 emissions. These operational measures are Continuous Descend Operations (CDO), Continuous Climb Operations (CCO), Standard Terminal Arrival Routes (STAR), Performance Based Navigation - Standard Instrument Departures (PBN-SID), Radius to Fix PBN Procedures, Required Navigation Performance Procedures – Authorization

Required (RNP-AR). The implementation of all these measures is within the scope of the National Airspace Optimization project.

One hundred fifty aerodromes have implemented PBN departures associated with the CCO concept. In 2021, at these aerodromes, there was an approximate movement of 1.25 million aircraft departures. The calculations pointed to a fuel consumption reduction between 90,000 and 187,000 tons, according to the rules of thumb shown in Table 1 (considering that in all aerodromes, 80% of the departure aircraft performed CCO and 100% flying PBN SID). Multiplying these values by 3.16 (the conversion factor), it is possible to find the mass of CO2. Based on the mass of fuel, the estimated reduction in CO2 emissions is between 284,000 and 590,920 tons of CO2.

Table 1: Rule of Thumb for CCO and PBN SID Fuel Consumption Reduction Estimation Calculations

Measure	Rule of thumb	Example
Measures to improve fuel-efficient departure and approach procedures: CCO (CAEP/10 Report 2016)	Use IFSET or FS= 90 – 150kg (0.09 – 0.15 tonnes) of fuel number of CCOs	A State averages 2.000.000 flights per year. Currently, 50 of its airports offer CCO, which accounts for approximately 20.000 departure movements. Expert judgment estimates that CCO is performed by 80% of the departures, a total of 160.000 departure movements. The annual savings can be estimated as: - 0.09 * 160.000 = 14.400 tonnes of fuel saved (low-end range) - 0.15 * 160.000 = 24.000 tonnes of fuel saved (high-end range)
Measures to improve fuel-efficient departure and approach procedures: PBN SID (CAEP/10 Report 2016)	Use IFSET or FS = 0kg to 30kg of fuel (0 to 0.03 tonnes) * number of departure movements on PBN SID	A State averages 1.000.000 flights per year. Currently, 50 of its airports have implemented PBN SID which is estimated to be used by 200.000 departure movements. Expert judgement is that 100% of these departures fly PBN SID. The annual savings can be estimated as: - 0.0 * 200.000 = 0 tonnes of fuel saved (low-end range) - 0.03 * 200.000 = 6.000 tonnes of fuel saved (high-end range)

Source: Author

Thirty-three aerodromes have implemented PBN STAR associated with the CDO concept. STAR is aircraft arrival trajectories for aerodromes with a considerable volume of traffic. The total movement of aircraft approaching these aerodromes was approximately 892,460 in 2021. Based on the rules of thumb in Table 2, the estimated reduction in fuel consumption was between 36,590 and 63,364 tons of fuel, which, based on the already-mentioned factor, generates an estimated reduction in CO2 emissions between 115,624 and 200,230 tons (considering that in all aerodromes 35% of the arriving traffic movement perform CDO and 100% perform PBN STAR).

Thirteen aerodromes in Brazil have PBN arrival procedures associated with radius to fix sections, consisting of circumference arcs that tend to reduce the number of miles flown by aircraft. The total movement of arrivals to these aerodromes in 2021 was 389,980. The estimated calculation of fuel consumption reduction, using the rule of thumb of Table 3, is between 11.738.413 and 23.301.335 tons of fuel, which, multiplied by the factor 3.16, results in CO2 emissions reduction between 37.093.385 and 73.632.219 tons of CO2 (considering 50% of arrivals at all airports fly this approach procedure and the breakdown of traffic at all airports 10%, 80% and 10% in relation to small, medium and heavy aircraft).

Table 2: Rule of Thumb for CDO and PBN STAR Fuel Consumption Reduction Estimation Calculations

Measure	Rule of thumb	Example
Measures to improve fuel-efficient departure and approach procedures: CDO (CAEP/10 Report 2016)	Use IFSET or FS= 60kg (0.06 tonnes) of fuel number of CDOs	A State averages 1.000.000 flights per year. Currently, 10 of its airports offer CDO, which accounts for approximately 4.800.000 arrival movements. Expert judgment estimates that CDO at these airports is performed by 100% in off-peak hours, which accounts for approximately 35% or 1.680.000 traffic movements. The annual savings can be estimated as: - 0.06 * 1.680.000 = 100.800 tonnes of fuel saved
Measures to improve fuel-efficient departure and approach procedures: PBN STAR (CAEP/10 Report 2016)	Use IFSET or FS = 20kg to 50kg of fuel (0.02 to 0.05 tonnes) * number of arrivals on PBN STAR	A State averages 1.000.000 flights per year. Currently, 50 of its airports have implemented PBN STAR which is estimated to be used by 250.000 arrival movements. Expert judgment is that 100% of these departures fly PBN STAR. The annual savings can be estimated as: - 0.02 * 250.000 = 5.000 tonnes of fuel saved (low-end range) - 0.05 * 200.000 = 12.500 tonnes of fuel saved (high-end range)

Source: Author

Table 3: Rule of Thumb for Radius to Fix PBN Procedures Fuel Consumption Reduction Estimation Calculations

Measure	Rule of thumb	Example
Implementation of radius to fix PBN procedures	Use IFSET or FS= [(Total movements * 0.1 * fuel savings for small aircraft (11 – 40kg)) + (total movements * 0.8 fuel savings for medium aircraft (62 – 121 kg)) + total movements * 0.1 * fuel savings for heavy aircraft (95 – 187 kg))] * 0.5	An airport with 100.000 arrival movements is planning to implement radius to fix procedures. It is assumed that 50% of arrivals to this airport will fly this approach procedure. Procedure. The breakdown of traffic at this airport is estimated to be: 10%: 80%: 10% in relation to small: medium: heavy aircraft. The annual fuel savings can be estimated as: - ((100.000 * 0.1 * 11 kg) + (100.000 * 0.8 * 62 kg) + (100.000 * 0.1 * 95 kg)) * 0.5 = 3.010 tonnes of fuel saved (low end range) - ((100.000 * 0.1 * 40 kg) + (100.000 * 0.8 * 121 kg) + (100.000 * 0.1 * 187 kg)) * 0.5 = 11.950 tonnes of fuel saved (high end range)

Source: Author

Finally, twelve aerodromes in Brazil have RNP AR APCH-type arrival procedures, which are PBN arrival procedures that require special authorizations for their execution by aircraft crews due to particular characteristics. The total number of aircraft arrivals using these procedures in 2021 was 376,343. Based on the rules of thumb in Table 4, we arrive at an estimate of fuel consumption reduction between 358,466 and 442,203 tons, which from the conversion factor provides an estimate of CO2 emissions reduction between 1,132,754 and 1,397 .362 tons of CO2 (considering 50% of arrivals at all airports fly this approach procedure).

Table 4: Rule of Thumb for RNP AR APCH Procedures Fuel Consumption Reduction Estimation Calculations

Measure	Rule of thumb	Example
Implementation of RNP AR APCH procedures for reducing approach minima and the possibilities of missed approach/diversion	Use IFSET or FS= total arrival movements * 0.5 * 0.005 * fuel savings (381 – 471 kg)	An airport with 100.000 arrival movements is planning to implement an RNP AR APCH procedure. It is assumed that 50% of arrivals to this airport will fly this approach procedure. It is estimated that in the event of a missed approach or diversion the average extra fuel burn used ranges from 381 – 470 kg. It is assumed that the minima are sufficiently reduced to require an aircraft to carry out a missed approach or diversion in 0.005 operations. The annual fuel savings can be estimated as: - 100.000 * 0.5 * 0.005 * 381 kg = 95.25 tonnes of fuel saved (low end of range) - 100.000 * 0.5 * 0.005 * 470 kg = 117.5 tonnes of fuel saved (high end of range)

Source: Author

Therefore, in 2021, the estimated reduction in CO2 emissions due to the implementation of airside operational measures in Brazil was between 37.8 and 75.8 million tons. However, it is essential to emphasize that the estimates mentioned above and presented in Figure 6 only include operational measures associated with aerodromes and do not include those associated with the airspace itself. So, operational measures such as the Flexible Use of Airspace (FUA) and Direct Routes, among others, were not included in the calculations. They also do not include operational measures associated with aerodromes but which do not contribute significantly to the reduction of CO2 emissions because they have yet to be implemented on a large scale, being present only in a few airports. Among these measures, we can highlight the Arrival Manager (AMAN), Airport Collaborative Decision-Making (ACDM), and Automatic Dependent Surveillance-Broadcast (ADS-B).

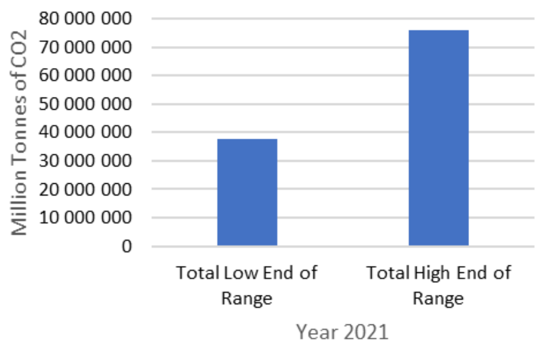

Figure 6: Total CO2 Emissions Reduction Estimate from Operational Measures in the Year 2021

Source: Author

Discussion and conclusions

The CO2 emissions from all air transport worldwide account for only 2% of total emissions, considering all other sources. However, its effects are enhanced as these emissions occur at high altitudes. These impacts will probably increase, given that despite the impact of the COVID-19 pandemic on air transport activity worldwide, its growth will be exponential in the long term. Reducing GHG emissions is possible by implementing operational, technological, and market measures and using SAF. However, each of these measures has peculiar characteristics that can facilitate or hinder their implementation.

Implementing technological measures and using sustainable fuels have the most significant potential for reducing CO2 emissions. However, technological measures have a high implementation cost, and their incorporation into aircraft fleets takes a long time. Using SAF strongly depends on reducing associated production costs and developing a supply chain that allows its production to scale. As for market measures, ICAO launched CORSIA, which comprises a global compensation scheme to reduce CO2 emissions from air transport, establishing as a baseline the number of international flights carried out in each State between 2019 and 2020. Because of the COVID-19 pandemic, ICAO decided only to consider flights performed in 2019 to form the baseline. The implementation of operational measures is worldwide, as they appear in the Global Air Navigation Plan that guides their implementation in ICAO signatory countries.

The BRICS countries, primarily members of the ICAO Council, have been implementing several operational measures that increase the efficiency of air transport operations. The Ministry of Transport of Russia and South Africa, the Airport Authority of India, the Civil Aviation Administration of China, and the Department of Airspace Control in Brazil (DECEA) carry out several based on their national plans inspired by GANP. The increase in efficiency caused by the implementation of operational measures generates a reduction in fuel consumption and, consequently, in CO2 emissions.

The article presented an estimate of the reduction in CO2 emissions in Brazil in 2021 due to the operational implementations made by DECEA on the air side associated with several aerodromes in the country, based on the methodology established by ICAO that uses the annual number of movements at the aerodromes where these operational measures were implemented and allows calculating the estimated fuel savings obtained and, consequently, the estimated reduction in CO2 emissions. These operational measures generally result in more continuous climb and descent trajectories and more direct cruise flights, in addition to increasing the accessibility of airports in bad weather conditions, which prevents aircraft from performing holdings in the airspace, emitting CO2, while awaiting improvements in these conditions.

Considering CORSIA and the BRICS countries, only South Africa volunteered to participate in the pilot phase and the scheme's first phase. However, except for South Africa, all other BRICS countries must participate in the second phase of CORSIA in 2027, as they are part of 90% of the RTK accumulated in the world unless they present a difference to ICAO that justifies their non-participation. Since the air transport infrastructure development and the increase in flights can promote economic growth and social inclusion, schemes such as CORSIA may constrain growth strategies in developing countries, such as BRICS countries, by raising the operational costs of the air transport systems, which already need more and sometimes adequate infrastructure.

Some strategies could be adopted to mitigate the effects of CORSIA on the development of air transport. The BRICS countries impacted by these measures could, together, present the so-called difference to ICAO, justifying their non-participation in the compulsory phase of the scheme due to evident inequalities between the air transport systems of the Global South and the Global North. In return, these countries could promote policies to encourage the production and use of SAF, as well as increase investment in the implementation of operational measures that align with the "United Nations' sustainable development goals.

It is necessary to consider alternative measures to achieve the efficiency of operations and reduction of GHG emissions in these countries through evaluations based on the efficiency of operations and not on the volume of emissions generated. With this, it will be possible to allow a sustainable expansion of air transport activities in the BRICS countries, favoring their economic growth. In addition, expanding the air transport infrastructure in these countries and assuring favorable conditions for people to spend their resources on them will foster tourism activities and economic growth.

As mentioned, there is a big difference between the air transport infrastructure and connectivity of G7 and BRICS countries. The number of international airports per million inhabitants in the BRICS countries is lower than in the G7 countries, except for Russia, which has a higher number than Japan and Germany. Additionally, observing the expenditures and receipts related to international tourism activities among the BRICS and G7 countries, it is possible to notice that while the G7 nations handle 56% of expenditures on international tourism, they receive about 87% of total revenue. The seats made available in 2019 between direct flights from the BRICS countries to the G7 countries were almost ten times greater than those made available for direct flights between the BRICS countries themselves. Thus, there is evidence of a preference by populations of the BRICS countries to take tourist trips to the G7 countries to the detriment of trips to other BRICS countries.

However, increasing the number of airports in BRICS countries to accommodate more flights will not promote economic growth per se. Visitors must have favorable conditions to spend resources on goods and services in these countries. We must consider that demand for air transport is associated not only with the accessibility and price of services but also with changes in society's consumption patterns and GDP growth. It is noteworthy that even if consumption patterns change and more people can travel, they prefer to travel to countries in G7 nations or other destinations in developed countries rather than BRICS and other developing countries. The migration patterns in international tourism activities are related to historical ties between metropolises and colonies, and due to this, outbound tourism from BRICS to the Global North is more significant than outbound tourism among the countries of the block. The change in these preferences may involve the adoption of policies among the BRICS countries to promote international tourism activities among them, as well as actions to build human capital and maintain environments conducive to attracting tourists both from other BRICS countries and from other countries around the world.

Furthermore, it is necessary to disseminate a more positive image of BRICS countries, highlighting their natural beauties and other attractions. It should be noted, however, the importance of promoting sustainable tourism without generating impacts that degrade the environment and destroy the social fabric, especially in small and more isolated locations. It is also important to highlight that the economic growth process would be even more effective if the BRICS countries promoted outbound tourism between themselves, encouraged by establishing a preferential visa regime and through cooperation programs for workforce training and technology transfer, among other actions.

Future studies should consider more advanced techniques that use specific tools and systems to obtain more precise estimates on the reduction of CO2 by Brazilian air transport based on more accurate operational data since these calculations, in addition to simplifications of reality, only considered some airside operational measures implemented in Brazil associated with aerodromes. Other operational measures not directly associated with the aerodromes but with portions of airspace, such as Direct Routes and Flexible Use of Airspace, were not considered. It is essential to highlight that the calculated CO2 emissions reduction is a reasonable approximation of the benefits associated with airside operational measures. It is essential in addition to analyze why the population of the BRICS nations are not interested in traveling to other BRICS countries and try to find out ways of promoting international tourism activities inside the arrangement. Finally, it is important to expand the analysis of the feasibility of creating a Global South Air Transport Belt including the new countries that are joining the BRICS.

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Comparing Factor Models in the Indian Stock Market

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Abstract

Which factor model better explains portfolio return variation in India? This study compares the Fama French Three Factor Model, Carhart Four Factor Model & Fama French Five Factor Model in the Indian Stock Market. S&P BSE 100 index companies are studied over 16 years, i.e., April 2005 to June 2021. Four fundamentals & a momentum variable (Market Capitalization, P/B ratio, past performance, Profitability & Investment) based factor mimicking portfolios had been formed using the Fama French (1993, 2015) & Carhart (1997) Methodology. Portfolios for dependent variables were formulated using a double-sorting process keeping the Size factor conditional. The degree of multicollinearity is required to be checked & hence VIF test is conducted before regression analysis. It was found that the Carhart Four-factor model performs better compared to the other two models. Findings of the study can be useful to fund managers, managers, investors & traders in selecting stocks for portfolio management, trading & risk management.

Keywords: Size, Value, Momentum, Profitability, Investment.

Introduction

Asset pricing models developed so far have aspired to explain the returns completely. However, various versions of asset pricing models have not been able to. The pioneering work in the same line is the capital asset pricing model by Mossin (1966), Sharpe (1964), & Lintner (1965) which is a single index model. Following the development of CAPM, many researchers & practitioners found that there are other factors beyond the market return which led to the development of multi-factor models. Fama & French (1993) developed the three-factor model adding size & book to market equity as explanatory variables which is the extension of CAPM. The Fama-French model aims to describe stock returns through three factors: (1) market risk, (2) the out-performance of small-cap companies relative to large-cap companies (size), and (3) the out-performance of high book-to-market companies versus low book-to-market companies (Value).

A few years later, Carhart (1997) put forth a momentum anomaly cum strategy which was later incorporated as the fourth factor in Fama French Three factor model. It is also known in the industry as the MOM factor (monthly momentum). Momentum in stock is described as the tendency for the stock price to continue rising if it is going up and to continue declining if it is going down. The MOM can be calculated by subtracting the equal-weighted average of the lowest-performing firms from the equal-weighted average of the highest-performing firms, lagged one month (Carhart, 1997).

In 2015, Fama French again extended the three-factor model by adding profitability & investment as two more explanatory variables. Similar to the Three-factor model, the Five-Factor model is an empirical asset pricing model. The empirical tests of the five-factor model aim to explain average returns on portfolios formed to produce large spreads in Size, B/M, profitability, and investment. (Fama and French, 2014).

This study compares the asset pricing models, namely, Fama French Three, Five-factor models & Carhart Four Factor model in the Indian Stock Market & will try to answer which model better explains the security returns in the Indian stock market. Moreover, findings will be useful in making well thought out informed decisions to maximize return with minimum possible risk. Moreover, it is an effort to contribute to the body of knowledge of fundamental factor models for asset pricing.

Literature review

There is dearth of research regarding comparison of Factor Models covered in the study. Majority of the studies compared Fama French Factor model with CAPM. Maheshwari & Dhankar (2014) supported the multi-dimensional nature of risk and suggested the application of multi-factor asset pricing models for consideration in investment decisions. Fama and French three-factor model was found superior to the traditional one-factor CAPM. Singh & Yadav (2015) found that the five-factor model performed better than the other models for the portfolios formed on investment. However, except for cases in which portfolios are formed on investment, the four-factor model (without an investment factor) is parsimonious. Arora & Gakhar (2019) found that the three-factor model performed better than the other models in elucidating average stock returns. The majority of the studies confirm size & value as significant factors in detecting expected returns variation.

Methodology & Models

Data

The study uses constituents of S&P BSE 100 as a sample, traded over the period 1st April 2005 to 31st June 2021. The monthly closing prices of stocks are converted into arithmetic returns & the closing value of the index into market return. The Bombay Stock Exchange (BSE) -100 index is used as the market proxy & 91-day Treasury bill yields are used as the proxy for the risk-free rate. Various company characteristics are used to form "stylized portfolios", stated below.

Methodology

For creating portfolios and factors, the methodologies developed by Fama French (2015) and Carhart (1997) have been applied. Each company has been allocated to different portfolios by using five variables every year June end. These are:

- Size: Market capitalization at each 31st March.
- Value: Price to Book ratio (P/B ratio) on each 31st March.
- Momentum: Returns of the Past 12 months calculated at the end of June each year.
- Profitability: The ratio of pre-tax profit to total book equity on the 31st March of each year.
- Investment: Change in total asset, i.e. $(A_t - A_{t-1}) / A_{t-1}$. Where A_t is the total asset at 31_{st} March of year t and A_{t-1} is the total asset at 31^{st} March of year $_{t-1}$.

Every year 30th of June, all companies are split into small (S) and big (B) size groups by taking market capitalization as a base and for which median breakpoint is used. Further, each group (small and big) gets subdivided into three subgroups: low (L), neutral (N), and high (H) by using the top 30th & bottom 30th percentile value of the P/B ratio for breakpoints. By doing 2*3 Bivariate sorting on variables the size and the P/B ratio, six portfolios are formed, i.e., SL, SN, SH, BL, BN, and BH, Where L stands for low, N for neutral & H for High. Every year from July, the monthly equally weighted return for all these six portfolios has been calculated. The same process has been repeated each year by employing bivariate sorting. In this way, we can see the impact of second sorting variables on stock returns while keeping the first sorting variable conditional. The above process has been followed to construct the portfolios based on size-momentum, size-profitability & size-investment return except the second variable sort has been done either on momentum or profitability or investment return. Portfolios based on size and momentum are SW, SN, SL, BW, BN, and BL, where W stands for the winner, N for neutral, and L for the loser. Portfolios on size and profitability are SR, SN, SW, BR, BN, and BW, where R stands for robust, N for neutral, and W for weak. Portfolios based on size and investment are SC, SN, SA, BC, BN, and BA, where C is conservative, N is neutral, and A is aggressive. Similarly, the equally weighted monthly returns for all categories of portfolios (as shown in the tables below) have been calculated.

Table 1: Size & P/B (Value)

Size	P/B Ratio (Value)		
	Low(L)	Neutral (N)	High (H)
Small (S)	SL(16)1	SN(18)	SH(13)
Big (B)	BL(12)	BN(18)	BH(15)

Source: Compiled by Author

Table 2: Size & Momentum

Size	Momentum		
	Winner(W)	Neutral (N)	Loser (L)
Small (S)	SW(15)	SN(17)	SL(14)
Big (B)	BW(12)	BN(20)	BL(14)

Source: Compiled by Author

Table 3: Size & Profitability

Size	Profitability		
	Robust(R)	Neutral (N)	Weak(W)
Small (S)	SR(6)	SN(19)	SW(22)
Big (B)	BR(22)	BN(18)	BW(6)

Source: Compiled by Author

Table 4: Size & Investment

Size	Investment		
	Conservative(C)	Neutral (N)	Aggressive (A)
Small (S)	SC(15)	SN(18)	SA(14)
Big (B)	BC(13)	BN(19)	BA(14)

Source: Compiled by Author

1 Average number of firms during the entire study period.

Explanatory variables:

- Market premium (Rm-Rf): the monthly excess return of the market portfolio.
- Small minus Big (SMB): is the monthly premium of the size factor that is the average of SMBP/B, SMBM, SMBP, and SMBI. SMBP/B is the difference between the average return of SL, SN, and SH and the average return of BL, BN, and BH. SMBM is the difference between the average return of SW, SN, and SL and the average return of BW, BN, and BL. SMBP is the difference between the average return of SR, SN, and SW and the average return of BR, BN, and BW. Similarly, SMBI is the difference between the average return of SC, SN, and SA and the average return of BC, BN, and BA.
- Low minus High (LMH): is the monthly premium of price to book factor that is the difference between the average return of SL and BL & average return of SH and BH.
- Winner minus loser (WML): is the monthly premium of the momentum factor which is the difference between the average return of SW and BW and the average return of SL and BL.
- Robust minus Weak (RMW): is a monthly premium of the profitability factor that is the difference between the average return of SR and BR and the average return of SW and BW.
- Conservative minus Aggressive (CMA): is the monthly premium of the investment factor that is the difference between the average return of SC and BC and the average return of SA and BA.

SMB, LMH, RMW, CMA, and WML (calculated as shown in Table 5) are returns of zero investment or mimicking portfolios of size, Price to book, momentum, investment, and profitability.

Table 5: Factors' Description

Factor	Formula
$SMB_{P/B}$	(SL + SN + SH)/3 - (BL + BN + BH)/3
SMB_{M}	(SW + SN + SL)/3 - (BW + BN + BL)/3
SMB_{P}	(SR + SN + SW)/3 - (BR + BN + BW)/3
SMB_{I}	(SC + SN + SA)/3 - (BC + BN + BA)/3
$SMB_{P/B\&M}$	$(SMB_{P/B} + SMB_{M})/2$
$SMB_{P/B\&P}$	$(SMB_{P/B} + SMB_{P})/2$
$SMB_{P/B\&I}$	$(SMB_{P/B} + SMB_{I})/2$
SMB	$(SMB_{P/B} + SMB_{P+}\ SMB_{I})/3$
LMH	(SL+BL)/2 - (SH+BH)/2
WML	(SW+BW)/2 - (SL+BL)/2
RMW	(SR+BR)/2 - (SW+BW)/2
CMA	(SC + BC)/2 - (SA + BA)/2

Source: Compiled by Author

Note: SMB - Small minus big; LMH - Low minus high; WML - Winner Minus Loser; RMW - Robust minus weak; CMA – Conservative minus aggressive.

Fama French & Carhart Models

The study has used time series regression modeling. The models have been explained in Table 6 & explanations of variables are in Table 7.

Table 6: Equations of the Asset Pricing Models

Model	Regression Equation
Three – Factor Model	$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + e_{it}$
Four -Factor Model	$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + w_i WML_t + e_{it}$
Five – Factor Model	$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + e_{it}$

Source: Compiled by Author

Table 7: Explanation of Variables of the Asset Pricing Models

Variables	Explanation
R_{it}	Portfolio (i) return for period t.
R_{ft}	Risk-free rate of return for period t.
R_{mt}	Market return for period t.
α_i	Intercept
$\beta_{i,} s_{i,} l_{i,} w_{i,} r_{i,} c_i$	Coefficients
e_{it}	Residual term
SMB_t	Returns on portfolios of small market capitalization securities
	minus big market capitalization securities for period t
LMH_t	Returns on portfolios of low P/B ratio securities
	minus high P/B ratio securities for period t.
WML_t	Returns on portfolios of winner securities
	minus loser securities for period t.
RMW_t	Returns on portfolios of robust profitability securities
	minus weak profitability securities for period t.
CMA_t	Returns on portfolios of conservative investment securities
	minus aggressive investment securities for period t.

Source: Compiled by Author

Correlation analysis has been used to know the association among the explanatory variables. Gujarati (2009) stated that multicollinearity is associated with degree & the assumptions of the classical linear regression model for no- multicollinearity must be tested before running regression models. The variance inflating factor (VIF) test checks the degree of multicollinearity. If VIF = 1, it implies the absence of multicollinearity & the acceptable limit is < 10. Corrective action needs to be taken if VIF >20 (St – Pierre & Glamocic, 2000).

$VIF_{k=}$

Where,

VIF_k – Varience inflating factor k,

r_{12} - correlation coefficient between factors $f_{1\,\&}\,f_2$.

All statistical tools were employed through MS Excel and SPSS using 1% & 5% levels of significance.

Analysis & Discussion

Graphical Representation of Portfolio Returns

In this section, all portfolio returns are plotted on a graph to check the returns' pattern of various factors covered in this study.

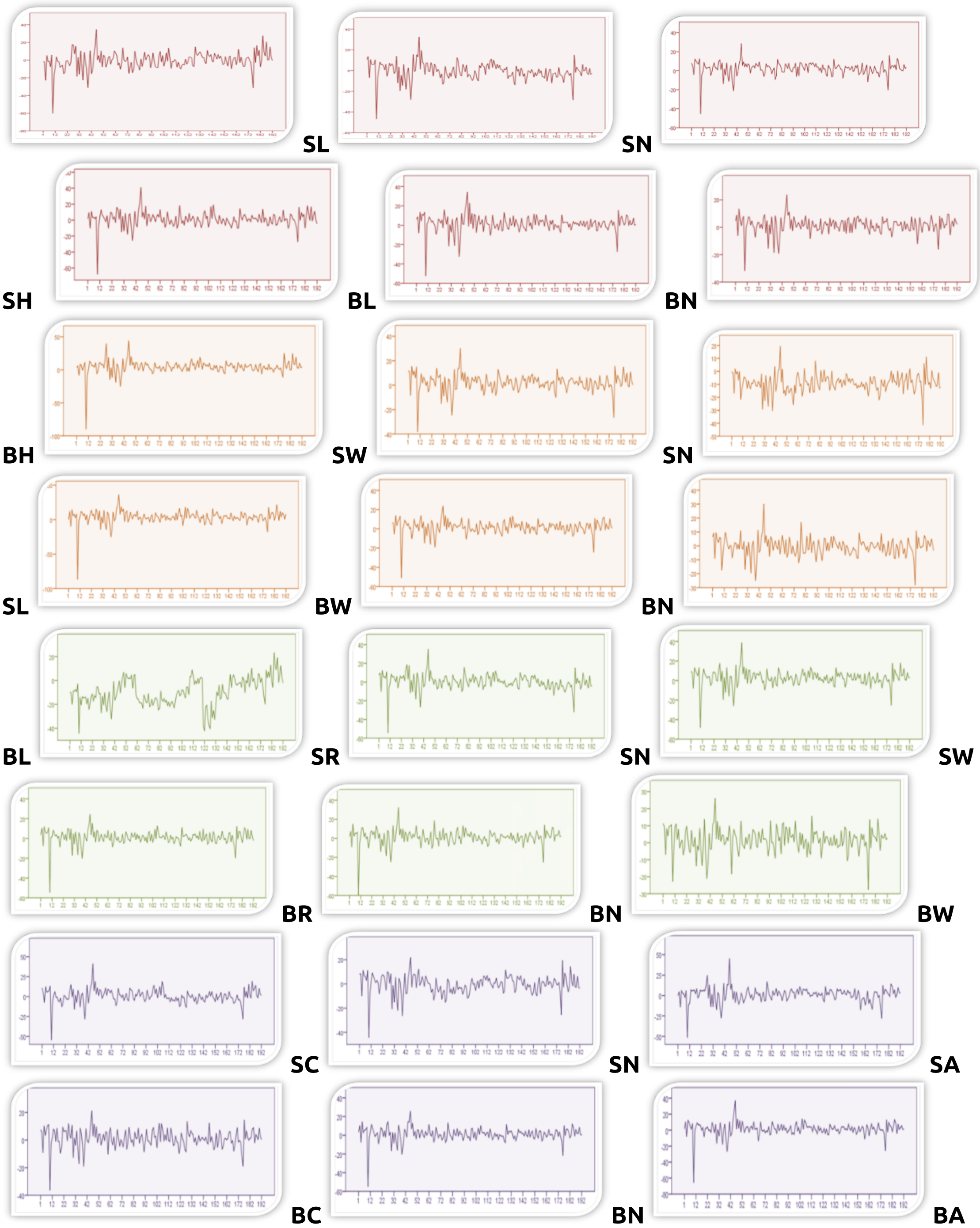

Figure 1: Graphical Representation of Portfolio Returns

The Figure 1 depicts the graphical representation of unadjusted returns on the bivariate portfolios formed based on five variables using Fama French (2015) & Carhart's (1997) methodology. The volatility in returns can be seen clearly.

Descriptive Statistics

In this section, we provided descriptive statistics of designed portfolios & all explanatory variables.

Table 8: Summary statistics on the portfolio Unadjusted Returns (Size & Value Sorted)

(July 2005 – June 2021, 192 observations)

	Min.	Max.	Mean	Std.Dev.	Skewness	Kurtosis
S/L	-0.6015	3.935	0.0153	0.3012	11.59	151.91
S/N	-0.4683	2.6714	0.0058	0.2104	10.67	136.29
S/H	-0.4534	3.8085	0.0415	0.2818	12.59	169.43
B/L	-0.6771	3.6999	0.0294	0.2829	11.46	150.17
B/N	-0.5254	2.7836	0.0300	0.2168	10.70	137.82
B/H	-0.3175	1.1334	0.0194	0.1000	6.98	81.22
Mkt	-0.2596	0.3129	0.0126	0.0670	-0.266	3.702
SMB	-0.0698	0.9327	-0.0053	0.0716	11.87	156.09
LMH	-0.2539	1.3465	-0.0081	0.1112	9.49	115.92

Source: Compiled by Author

Table 8 includes the results of unadjusted returns on Size & value sorted portfolios, Market, SMB & LMH for the entire period. Portfolio annual unadjusted returns range from 6.96% to 49.8%. Among three small-sized portfolios, only S/H outperformed the B/H portfolio. However, big-sized portfolios, viz. (B/L & B/N) outperformed small-sized portfolios on similar double sorting. B/H portfolio depicts the lowest Standard deviation with moderately high average monthly returns. S/L portfolio accounts for the highest standard deviation among all portfolios as smaller-size portfolios sorted on low Price to Book ratio inherently cover the higher risk but should provide the maximum return. Instead small sized high price-to-book value sorted portfolio could fetch the highest return. Small-sized portfolios have higher average returns than big-sized portfolios (Fama and French,1995; Connor and Sehgal 2001; and Gupta and Kumar,2007) could not be confirmed for this study. However, Portfolio returns fared well compared to market returns except the S/N portfolio. Moreover, SMB & LMH factors are providing very low negative returns with comparatively lower standard deviation. Thus, the strategy of going long on small & short on big-sized stock didn't perform as expected. The same is the case with the Value factor, i.e., buying value stocks & selling growth stocks also didn't perform as anticipated. A very high value of Skewness & Kurtosis confirms fat right skewed tail.

Table 9: Summary statistics on the portfolio Unadjusted Returns (Size & Momentum Sorted)

(July 2005 – June 2021, 192 observations)

	Min.	Max.	Mean	Std.Dev.	Skewness	Kurtosis
S/W	-0.4308	4.0073	0.0451	0.2988	12.31	164.06
S/N	-0.5448	3.3069	0.0386	0.2494	11.83	156.51
S/L	-0.5527	2.6889	-0.0385	0.2175	10.33	130.71
B/W	-0.6833	5.0158	0.0380	0.3726	12.84	173.99

	Min.	Max.	Mean	Std.Dev.	Skewness	Kurtosis
B/N	-0.3751	1.7039	0.0218	0.1397	9.08	110.98
B/L	-0.5495	2.0494	0.0222	0.1698	8.75	107.57
SMB	-0.0749	0.3993	-0.0123	0.0384	6.48	68.84
WML	-0.1307	2.1604	0.0497	0.1592	12.30	163.83

Source: Compiled by Author

Table 9 covers the results of unadjusted returns on Size & Momentum sorted portfolios, SMB & WML for the entire period. Portfolios' annual unadjusted returns ranged from (46.2) % to 54.12 %. S/W outperformed all other portfolios followed by S/N & B/W portfolios. The S/L portfolio depicts the worst result followed by the B/N portfolio. Thus, Winner portfolios carry quite better returns than looser portfolios. Stocks that have performed well in the past will generate significant positive returns over 3 to 12-month holding periods & vice versa (Jegadeesh & Titman,1993; Dr. A Balakrishnan, 2015) can be confirmed in this study. B/N portfolio depicts the lowest Standard deviation with comparatively low average monthly returns. S/W portfolio accounts for the highest standard deviation among all portfolios, providing the highest returns too. Except for the S/L portfolio, Portfolio returns are moderately higher than the market returns. Moreover, the WML factor can also fetch moderately higher returns with a comparatively lower standard deviation than the S/W portfolio. The portfolio of past winners (losers) outperformed (underperformed) the market over the sample period, and the strategy of buying recent winners and selling losers (WML) has outperformed both the strategy of buying small and selling big stocks (SMB), as well as buying low and selling high P/E stocks (LMH). A strategy that buys stocks that have performed well in the past and sells stocks that have performed poorly in the past generates significant positive returns (Jegadeesh & Titman,1993; Dr. A Balakrishnan, 2015) get verified. A very high value of Skewness & Kurtosis confirms fat right skewed tail for all the portfolios.

Table 10: Summary statistics on the portfolio Unadjusted Returns (Size & Profitability Sorted)

(July 2005 – June 2021, 192 observations)

	Min.	Max.	Mean	Std.Dev.	Skewness	Kurtosis
S/R	-0.4439	1.6911	-0.0860	0.1723	5.66	58.70
S/N	-0.5453	3.7858	0.0220	0.2859	12.01	159.28
S/W	-0.4809	3.6725	0.0441	0.2758	11.98	158.74
B/R	-0.5457	2.5802	0.0248	0.1984	11.15	146
B/N	-0.5975	3.6257	0.0308	0.2732	11.96	158.88
B/W	-0.2762	0.2823	0.0172	0.0723	-0.355	2.81
SMB	-0.1399	0.8870	-0.0309	0.0756	9.449	114.49
RMW	-0.2127	0.1582	-0.0613	0.0606	0.112	0.322

Source: Compiled by Author

Table 10 uncovers the results of unadjusted returns on Size & profitability sorted portfolios, SMB & RMW for the entire period. Portfolios annual unadjusted returns ranged from (103.2) % to 52.92%. S/W outperformed all other portfolios followed by the B/N portfolio. S/R portfolio depicts the worst result despite covering small-sized profitable companies. Small-sized profitable firms earned negative returns, whereas loss-making firms earned the highest. Big-sized profitable as well as loss-making firms produced positive returns, though the former fetched more. Moreover, the RMW factor also depicts high negative returns. Thus, the strategy of going long on robust & short on weak stock didn't perform as projected. Similar patterns have been documented in the past for the Indian stock market (Singh & Yadav,2015; Sehgal et al.,2014; Sehgal and Balakrishnan, 2013). However, a positive profitability return relationship, conditioned on the size factor, cannot be established, similar to Fama & French (2008 & 2015) & Subramaniam (2016). B/W portfolio depicts the lowest Standard deviation with low positive average monthly returns. S/N portfolio accounts for the highest standard deviation among all portfolios, though providing moderate returns only. Except for the S/R portfolio, returns are moderately higher than the market returns. A very high value of Skewness & Kurtosis confirms fat right skewed tail for all portfolios except B/W (Light left skewed tail) & RMW (light right skewed tail).

Table 11: Summary statistics on the portfolio Unadjusted Returns (Size & Investment Sorted)

(July 2005 – June 2021, 192 observations)

	Min.	Max.	Mean	Std.Dev.	Skewness	Kurtosis
S/C	-0.5459	4.3827	0.0292	0.3283	12.29	163.90
S/N	-0.4430	2.7831	0.0090	0.2157	11.15	144.71
S/A	-0.5156	3.1636	0.0263	0.2446	11.09	143.36
B/C	-0.3644	1.0980	0.0174	0.1029	5.75	64.18
B/N	-0.5486	3.3305	0.0287	0.2504	12.04	160.31
B/A	-0.6561	3.1831	0.0295	0.2439	11.30	148.30
SMB	-0.0692	0.9059	-0.0037	0.0707	11.29	144.27
CMA	-0.4329	0.1306	-0.0046	0.0487	-3.369	30.42

Source: Compiled by Author

Table 11 uncovers the results of unadjusted returns on Size & Investment sorted portfolios, SMB & RMW for the entire period. Portfolios' annual unadjusted returns range from 10.8 % to 35.4%. The B/A portfolio outperformed all other portfolios followed by S/C portfolio. B/C portfolio earned the lowest return despite covering small conservative companies. There is not much difference in small-sized conservative & aggressive company's portfolio returns. In contrast, Big-sized aggressive companies depict much better returns than conservative companies in the same size grouping. Portfolios of small stocks have higher average returns than big stocks as company investment increases. This is not the same for companies that invest aggressively. Negative returns on CMA factor signify that returns typically fall as we move from higher to lower investment sorts, showing an inverse relationship between returns and investment. A similar pattern is reported in Fama and French (2015) and Singh & Yadav (2015). Thus, the strategy of going long on conservative & short on aggressive stocks didn't perform as estimated. The B/C portfolio depicts a low standard deviation with a low positive average monthly return. S/C portfolio accounts for the highest standard deviation with the highest returns among all portfolios. All portfolio returns are higher than the market returns. The very high value of Skewness & Kurtosis confirms fat right skewed tail for all portfolios except CMA (Fat left skewed tail).

Correlation Analysis

Table 12: Correlations between the factor portfolios

	Mkt	SMB	LMH	WML	RMW	CMA
Mkt	-	0.126	0.094	0.096	-0.005	-0.064
SMB	-	-	0.849**	0.913**	0.245**	-0.617**
LMH	-	-	-	0.811**	0.246**	-0.601**
WML	-	-	-	-	0.222**	-0.650**

	Mkt	SMB	LMH	WML	RMW	CMA
RMW	-	-	-	-	-	-0.062
CMA	-	-	-	-	-	-

Note ** indicates significance at a 1% level of confidence.
Source: Compiled by Author

Table 12 shows the Correlation coefficients between the Mkt, SMB, LMH, WML, and RMW CMA factors, which serve as the independent variables in the main regression model. The correlation is significant between SMB-LMH, SMB-WML, SMB-RMW, SMB-CMA, LMH-WML, LMH-RMW, LMH-CMA, and WML-RMW&WML-CMA suggesting some overlapping amongst factors. The mkt factor is not correlated to any of the factors. RMW & CMA factors are also not correlated, which suggests that market, Profitability & Investment independently contribute to explaining the returns of portfolios.

Variance Inflating Factor

Table 13: VIF of the factor portfolios

	Mkt	SMB	LMH	WML	RMW	CMA
Mkt	-	1.01	1	1.01	1	1
SMB	-	-	3.58	6	1.06	1.61
LMH	-	-	-	2.92	1.06	1.57
WML	-	-	-	-	1.05	1.73
RMW	-	-	-	-	-	1
CMA	-	-	-	-	-	-

Source: Compiled by Author

A VIF value of 1 indicates the absence of multicollinearity. VIF value corresponding to market factor (f1) & all other factors (f2) is very close to 1. Factor combinations, except SMB & WML factors, have values less than or around 5. Hence, the rest of the factors are proving the absence of multicollinearity even at the limit of 5. SMB & WML factors have the highest VIF value. Though below the acceptable limit of 10, the applicability of these factors as independent factors simultaneously for explaining the returns of portfolios can be questionable.

Regression Analysis

This section aims to test whether hierarchical regression models can explain the wide variations in the returns of the test portfolios. We covered individual regression alphas, the coefficients, and Adjusted R-squared values to provide a more detailed picture of model performance. Several points should be highlighted when analyzing the results of the time-series regression. First, the intercepts of the time-series regressions should be indistinguishable from zero, if the asset pricing model is well-specified. Second, the slopes of the risk factors employed in the time-series regression provide direct evidence on whether they can capture common variation in stock returns. The model comparison relies on Merton's (1973) zero-intercept criterion. We employ the F-statistic of Gibbons et al. (1989), the average adjusted R^2.

Table 14: Regression Results of Fama French Three Factor Model for Double sorted portfolios' excess returns

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + {}_{si} SMB_t + l_i LMH_t + e_{it}$$

Portfolios	α	β	S	L	R2	AIC
Value						
SL	0.032**	-0.003	1.521**	1.767**	0.955**	-507.25
SN	0.015*	0.091	1.470**	0.859**	0.846**	-406.61
SH	0.057**	-0.002	2.405**	0.966**	0.912**	-402.04
BL	0.044**	0.029	1.145**	1.784**	0.921**	-420.33
BN	0.040**	0.027	0.988**	1.223**	0.846**	-399.56
BH	0.020**	0.029	0.262*	0.585**	0.662**	-540.6
Momentum						
SW	0.061**	0.086	2.296**	1.185**	0.912**	-379.45
SN	0.052**	-0.026	1.694**	1.150**	0.920**	-467.53
SL	-.029**	0.084	0.997**	1.258**	0.883**	-445.98
BW	0.060**	-0.061	2.658**	1.617**	0.909**	-287.30
BN	0.025**	0.048	0.392**	0.901**	0.799**	-512.67
BL	0.028**	0.007	0.372**	1.177**	0.821**	-460.36
Profitability						
SR	-0.082**	0.112	0.761**	0.765**	0.609**	-303.48
SN	0.038**	0.006	1.954**	1.298**	0.913**	-399.78
SW	0.059**	0.042	1.901**	1.249**	0.92**	-429.06
BR	0.034**	-0.023	0.926**	1.135**	0.873**	-466.32
BN	0.045**	-0.007	1.575**	1.404**	0.895**	-380.02
BW	0.013**	0.109	-0.445**	0.505**	0.217**	-503.52
Investment						
SC	0.048**	0.081	2.336**	1.444**	0.924**	-372.27
SN	0.019**	0.009	1.356**	1.031**	0.890**	-460.92
SA	0.038**	0.076	1.548**	1.163**	0.896**	-423.47
BC	0.018**	0.025	-0.025	0.778**	0.678**	-539.79
BN	0.042**	-0.019	1.444**	1.288**	0.896**	-414.61
BA	0.042**	0.017	1.287**	1.3**	0.873**	-386.64

Note **, * indicates significance at 1% & 5% level of confidence.
Source: Compiled by Author

According to Adrian, Etula, and Muri (2014), a good pricing model features an economically small and statistically insignificant intercept. If the null hypothesis is not rejected, the model seems to include all priced risk factors, as the intercept is not significantly different from zero. However, if the null is rejected, the model has an unexplained return, which implies that the model does not include all the priced risk factors. If all intercepts are significantly different from zero, we favor a small intercept.

From Table 14, it is clear that not a single model has an insignificant value of alpha. Thus, no model covers all priced risk factors & therefore, there is unexplained return variation in all portfolio return cases. Winner portfolios depict the highest unexplained variation, whereas size (Big) - OP (weak) sorted portfolios represent the lowest unexplained variation. Few portfolios viz. looser and Size (small) & OP (Robust), contain negative alphas indicating overestimation of returns by that model.

It is somewhat unusual that none of the coefficients of R_m-R_f in Table 14 regressions are significant at even a 5% level of significance. However, this may be because the S & P BSE 100 Index is heavily financial sector stocks Weighted. SMB representing size factor has three (Momentum neutral Portfolios & Big Conservative) insignificant coefficients out of twenty-four models. For the Size (big) Value (high) sorted portfolio, the Size coefficient is significant at a 5% level of significance. Moreover, All LMH coefficients representing the Value factor are significant too, at a 1 % level of significance. Thus, Value is the dominant explanatory variable.

Adjusted R^2 values covered in Table 14 ranged from 22% (Big/Weak) to 95% (Small/Low). Value, Investment & Momentum sorted portfolio returns are explained better by the three-factor model. The adjusted R^2 values are similar to those reported in A. Balakrishnan et al. (2018), Singh & Yadav (2015), Arora & Gakhar (2019) & other international studies (for example, Fama and French ,1993; Halliwell et al., 1999 ; Gaunt,2004). However, the pattern we document with small stock portfolios exhibiting higher adjusted R^2 than big stock portfolios is inconsistent with international evidence.

This finding reinforces the findings of literature by Connor and Sehgal (2001), Bahl (2006), Taneja (2010), Mehta and Chander (2010), Sehgal et al. (2012), Sehgal and Balakrishnan (2013), Balakrishnan (2016), Das (2015), Singh & Yadav (2015) & Sobti (2016) i.e., the three-factor model better explains the variation in returns than the single market factor CAPM in Indian stock market. Moreover, the three-factor model performs well even when the underlying portfolios are formed on variables not considered in the three-factor model.

Table 15: Regression Results of Carhart Four factor model for Double sorted Portfolios' excess returns

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + w_i WML_t + e_{it}$$

Portfolios	A	β	S	l	W	R2	AIC
Value							
SL	0.010	-0.010	0.920**	1.722**	0.438**	0.961**	-530.57
SN	-0.007	0.081	0.941**	0.786**	0.431**	0.861**	-425.62
SH	0.013	-0.001	1.155**	0.881**	0.807**	0.934**	-456.69
BL	0.008	0.048	0.066	1.675**	0.609**	0.939**	-470.47
BN	0.005	0.046	-0.017	1.122**	0.557**	0.873**	-431.15
BH	0.004	0.039	-0.169	0.516**	0.241**	0.689**	-556.11
Momentum							
SW	0.013	0.089	0.991**	1.028**	0.874**	0.945**	-468.74
SN	0.022**	-0.029	0.902**	1.069**	0.556**	0.936**	-510.60
SL	-.0.029**	0.058	1.117**	1.259**	0.085	0.884**	-446.81
BW	-0.021**	-0.017	0.195	1.417**	1.354**	0.958**	-434.48

Portfolios	A	β	S	l	W	R2	AIC
BN	0.007	0.058	-0.119	0.829**	0.287**	0.819**	-531.19
BL	0.020**	0.013	0.070	1.186**	0.143*	0.821**	-459.10
Profitability							
SR	-0.078**	0.092	0.915**	0.801**	0.013	0.606**	-300.86
SN	0	0.008	0.897**	1.204**	0.692**	0.932**	-445.49
SW	0.028**	0.034	1.096**	1.162**	0.593**	0.936**	-469.12
BR	0.002	-0.004	-0.041	1.053**	0.520**	0.899**	-510.17
BN	-0.001	0.016	0.185	1.286**	0.778**	0.925**	-443.51
BW	0.017*	0.112	-0.327	0.499**	-0.092	0.210**	-500.97
Investment							
SC	0.009	0.078	1.252**	1.371**	0.732**	0.937**	-406.28
SN	-0.001	0.001	0.838**	0.966**	0.406**	0.902**	-482.80
SA	0.014	0.068	0.921**	1.085**	0.479**	0.909**	-449.29
BC	0.008	0.037	-0.322	0.742**	0.129*	0.686**	-543.29
BN	-0.004	0.007	0.073	1.179**	0.748**	0.929**	-486.64
BA	0.003	0.035	0.160	1.192**	0.642**	0.899**	-430.69

Note **, * indicates significance at 1% & 5% level of confidence.
Source: Compiled by Author

From Table 15, it is evident that 17 out of 24 models have insignificant values of alpha & hence, these models cover all priced risk factors & therefore, there is unexplained return variation in the remaining portfolios. However, 4 out of 17 intercepts are negative indicating an overestimation of returns by the model. Moreover, 3 out of 7 models with significant alpha values also encompass negative intercept values pointing out the overestimation of returns by the model. Small Winner portfolio depicts the highest unexplained variation (lower than the highest intercept value of the Fama French Three Factor Model) whereas, the Big Winner portfolio represents the lowest unexplained variation.

None of the coefficients of Rm-Rf in Table 15 regressions are significant at even a 5% level of significance. SMB representing size factor cover 12 insignificant coefficients (Big) out of twenty-four models. Hence, the size factor in the Carhart Four Factor model cannot explain return variations of big-sized portfolios. Moreover, All LMH coefficients representing the Value factor are significant, that too at a 1 % level of significance. 3 out of 24 WML coefficients are insignificant. For Big Looser & Big Conservative portfolios, the WML coefficient is significant at a 5 % level of confidence. Thus, Value is the dominant explanatory variable.

Adjusted R2 values ranged from 21% (Big/Weak) to 96% (Small/Low). Value, Momentum & Investment sorted portfolio returns are explained better by the four-factor model. Moreover, the Four-factor model performs well even when the underlying portfolios are formed on variables not considered in the Four-factor model. The studies carried out by Gumanti et al. (2015), Bello (2008), Awwaliyah & Husodo (2017), Artmann et al. (2011), Ondieki (2011), Evbayiro-Osagie & Osamwonyi (2017), Zaremba et al. (2019) concluded the similar finding that Carhart Four Factor model outperforms the Fama & French Three Factor Model. However, Tzakov et al. (2017) concluded that the four-factor model is not significantly better than Three Factor Model.

Table 16: Regression Results of Fama French Five Factor model for Double sorted portfolios' excess returns

$$R_{it} - R_{ft} = a_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + e_{it}$$

Portfolios	A	β	S	l	R	C	R2	AIC
Value								
SL	0.025**	-0.045	1.547**	1.675**	-0.285**	-0.408**	0.958**	-514.54
SN	0.003	0.039	1.619**	0.702**	-0.358**	-0.436**	0.864**	-428.12
SH	0.051**	-0.064	2.419**	0.853**	-0.366**	-0.534**	0.911**	-397.96
BL	0.038**	0	1.116**	1.681**	-0.203*	-0.530**	0.926**	-430.89
BN	0.029**	-0.003	0.997**	1.121**	-0.260*	-0.480**	0.856**	-406.32
BH	0.012*	0.019	0.243*	0.504**	-0.123	-0.403**	0.692**	-556.58
Momentum								
SW	0.047**	0.018	2.379**	1.021**	-0.481**	-0.647**	0.922**	-399.84
SN	0.046**	-0.072	1.727**	1.016**	-0.265**	-0.539**	0.928**	-485.47
SL	-0.037**	0.048	1.111**	1.173**	-0.258**	-0.195	0.887**	-451.57
BW	0.055**	-0.118	2.535**	1.524**	-0.344*	-0.731**	0.905**	-277.87
BN	0.017**	0.034	0.383**	0.822**	-0.143	-0.385**	0.814**	-525.42
BL	0.019**	-0.006	0.368*	1.109**	-0.158	-0.340*	0.829**	-467.15
Profitability								
SR	0	0.123	0.829**	0.543**	1.254**	-0.044	0.836**	-468.58
SN	0.013	-0.057	2.018**	1.191**	-0.627**	-0.557**	0.925**	-424.4
SW	0.045**	-0.018	2.015**	1.107**	-0.452**	-0.494**	0.93**	-451.5
BR	0.032**	-0.042	0.852**	1.056**	-0.087	-0.478**	0.879**	-473.4
BN	0.037**	-0.044	1.501**	1.307**	-0.274*	-0.629**	0.900**	-386.61
BW	-0.013*	0.1	-0.335*	0.492**	-0.382**	-0.028	0.310**	-525.79
Investment								
SC	0.043**	0.007	2.584**	1.359**	-0.426**	0.026	0.923	-367.71
SN	0.014	-0.031	1.417**	0.902**	-0.233**	-0.454**	0.900**	-477.61
SA	0.018**	0.032	1.491**	0.970**	-0.424**	-1.038**	0.931**	-502.12
BC	0.008	0.016	0.056	0.775**	-0.189*	0.061	0.686**	-542.3
BN	0.036**	-0.05	1.360**	1.202**	-0.207*	-0.575**	0.899**	-419.02
BA	0.033**	-0.009	1.148**	1.164**	-0.192	-0.876**	0.890**	-413.17

Note **, * indicates significance at 1% & 5% level of confidence.
Source: Compiled by Author

From Table 16, it is evident that 5 out of 24 models have insignificant values of alpha & hence, these models explain variations in returns completely. 2 out of the remaining regression alphas are significant at a 5% level of confidence. Small Looser as well as Big Weak portfolios boast negative alphas indicating overestimation of returns by that model. The Big Winner portfolio depicts the highest unexplained variation, whereas the Big High portfolio represents the lowest unexplained variation.

None of the coefficients of RM-Rf in Table 16 regressions are significant at even a 5% level of significance. SMB representing size factor cover 1 insignificant coefficient out of twenty-four models. For 3 out of 23 portfolios, the Size coefficient is significant at a 5% level of significance. A Big Weak portfolio is negatively related to the size factor. All the LMH coefficients representing the Value factor are significant too, at a 1 % level of significance. 5 out of 24 RMW coefficients are insignificant. 6 RMW coefficients out of the remaining are significant at a 5% level of confidence. Except for the Small Robust portfolio, the RMW factor is negatively related to portfolio returns. For 5 out of 24 portfolios, CMA coefficients are statistically insignificant. Big Looser portfolio is significant at a 5% level of confidence. The CMA factor depicts a negative relationship with portfolio returns except for Conservative portfolios. From the above discussion, it is clear that Value is the dominant explanatory variable. This finding is dissimilar to Fama & French (2015) as they found Value to be a redundant factor.

Adjusted R2 values ranged from 31% (Big/Weak) to 96% (Small/Low). Value, Momentum & Investment sorted portfolio returns are explained better by the five-factor model. Moreover, the Five-factor model performs well even when the underlying portfolios are formed on variables not considered in the model.

The adjusted R^2 values are similar to those reported in A. Balakrishnan et al. (2018), Singh & Yadav (2015), Arora & Gakhar (2019) & Fama & French (2015). Moreover, the pattern we document with small stock portfolios exhibiting higher adjusted R^2 than big stock portfolios is consistent with international evidence. A. Balakrishnan (2018), Sutrisno & Ekaputra (2016), Wijaya et al. (2017), Djamaluddin et al. (2017), Zaremba & Czapkiewcz (2016), Erdinç (2017), Chiah et al. (2016) & Chai et al. (2019) reported similar findings that Five Factor model performs superior to three-factor model. Whereas, Arora & Gakhar (2019) & Vakilifard et al. (2017) concluded three-factor model is better than the five-factor model in explaining portfolio returns. Zaremba & Czapkiewcz (2016), Chiah et al. (2016) & Chai et al. (2019) testify the superiority of Five Factor Model over the four-factor model in explaining portfolio returns. Whereas, Zaremba et al. (2019), Czapkiewicz et al. (2019) describe parallel results of the four-factor model better than the five-factor model in explaining portfolio returns.

Comparing Models

Looking at the findings of intercept & adjusted R2 values, it is clear that the Carhart Four Factor model is a better though not perfect model for explaining portfolio returns in the Indian Capital Market. Additionally, we tried to evaluate model performance by comparing the AIC values of all portfolios for three models, i.e., FF3F, C4FM & FF5F. Looking at the AIC values of each portfolio regression model (from tables 14,15 &16), it is evident that AIC values are lowest for only 7 models out of 24 viz. Small/Neutral (Value), Big/High, Small/Looser, Big/Looser, Small/Robust, Big/Weak & Small/Aggressive, pertaining to Fama French Five Factor Model. For the rest 17 models, the Carhart Four Factor Model performed well as supported by the Lowest AIC values.

Conclusion

This study aimed to compare factor models viz., Fama French Three Factor Model, Carhart Four Factor Model & Fama French Five-Factor Model, of its ability to capture returns on portfolios formed on many corporate fundaments such as size, value, profitability & investments. We examine whether average returns on portfolios based on size, value, momentum, profitability & investment exhibit any patterns. We employ data for companies listed on BSE-100. The study period is April 2005 to June 2021. The average return pattern shows that the Indian stock market is influenced by certain firm fundamentals, such as size, value, investment, and profitability & momentum factors, except the fact that a small robust profitability sorted portfolio depicts abnormally high negative returns & Big Looser portfolio depicts positive returns. Moreover, there subsists a direct relationship between returns & size, returns & value, and returns & momentum, though the returns & size pattern is not very clear. At the same time, there exists an inverse relationship between returns & profitability, and returns & investment. The goodness of fit test (adjusted R2 values), the feasibility of the model (intercept values) & AIC values clearly emphasize that the Carhart Four Factor model (1997) of asset pricing performs better than other asset pricing models covered in the study for the Indian Stock Market. This study has some limitations in not including a key CAPM anomaly as the scope of this study covers multi-factor models. Further, the study does not incorporate other corporate fundamentals, such as leverage, liquidity, working capital, and human capital.

Value & Momentum proved to be major factors in Portfolio return determination. One can invest in low price-to-earnings ratio stocks to earn higher returns. One can even design a strategy of taking a long position in low P/E stocks & short in high P/E stocks at the same time. Momentum factor mimicking portfolio turned out to be performing best among all the portfolios. One can choose to frame 3-3, 6-6, 12-12 months' momentum strategy. Taking a long position in past winners & short in past losers can fetch the highest returns.

No single factor seems to be significant alone to explain the variation in returns, but jointly size, value & momentum explain the maximum variation. This lends support to Carhart's four-factor as well as the Fama French models. Market beta alone is not statistically significant dissolving the predictions of CAPM. It also implies that firm-specific variables are gaining importance in explaining the variation.

The future perspectives of such research can be on exploring whether firm-specific factors explain risk in broad asset classes, such as industry-sorted portfolios, examining the role of business cycles on the asset pricing and company fundamentals, testing whether size, value, momentum, profitability & investment effects are found only in emerging markets or developed markets or both. In addition, the robustness of the Fama French model can be checked through alternative size & value measures & by dividing the total period into sub-periods. Fundamental factors, other than those considered in the study, can be explored to design a factor model. Residual diagnostics can also be performed for similar studies. Feasibility checks can be conducted through GRS statistics. In addition, Explanatory power can be checked other than through F statistics.

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Fostering Financial Independence among Women in India: A Case Study of LXME

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Abstract

This article explores the relationship between financial literacy and financial independence. Through the case study method, it studies the impact and role of a fintech startup firm LXME in educating women about financial planning and helping them empower themselves in their personal and professional lives. LXME manages a Facebook group named 'Being LXME' which is a group of women that promotes women's economic empowerment through financial literacy. The group works to simplify the financial terms and financial planning and investment so that women can understand the terminology easily and plan their finances better. LXME (beta version) was launched in 2018-19 by the Anand Rathi group. While there is no dearth of fintech apps in recent times, LXME has a unique proposition. Armed with the Facebook community, LXME guides women to make the right choices when it comes to decision-making for investment and personal finances. This article aims to shed light on how LXME has charted its path toward being a successful venture and how it plans to connect with their consumers to empower them to take charge of their finances by educating them.

Keywords: Fintech, Financial Literacy, Women Empowerment

Introduction

India, being one of the five BRICS economies, is at the cusp of a transition to a technology-based economy with digital transactions and a booming Fintech Industry. Fintech is a short form of Financial Technology. Though the technological progress started much later in India than the developed economies, it has now caught pace with the expansion of internet services, smart mobile devices, and the introduction of 5G networks. Every day a new Fintech firm is popping up which is proof of the fast growth that is happening in the industry. Statistically speaking, the Fintech adoption rate in India and China was 87% as compared to the global rate of 64% in the year 2019, which makes India the fastest growing Fintech market in the world along with China ("Global FinTech Adoption Index 2019," 2019). Since 2019, the usage of mobile apps for payments and investing has increased drastically due to demonetization, inclusive banking services, the introduction of UPI for payments, and the pandemic of Coronavirus. Today, a small vegetable vendor in a small town in India has a contactless payment option for customers thanks to the changes that have happened for the better in the financial services industry. Fintech enables users to access financial services from digital devices like laptops, mobile phones, and tablets. It also aims to improve and deliver services in an automated manner to reach a greater number of users and customers. It remains to be seen how many of these fintech firms can sustain and survive in the long run.

Fintech has increased the reach of financial services. However, without sufficient financial knowledge people are unable to make better financial decisions. Financial literacy is a critical aspect of achieving economic empowerment for women. Despite the significant progress made in recent years, women in India still face significant barriers to financial independence, including lack of access to financial services, limited financial literacy, and societal attitudes that restrict their economic opportunities. A survey report by Tata AIA on Financial Awareness among Women found that 59 percent of working women are still dependent on the male member of the household to manage their finances

(Indian Women Are Still Financially Dependent, 2022). In response to these challenges, LXME was established to provide a platform for women to invest in mutual funds and other financial products, with a focus on educating and empowering women to take control of their finances.

This article explores the impact of the fintech explosion on the accessibility of financial services and whether financial literacy can impact the utility of fintech services and as such improve the financial independence of women through a case study of LXME.

Defining Financial Independence

In the literature, the terms 'financial independence' and 'women empowerment' are used interchangeably without regard to semantics. Therefore, it is pertinent to discuss the definitions of both for the purpose of this study. Financial independence can be defined as "a condition whereby an individual receives a sustainable source of income that is not reliant on paid work and is sufficient to fund their desired life choices" (Perrone et al., 2015). There is limited academic research on the financial independence of women and the factors associated with it. Financial independence and women's empowerment are interdependent. The financial independence of women stems from the empowerment of women through financial literacy and equal opportunity for education and work (Srivastava, 2020). Financial literacy combined with access to financial services improves financial independence among women (Asghari et al., 2013). Increased participation of women in the labor force improves the financial independence of women in general (Burke & Redmond, 2002). Education and the availability of economic resources have a positive impact on financial independence (Xiao et al., 2014).. Much of the literature talks about women's empowerment rather than financial independence. Therefore, it is important to understand what women's empowerment is and how is it related to financial independence.

Definition and Nature of Women's Empowerment

Women empowerment has been one of the many objectives of Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) proposed by the United Nations (UN). Women empowerment refers to the process of enabling women to gain control over their own lives and make choices that affect their personal, social, and economic well-being as noted by researchers like (Koomson et al., 2021), (Mohanty, 2017), (van den Bold et al., 2013), (Narayan, 2005). A much clearer definition of women empowerment is "the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them." (Kabeer, 1999) Thus, it can be said that women's empowerment is a much wider and multi-dimensional concept than financial independence and it involves promoting gender equality (Siscawati et al., 2020), eliminating gender-based discrimination (Sen, 2019), and the enforcement of women's rights and boosting career opportunities for women (Bayissa et al., 2018), (Bhattacharya & Banerjee, 2012). Research has shown that gender equality is positively associated with increased economic growth, reduced poverty, and improved health outcomes (Sen, 2019), (Kabeer, 1999). Furthermore, empowering women has been found to lead to a more democratic and peaceful society, as women's increased participation in decision-making processes can lead to more inclusive and equitable outcomes (U. N. Women, 1995).

Economic Empowerment of Women

Economic empowerment is one of the many aspects of women's empowerment. Economic empowerment of women as per the Bill and Melinda Gates Foundation is that "women should have access to income and assets, women should be in control of and benefit from economic gains and they should possess the power to make decisions" (Women's Economic Empowerment, n.d.). This involves enabling women to participate in the economy on an equal footing with men and to have control over economic resources and decisions (Pal et al., 2022), (Hendriks, 2019). Research has shown that increasing women's economic empowerment can lead to a range of positive outcomes, including improved health and education outcomes, increased productivity and income, and reduced poverty (Pal et al., 2022). Strategies to enhance women's economic empowerment include improving access to credit, property rights, and training and employment opportunities, as well as addressing gender-based discrimination in the workplace (Hendriks, 2019).

Social Empowerment of Women

The next approach to women's empowerment is pertaining to violence against women (E. Sharma & Das, 2021), (Sen, 2019). This includes addressing the physical, sexual, and psychological abuse that women face in their homes, communities, and workplaces (Bayissa et al., 2018). Research has demonstrated that violence against women is a widespread problem that affects women across the globe and has serious consequences for their physical and mental health, as well as their economic security (Bayissa et al., 2018), (I. Sharma, 2015). Strategies to eliminate violence against women include the development of laws and policies that criminalize violence, the provision of support services for survivors of violent acts, and the promotion of gender-sensitive attitudes and behaviors through education and public awareness campaigns (Garcia-Moreno & Amin, 2019), (Bayissa et al., 2018).

Political Empowerment of Women

Finally, political empowerment is crucial for women's empowerment. This involves enabling women to participate in political processes and decision-making at all levels, from the local to the national (Al-Qahtani et al., 2020), (Krook & O'Brien, 2012), (Leyenaar, 2004). Researchers opined that women's political empowerment is improved with greater participation or representation in the government bodies, better policy outcomes, and overall inclusive governance. (Krook & O'Brien, 2012) . Strategies to enhance women's political empowerment include the promotion of gender-sensitive laws and policies, the creation of opportunities for women's political participation, and the development of networks and organizations that support women's leadership. (Al-Qahtani et al., 2020).In conclusion, the term 'economic empowerment of women' grasps the critical nuances of the term 'financial independence', and as such both are considered to refer to the women's ability to earn their living, make financial decisions regarding their money and be able to buy and sell assets on their own. The other aspects of women's empowerment are not part of the scope of this research study.

Financial Literacy and Women's Economic Empowerment

As noted in the earlier paragraphs the findings of researchers like (Srivastava, 2020) and (Asghari et al., 2013) point to financial literacy being a critical aspect of financial independence. Without financial literacy women are not equipped to make financial decisions therefore financial literacy has to be studied in detail.

Definition of Financial Literacy

Financial literacy refers to the individual's awareness and knowledge of financial terms and concepts and using them to manage personal finances effectively (Lusardi, 2019), (Mandell, 2008). Among social researchers, there is little consensus on a single definition of financial literacy. However, to maintain uniformity and consistency in this article, the definition given by the Organization for Economic Cooperation and Development (OECD) and the International Network on Financial Education (INFE) is considered: "A combination of awareness, knowledge, skill, attitude, and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing." This definition postulates that an individual's personality and preferences affect financial decisions as seen in the empirical evidence from recent research studies (Andriamahery & Qamruzzaman, 2022), (Koomson et al., 2021), (D.A.T. et al., 2020), and (Hung et al., 2012).

Importance of Financial Literacy

The importance of financial literacy has been increasingly recognized in recent years, with the ever-increasing inflation ensuring that individuals make responsible choices for their own financial well-being (Lusardi, 2019), (Garg & Singh, 2018), (Mandell, 2008), (Beverly & Burkhalter, 2005).

In some studies, researchers have found that people have a good grasp on financial matters and plan for their retirement and other financial goals (Lusardi & Mitchell, 2011a), (Lusardi & Mitchell, 2011b). They also take on manageable amounts of debt and work towards improving their financial stability (Garg & Singh, 2018), (van Rooij et al., 2011). Additionally, individuals with higher levels of financial knowledge are less likely to fall victim to financial scams and fraud (Williams & Rote, 2019), (Mandell, 2008), (Beal & Delpachitra, 2003). This is in line with a study by (Bhutoria & Vignoles, 2018) that found that poor women who received financial education were more likely to save, invest, and engage in financial planning, which increased their financial autonomy.

Financial Literacy and Financial Decision Making

Financial literacy can also empower women by increasing their decision-making power in the household (Kumar et al., 2022). In many cultures, men are traditionally considered to be the primary financial decision-makers. However, research has shown that financially literate women are more likely to participate in household financial decision-making and to have an equal say in financial matters (Yin & Yang, 2022). This can be particularly important for women in low-income households, as they may be more likely to experience financial insecurity and need to make important financial decisions for themselves and their families.

In addition to enhancing financial autonomy and decision-making power, financial literacy can also lead to women's empowerment by increasing their income-generating potential (Kumar et al., 2022). There is also evidence that financial literacy can improve women's ability to access and use financial services, such as bank accounts, credit, and insurance. Access to financial services can be particularly important for women, as it can help them to manage their finances more effectively, increase their financial stability, and reduce their vulnerability to economic shocks (Grohmann et al., 2018), (Atkiinson, A.; Messy, 2013).

Despite the importance of financial literacy, many individuals lack basic financial knowledge. In a few research studies, a major portion of the population was found to be struggling with understanding financial concepts and making informed financial decisions (Wafula, 2022), (Garg & Singh, 2018), (Lusardi & Mitchell, 2011a). Some researchers have found that financial literacy is affected by multiple demographic variables like an individual's age, education level, amount of wealth and race (Garg & Singh, 2018), (Lusardi & Mitchell, 2011a), (Marcolin & Abraham, 2006).

Multilateral organizations imparting financial literacy education to individuals are effective (Fan & Zhang, 2021), (Garg & Singh, 2018), (Bannon et al., 2014), (Klapper et al., n.d.), (Mandell, 2008), (Beverly & Burkhalter, 2005). Some other researchers have found that these programs may not have a positive outcome on an individual's financial behavior (Paiella, 2016), (Gustman et al., 2012).

Financial Literacy and Technology

One promising avenue for improving financial literacy is technology. The widespread availability of mobile devices and the increasing use of online financial services have created new opportunities for financial education and information access (Lusardi, 2019). For example, mobile apps and online tools can help individuals track their spending, develop a budget, and learn about financial concepts in an engaging and accessible way (Lusardi, 2019). In recent research studies, researchers have found that implementing gamification has shown a positive impact on the financial behavior of individuals (Bayuk & Altobello, 2019).

Empirical evidence discussed above suggests that financial literacy is positively correlated with women's confidence to make financial decisions, it can also help in income generation and thus enhance the autonomy of women in financial matters which results in improved financial independence.

Research Objectives

The research objectives of this study are as follows:

1. To analyze the strategies employed by LXME to disseminate financial information to women (e.g., workshops, online resources, community outreach)
2. Evaluate the Impact of LXME membership on women's financial literacy levels
3. To examine the range of investment avenues offered by LXME and analyze how they cater to the specific financial needs and goals of women.
4. Future prospects and challenges faced by LXME

Analysis and Discussion

The research article is exploratory in nature and the data has been analyzed using the content analysis method for qualitative data. The target population is members and users of the women-only Facebook group Being LXME to study the objectives. The study follows a non-probability purposive sampling technique for sample selection. The purposive sampling technique was found to be most suitable as it permits the inclusion of respondents with unique characteristics, attitudes, and perceptions to include a diverse range of perspectives. "Purposive sampling technique is found to improve generalizability in qualitative research" (Jarrahi & Newlands, 2024). A total of 35 members were selected and studied in depth for their posts and comments in the Facebook group. Researchers (Easterby-Smith et al., 2018) and (Creswell, 2007) have suggested that the case study method is one of the five methods appropriate for a qualitative research study. This involves in-depth data collection through multiple sources of information which is iterative and contingent on the research process. Another researcher has discussed the drawbacks of survey methods for assessing financial literacy specifically the low response rates, low accuracy rates, and low frequencies of data, whereas textual analysis is able to overcome these limitations (Li, 2020). There are three steps in textual analysis – text harvesting, text cleaning, and text analysis (Guo et al., 2016) Unstructured secondary data has been used from the Being LXME Facebook group from the posts and comments of women who have been writing about their experience on the group about LXME app and their Facebook group. The raw chat data was then cleaned and transformed into correct and meaningful words and sentences which could be analyzed further. The data is then analyzed using thematic content analysis for psychological research given by (Braun & Clarke, 2006) which was adapted for this research article to report patterns and themes from the available data. However, like any qualitative research method, the chosen method also has its own limitations like subjectivity and lack of objective data analysis methods. The study is primarily to understand how a Fintech startup like LXME can impact the financial independence of women through financial literacy. There is no conflict of interest for the researcher apparent or otherwise in the firm or the Facebook group.

How LXME spreads Awareness among women

LXME manages a Facebook group known as Being LXME. In the group, there are various people acting as admins and moderators of the group. Then there are group experts who help with the queries of members in the group posts. These three categories of people keep the group bussing with various updates, posts, news items, fun challenges, events, finance-related discussions, etc. A list of things that run regularly in the group is given below:

1. Festive posts: The posts by the group admins are targeted around the theme of the upcoming festivals which are related to finance terms for making the complex terms easy to understand for women. Create a buzz about an upcoming festival around the theme of money/finance and keep members engaged
2. The Savings and Investment Challenge: Three different baskets of investment goals where participating members would save a specific amount each day depending on the basket chosen
3. FINCAP: Financial news in a capsule form
4. Fun Friday posts: Posts that engage the members with fun games and learning about personal finances
5. Story posts: Engaging posts with a story or idea. For example, financial milestones achieved till date, preferred mode of payment, preferred mode of investment, dream vacation spot, dream purchase, etc.
6. Informative posts: Finance news in an informative page
7. Fun Memes: Memes about fun scenes that may be applicable to finance-related topics.
8. Finance Polls: Polls asking what the members would choose from the given options. For example, what would be their preferred change in the upcoming budget, etc.
9. Short video clips: Short video clips about investment strategies or ideas

The strategies employed by the Being LXME group are mainly in a conversational tone to keep the discussions light and friendly. The buzzwords are always explained using small and easy-to-understand definitions that make it easy for the novice learner to understand. It makes finance fun for the female members.

Impact of LXME on the financial literacy of women members

The impact of the strategies used by Being LXME group to educate women regarding investment avenues and financial terms is measured by the way the members communicate and share new knowledge, exhibit more confidence when it comes to managing their money through their comments or posts in the group. The impact of LXME on the financial literacy of women members was analyzed using the thematic content analysis method provided by (Braun & Clarke, 2006).

Table 1: Thematic representation for Financial Literacy of LXME members

Themes	Sub-Themes	Summarized Response text
Basic Financial literacy	Interest rates & Inflation	"Interest rates are going up." "Because repo rates changed." "Equity - must for beating inflation." "Home loan interest hikes, Yikes!" "High returns on FDs" "Been waiting for that"
	Budgeting	"Made a budget the first time." "Deleted shopping apps." "Add to cart but don't buy." "New funda of my life." "Plan investments first, then spend."
	Risk	"Low-risk preference" "Prefer risk-free investments" "Medium Risk Preference"
	FDs	"Emergency fund" "Short-term needs" "Replaced with liquid funds"
	Tax filing and tax planning	"Tax saving investments" "Filed my returns the first time"
	Gold	"Sovereign Gold Bonds (SGB)" "Gold ETFs" "Gold Mutual Fund" "Gold coins" "Gold Jewelry for daughter"
Advanced Financial Literacy	Investing in stocks, ETFs	"Nothing is safe in the stock market" "Don't time the market" "Swing trading"
	Investing in mutual funds	"Systematic Investment Plans (SIPs)" "Better returns for the medium-long term"
	Diversification benefits	"Divide your risk" "Debt + Equity" "Balanced funds" and "Don't put your eggs in one basket"
	Retirement planning	"LIC Pensions Plans" "Employee Provident Fund" "Public Provident Fund" "Kisan Vikas Patra" "National Savings Certificate" "Senior Citizen Savings Scheme"
	Insurance	"Family Floater versus Individual Health Insurance" "Private Health Insurance" "Term Insurance" "Endowment versus Pure Term Insurance" "Health insurance for parents"
Financial Independence OR Economic Empowerment	Participation in decision-making	"Shared accounts" "Shared decision-making" "Individual accounts" "Feeling confident"
	Planning for future financial goals	"Children's Education" "Children's Marriage" "Retirement Planning" "Dream vacation" "Own home"
	Ability to spend money/ Advise	"I can buy branded makeup now." "I'm able to participate in finance discussions now." "I advised my friend on her finance question." "Buying a laptop" "Buying a home"

The financial literacy can be classified into two levels, 1) Basic financial literacy and 2) Advanced financial literacy (Dam & Hotwani, 2018). The comment statements are categorized into these two levels of financial literacy as per Table 1Women with advanced financial literacy sounded confident in their language and had stronger personalities, than the ones with less financial skills and knowledge. Women who have advanced levels of financial literacy are also managing their money and participating in household decision-making about finances. The more confident women were always happy to share their knowledge with other new members and they would be more engaged in the group conversations. The group has a positive impact on women's literacy levels based on the thematic analysis carried out in Table 1. There seems to be a stronger linkage between advanced financial literacy and financial independence than basic financial literacy and financial independence.

Types of investment avenues available through LXME

LXME facilitates investment in mutual fund baskets designed to suit different investment horizons and risk appetite. They also provide personal finance calculators to identify the amount of money individuals need to save, for example, child education, tax liability, retirement fund corpus, and goal calculator for any other financial goals.

1. Ultra-Short term plan
2. Short term plans
3. Rs. 100 equity fund
4. Rs. 100 gold fund
5. Rs. 100 debt fund
6. Tax Savings plan
7. Child Education Plan
8. Long-term plan

These are different types of mutual fund baskets that the app has pre-selected based on past performance criteria. Women can invest based on their preferences and the availability of funds. Besides these fund baskets, LXME also facilitates investment in Sovereign Gold Bonds which are issued by the Reserve Bank of India in tranches. Tailored insurance products are also provided by LXME.

Future Prospects and Challenges Faced by LXME

1. LXME aims to be India's first Neo bank for women within the next 5 years. Literally speaking, Neobank is a new-age online banking without physical boundaries. They are digital-only banking companies either operating through mobile apps or websites or both. They provide digital services for payments, money transfers, lending, and more. These banks generally use cutting-edge technology like Artificial Intelligence and Machine Learning models which enable them to operate completely in the digital platform. WeBank in China and NuBank in Brazil are Neo Banks that operate similarly. Within India, banks are regulated by the Reserve Bank of India (RBI). However, Neo Banks are not yet under the same regulation since they are not completely banks as per the traditional nomenclature. Traditionally, a bank is a company that takes public deposits and provides loans to the public thus creating credit in the economy. However, these neo-banks are not banks in that sense because they only provide payment services, money transfer facilities, providing loans, and investment avenues. There are so many growth opportunities that LXME is planning to expand into – Providing loans to women, money transfers and payment services. Starting in 2018, LXME has been expanding its services to insurance and loan portfolios. The competitive advantage of LXME is described as follows: Exclusively for women users – The company is founded and run by Priti Rathi Gupta and Ridhi Kanoria Doongursee who run a team of majority of women. The Facebook group is run by women administrators and social media managers who understand the psyche of women. Women are traditionally relegated to the backstage when it comes to finances. Therefore, having an exclusive place to learn and talk about finances is very crucial in brand building.
2. Building Financial Literacy Through Social Media Community - LXME has the advantage of the community created using social media. It uses Facebook and Instagram to build on its customer base.

3. Tools - The app provides various tools to learn and manage personal finances which is quite useful for the members and users.
4. Curated Mutual Fund Baskets and Investments – The LXME app has specific mutual fund baskets targeted at different investment horizons and risk appetites. Each investment alternative is explained in easy-to-understand terms with a friendly user interface.
5. Easy Access to Experts – The Facebook group also acts as a trust builder for the users. People are generally wary of investing through apps, but the Facebook group acts as the connection between the company and the users. The users can directly raise a request to contact the company representatives on the Facebook group and the representatives get back to the users. This enables trust among the users.
6. Financial and Budget campaigns – The group targets financial campaigns related to budgeting and personal financial planning. This helps with engaging the users and gamifies financial planning.

Challenges faced by LXME

1. Competitors

The challenges in front of LXME are from other fintech that also provide similar platforms for investments and insurance products – ET Money, Grow, Femwealth, Salt. The latter two are also aimed at women investors whereas the first two are open to all investment apps. The Fintech industry is growing at a faster pace than ever, and it attracts more participants in the industry. Thus, LXME has to ensure that they are well equipped to deal with ever-increasing competition in the market.

Traditional banking and investment services will also be competing with LXME as the customers will be targeted by them as well. LXME will have to keep its marketing strategy in place to deal with different competitors.

2. Regulatory Challenges

LXME aims to be India's first Neo Bank as discussed earlier Neo Banks are not fully functional banks and as such they are not regulated by the RBI. The RBI aims to achieve greater financial inclusion through fintech and digital banks. However, the regulatory framework applicable to the Fintech company is not certain yet.

Conclusion & Recommendations

In conclusion, this research study has identified that financial literacy can play an important role in women's economic empowerment which is also supported by many empirical research studies. By enabling more financial autonomy for women, decision-making capabilities, income-generating potential, and access to financial services, financial literacy can help to empower women and improve their overall well-being. However, it is important to note that financial literacy is only one piece of the puzzle and that other factors, such as the cultural attitude of the community, public policies, and individual access to economic resources and education, also play a crucial role in women's economic empowerment.

LXME has a good strategy in place along with the first mover advantage in the fintech market. However, fintech is a fast-growing industry and with an ever-increasing list of fintech starting businesses, LXME will have to continue its unique brand offerings to stand out in the market, provide innovative financial solutions, and widen its customer base to hold on to the competitive advantage.

Although it is currently bootstrapped by the Anand Rathi group and growing 10 percent month on month (Saxena, 2021), the increased competition will squeeze these margins. Regulations may range bound the profitability to a certain extent. Though, it is growing exponentially, LXME is only able to target educated women who are well versed in English and technology. It doesn't have a way to reach women in the regional languages and those who don't use smart mobile devices yet. Also, just targeting women may be limiting the investor base and may make it difficult to compete with open-for-all apps like ET Money, Groww, etc.

Future Research Directions

Financial literacy can improve the economic empowerment of women and in turn, can contribute to overall women empowerment. Further research can be done on what proactive measures the new-age banking and finance companies can take to improve financial inclusion and women empowerment. Also, studying the relationship between factors affecting other facets of women's empowerment can be explored.

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Entrepreneurial Ecosystems: Best Practices and Lessons amongst SMEs in BRICS

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Abstract

The Small and Medium Enterprise (SME) sector is the backbone of the economy in various countries, and several challenges have hindered its growth. The sharp decline of participants in the SME sector across BRICS countries indicates the difficulties besetting the industry. This study explores the entrepreneurial ecosystems within BRICS nations, emphasizing that regulatory frameworks, policies, and legislation are pivotal factors contributing to the stagnation and decline of SMEs, especially in developing contexts. While governments aim to stimulate growth for the SME sector, on one end, the very SMEs are suffocating with compliance issues, labor laws, tax-related matters, and municipal bylaws, among others. This paper presents the main findings from qualitative research mapping the BRICS entrepreneurial ecosystem (EE). The analysis is underpinned by the six elements of EE developed by Daniel Isenberg: the regulatory framework, market conditions, access to finance, policy, Human capital, and an enabling culture. The study gathered qualitative data from secondary sources and interrogated existing policies on the above-mentioned determinants. Publications from Scopus, Web of Science, OECD reports, and government websites were used to source information using keyword searches. A notable decline in SME participation across BRICS countries underscores the difficulties faced. Barlow and Panton identify regulatory compliance burdens as a primary obstacle for SMEs, leading to higher operational costs and reduced competitiveness. Similarly, the World Bank's "Doing Business" report highlights that complex tax regulations and labor laws disproportionately affect smaller enterprises, often stifling their growth potential. This paper presents findings derived from a qualitative research mapping of the BRICS entrepreneurial ecosystem (EE), Grounded in Daniel Isenberg's entrepreneurial ecosystem, this paper based its findings on qualitative data obtained from BRICS countries. Using targeted keyword searches, data was gathered from secondary sources, including Scopus, Web of Science, OECD reports, and government websites. The analysis reveals that while governments aim to stimulate SME growth, many inadvertently impose compliance issues that suffocate these enterprises. The study recommends that governments review restrictive regulations and implement initiatives to enhance SME performance, ultimately contributing to broader economic growth. By addressing these regulatory challenges, a more vibrant and resilient SME sector can emerge, capable of driving innovation and job creation.

Keywords: SME, Policy, Regulatory framework, Entrepreneurial-Ecosystem

Introduction

For a thriving SME sector, it is imperative to establish a conducive environment to support the sector. In addition, when the government strengthens the EE, it propels SMEs towards growth and performance, Bakar & Ahmad (2020). The growth and performance of small and medium enterprises (SMEs) are critical for driving employment and reducing poverty, particularly in BRICS member countries. Despite establishing supportive legislation, policies, and regulatory frameworks, SMEs face significant challenges that impede their development and potential contributions to economic progress. Among these challenges is the inability of SMEs to survive external environment turbulence, which hampers their agility. Compliance requirements and bureaucratic hurdles create barriers to accessing necessary support, which limits innovation and growth (Mazzarol & Soutar, 2019; Tiwari & Bhatia, 2023). The COVID-19 pandemic has highlighted the need for business diversity and multiple income streams, prompting a reevaluation of how policies can better support entrepreneurs (Kuckertz & Prochotta, 2020). Furthermore, existing entrepreneurship policies often fail to address the multifaceted nature of entrepreneurial ecosystems (Moos, 2014; Pinho & de Lima, 2022). These policies do not adequately target the unique components required for fostering a vibrant entrepreneurial culture, such as human capital, regulatory frameworks, and financial resources (Brown & Mason, 2017; Alvedalen & Boschma, 2017). A one-size-fits-all approach to SME support leads to duplication of efforts and stagnation of businesses, highlighting the necessity for tailored strategies (Kuckertz & Prochotta, 2020).

Additionally, government resource constraints further inhibit the effectiveness of programs designed to support SMEs (Mohd Noor & Mansor, 2021). Without adequate monitoring and evaluation frameworks, the impact of these programs remains unclear, leading to missed opportunities for growth and sustainability (Zeng & Wei, 2023). As a result, the potential of SMEs to generate employment and reduce poverty is significantly undermined.

To address these issues, there is an urgent need for a comprehensive analysis of the policy frameworks and support mechanisms that can create an environment conducive to a thriving SME sector across BRICS countries. This study aims to develop a coherent policy position and actionable measures promoting sustainable SME growth. By examining the entrepreneurial ecosystems in BRICS countries, the research will identify best practices and effective policies that can facilitate the transition of informal enterprises to formal status, thereby enhancing the overall economic landscape.

The study is underpinned by the following objectives:

- To analyze policies that support or strengthen the SME ecosystem across the five BRICS countries, considering their alignment with Isenberg's entrepreneurial ecosystem framework.
- To evaluate the contributions of each country's ecosystem in terms of cultural values, financial resources, and other essential elements.
- To identify mechanisms currently in place to enhance the SME ecosystem in BRICS member countries.
- To extract and share best practices to inform and strengthen SME performance across the BRICS nations.

The COVID-19 lockdown has taught countries and aspiring entrepreneurs the importance of diversity in business and multiple income streams (Kuckertz & Prochotta, 2020). This has increased policymakers' focus on entrepreneurs because of entrepreneurship's ability to aid economic progress (Tiwari & Bhatia, 2023). Entrepreneurship policies may be channeled to address the education gap and curriculum (Wennekers & Thurik, 2018). The role of government as an enabler is to support entrepreneurs grow across various sectors, but resource constraints have hampered focused government support (Mohd Noor & Mansor, 2021). These can be mitigated by allocating more funding, relaxing bureaucratic red tape, and monitoring the effectiveness of support mechanisms. According to Moss (2014), the complexities around individual SME settings or operating environments might hinder the most ell-crafted policies, Pinho & de Lima (2022). An entrepreneurial ecosystem (EE) policy should target entrepreneurs, supporting structures, entrepreneurial connectors, and entrepreneurial culture or attitude (Brown & Mason, 2017). In the event of a policy failure, it becomes a challenge to make progress on the existing programs, allocate resources, and ensure sustainability. While several alternative views of the EE components exist, most EE models encompass cultural, regulatory, infrastructural, market, human capital, networking, policy, and financial aspects (Alvedalen & Boschma, 2017). Zeng & Wei (2023) assert that, making a thriving entrepreneurial ecosystem heightens sustainability, innovation, and firm growth. Ecosystems are shaped by social, cultural, political, and economic contexts. Global Entrepreneurship Monitor (GEM, 2022) provides an integrated perspective to address how SME support exists. The report emphasizes political, cultural, social and economic contexts as as the backbone of ecosystems. Meyer and Meyer (2017) stressed that the GDP rate has expanded in many developing and developed economies because of SMEs (Aidis & L. D., 2017). A one-size-fits-all approach to SME support needs further investigation as it results in duplication and business stagnation, especially if we are to compare the EE of the 5 BRICS member countries (Kuckertz & Prochotta, 2020). The significance of this paper is that it builds on a study done by the SAB Foundation (2017), which addresses policy gaps as drivers from policy development to implementation and monitoring results (Mazzarol & Soutar, 2019). These gaps include difficulty complying with existing legislation and regulatory requirements, resulting in barriers to obtaining the necessary support (Pinho & de Lima, 2022). This regulatory burden can inhibit innovation and growth (Tiwari & Bhatia, 2023). It has been observed particularly in South Africa that SMEs consistently rely on government support, before, during, and after the crisis. The study therefore considers the support mechanisms and their effectiveness in supporting growth of the SMEs operating in the manufacturing sector.

A lack of resources and inadequate funding for SMEs: Governments frequently face resource constraints, which limit their ability to provide adequate support for SMEs (Mohd Noor & Mansor, 2021). This factor, therefore, impacts programs designed to accelerate business growth. A lack of effective monitoring of support mechanisms: It is necessary to develop an effective monitoring and evaluation framework to gauge the impact of policies and programs that aim to support small and medium enterprises (Zeng & Wei, 2023). There are gaps in entrepreneurial education and skills, which causes individuals to be inadequately prepared for the challenges of starting and managing businesses. As a result, entrepreneurial success rates are lower (Kuckertz & Prochotta, 2020). Due to these gaps, SMEs are hindered from generating employment and reducing poverty to a greater extent. The SAB Report (2017) recommends governments strengthen the ecosystem to facilitate SME growth by creating an enabling environment. SME growth and performance must be encouraged in a conducive and enabling environment, which will increase employment and poverty reduction.

This study synthesizes EE research and related concepts, advancing research studies by Spiegel (2017) and Stam (2015) which draw more attention to the impact of a clear regulatory framework and policy. The study delves deep into the other elements of EE, an extension to the policy and regulatory framework by the to authors. The objective is to facilitate the transition of informal to formal enterprises in BRICS member countries using multifaceted analysis of the entrepreneurial ecosystems. In summary, addressing the gaps in SME support and policy effectiveness is crucial for leveraging the potential of SMEs as catalysts for economic growth and poverty reduction in BRICS countries.

Entrepreneurial Ecosystem: Literature Review

Godley (2021) defines an Entrepreneurial Ecosystem (EE) as a set of interlinked entrepreneurial organizations, institutions, and processes that merge to connect, facilitate, and govern the performance within the local environment, taking into consideration the dynamic and structured nature of EE, within a supportive environment, Madzikanda (2022). Isenberg's (2011) entrepreneurial ecosystem (EE) model delineates six interrelated domains essential for fostering a climate conducive to entrepreneurship:

Finance: According to (Beck & Cull, 2014), access to financial resources is vital for entrepreneurs. Financial institutions must perceive SMEs as viable clients rather than high-risk entities to ensure they obtain the necessary funding for growth. Policy: Government regulations exist to establish the regulatory and operational framework for entrepreneurs. Effective policies are crucial as they should support and facilitate growth, offering clarity for SMEs (Isenberg, 2011). Support: This encompasses both hard infrastructure (e.g., transportation and communication) and soft support systems (e.g., mentorship, incubators, and networks) that are crucial for entrepreneurs to succeed (Roig-Tierno et al., 2015).; Culture: Regarding culture, Msimango-Galawe et al. (2022) assert that the cultural context significantly influences entrepreneurial attitudes. Societal values and norms can promote or inhibit entrepreneurial activities, affecting the overall entrepreneurial climate. Human Capital: Some critical elements for successful entrepreneurship are an Individual's skills, experience, and knowledge. To advance sustainable growth and performance in the SME sector, Tshikovhi, More, and Cele (2023) recommend workforce development programs and partnerships with institutions of higher learning to advance skills in the small and medium enterprises sector. The latter is echoed by (Marvel et al., 2016), that a well-trained and skilled workforce enhances the effectiveness of the entrepreneurial ecosystem. Markets: Access to markets is essential for entrepreneurial success. Khurram Ali et al., 2014 of the view that policies should facilitate the creation of connections and networks that enable businesses to reach customers and expand their operations. According to Madzikanda, (2022) & Schweitzer et al., (2019), elements of an EE have a lock-on effect on one another with feedback loops that reinforce the EE's robustness.

Figure 1: Domains of the Entrepreneurial Ecosystem

Source: Isenberg,(2011).

Finance

Access to finance is a fundamental driver of entrepreneurial success, especially for SMEs, and critical for economic development in BRICS countries. Financial systems influence entrepreneurship by determining the availability of capital necessary for starting and expanding businesses. However, SMEs often need help securing funding due to perceptions of high risk by financial institutions, which can lead to higher interest rates and stringent lending requirements (Beck & Cull, 2014; Msimango-Galawe, 2022). This lack of financial support can stifle innovation and growth, particularly in developing economies with limited access to credit. According to Beck and Cull (2014), cited in Msimango-Galawe (2022). SMEs are the largest contributors to the economies of countries. While that contribution is noted or acknowledged SMEs remain facing challenges. Finance is essential for SMEs as their operations and borders on access to raw materials, personnel, technology, etc, OECD (2016). In addition, financial institutions generally view SMEs as risky due to fluctuations in their operating environment. This results in higher interest rates on lending there needs to be more clarity between financiers and SMEs, causing financial institutions to lend to SMEs at higher interest rates compared to larger businesses, OECD (2016). Risk appetite, collateral, and period in business affect interest rates offered for borrowings, which can be a tall order for SMEs. SMEs' access to external sources of funding depends predominantly on the state of financial markets, the regulatory framework within which financial institutions operate, and their ability to assess, manage, and cost the risks associated with loans for SMEs. Cited as an essential factor, access to markets drives continuity in the SME sector. Without markets and networks, there is no customer base; hence, business orientation and production appetite become essential.

Policy

Cumbersome policies hinder the growth of the entrepreneurial ecosystem rather than help them grow. The policy landscape is essential for creating a conducive environment for entrepreneurship. In many BRICS nations, cumbersome regulations and inconsistent policies can hinder entrepreneurial initiatives. For instance, complex tax systems or bureaucratic hurdles can dissuade startups from launching or scaling up. However, successful initiatives, such as Brazil's Simplified Tax System for small businesses, show that effective policies can foster growth by reducing barriers and creating clear pathways for entrepreneurs (World Bank, 2021). Common challenges include a lack of policy coherence and the need for regulatory frameworks that better support entrepreneurship. This is coupled with the duplication of efforts that yield no long-term results.

Support

According to Msimango-Galae and Majaja & Galawe, entrepreneurial support systems are divided into hard and soft forms. The hard form refers to the infrastructure entrepreneurs require for their operations, including a good road network to access suppliers and clients, transportation, internet, and water (Roig-Tierno et al., 2015). The soft form indicates support systems directly supporting entrepreneurs in incubators, technology centers, or universities (Roig-Tierno et al., 2015). Falkena et al. (2011) echo the latter, that appropriate 'soft infrastructure' exists in the form of suitable business associations, the availability of quality data and research, and well-rounded efficiency. Both forms of support are vital for reducing transaction costs and enhancing operational efficiency. For instance, collaboration between local entrepreneurs, universities, and NGOs can improve skills development and innovation, strengthening the Entrepreneurial Ecosystem, Ceptureanu & Gabriel (2016). Hard infrastructure varies widely in BRICS countries, with countries like China investing heavily in transportation networks while others may struggle with basic amenities. Packaging these support tools has proven to yield positive results for the entrepreneur and positively influence the performance of young firms. According to Ceptureanu & Gabriel (2016), SMEs can derive benefits if the infrastructure in all its forms can be accessible. This could help level the ground for SMEs propelling them towards a positive growth trajectory.

Culture

Culture refers to an organizational value system as a set of shared values within an organization, region, or country, Msimango-Galawe, Majaja, and Wright, (2022). These values have an effect on how people view entrepreneurship and its spin-offs, George & Azahra, (2002). Studies have been conducted on the relationship between entrepreneurship and culture to a more significant extent. Cultural attitudes towards entrepreneurship profoundly impact entrepreneurial activity. In BRICS countries, cultural values can encourage or discourage risk-taking and innovation. For example, a growing acceptance of entrepreneurship as a viable career path in India has led to a surge in tech startups (George & Azahra, 2002). However, this picture is different in the past decades. India was one of the most conservative countries with expectations that to be successful, one must follow the employment route. Conversely, prevailing societal norms may stigmatize failure in specific contexts, inhibiting potential entrepreneurs from pursuing their ventures. Cultivating a culture that values innovation and proactiveness is crucial for fostering entrepreneurial traits and success. Societal beliefs can also influence how entrepreneurship is perceived and whether it is a viable career choice. The environment within which an EE operates has an impact on its growth. Political dynamics, societal beliefs, and perceptions affect the EE and the business growth trajectory.

Human capital

Human capital refers to the ability of an individual or an organization to perform its duties in a manner that reflects competence and skill, Marvel, Davis, and Sproul (2016). It can be delineated through education, operating environment, that is geographical location, work experience, and specific entrepreneurial experience. Work experience has become the foremost important factor in the human capital paradox and as a result, it is the most researched when entrepreneurial studies are conducted, (Marvel et al., 2014). In BRICS nations, the concept of a "skills gap" is particularly relevant, as many educational systems do not adequately prepare individuals for entrepreneurial roles (Marvel et al., 2016). Age, education, and work experience significantly shape the entrepreneurial landscape. For instance, high youth unemployment in South Africa highlights the urgent need for programs aimed at enhancing entrepreneurial skills and capabilities to prepare better the next generation of entrepreneurs (Msimango-Galawe et al., 2021)—demographic factors, such as a growing young population, present challenges and opportunities in human capital development.

Markets

Within the EE, markets denote access to markets and the network that ill support and help advance entrepreneurial aspirations (Khurram Ali et al., 2014). Market access is determined by policies that enable upward, downward, and lateral flow of business, knowledge, and resources. The level of understanding of the entrepreneur assists them in tapping into opportunities. Market access is critical for entrepreneurial success, influencing market size, growth potential, and consumer behavior. Policies that facilitate market entry and reduce barriers can significantly enhance entrepreneurial opportunities. In BRICS countries, diverse consumer markets present both challenges and opportunities. For example, China's massive market offers significant growth potential and intense competition (Khurram Ali et al., 2014). Understanding consumer behavior and competitive landscapes is essential for entrepreneurs to leverage their strengths. The role of formal and informal networks in fostering entrepreneurial success cannot be overstated. Networks facilitate knowledge sharing, resource access, and collaboration, which are crucial for navigating the complexities of market entry and growth. Entrepreneurs in BRICS countries can leverage technology and trade agreements to access international markets, enhancing their competitiveness and profitability.

Despite these critical domains, finance, market access, and quality human capital are crucial (Jha, 2018; Audretsch & Belitski, 2016; GEM, 2021; OECD, 2020). Brown and Mason 2017; Lafuente, Alonso-Ubieta, Laiva, Mora-Esquivel, 2021; Xie, Wang, Xie, Duan 2021).

Access to finance is a fundamental driver of entrepreneurial success, especially for SMEs, and critical for economic development in BRICS countries. Financial systems influence entrepreneurship by determining the availability of capital necessary for starting and expanding businesses. However, SMEs often need help securing funding due to perceptions of high risk by financial institutions, which can lead to higher interest rates and stringent lending requirements (Beck & Cull, 2014; Msimango-Galawe, 2022). This lack of financial support can stifle innovation and growth, particularly in developing economies with limited access to credit. Human capital refers to the skills, knowledge, and experience individuals bring to entrepreneurship. In BRICS nations, the concept of a "skills gap" is particularly relevant, as many educational systems do not adequately prepare individuals for entrepreneurial roles (Marvel et al., 2016). Age, education, and work experience significantly shape the entrepreneurial landscape. For instance, high youth unemployment in South Africa highlights the urgent need for programs to enhance entrepreneurial skills and capabilities to better prepare the next generation of entrepreneurs (Msimango-Galawe et al., 2021). Falkena et al. (2021) assert that a supportive human resource base is a formalized yet underrated success requirement for SMEs. In addition to entrepreneurship, advanced entrepreneurship and economic literacy levels create a solid foundation for robust and effective SME promotion. Therefore, the human resource development framework is a critical element of success. There is value derived from both formal and informal training programs. The affordability of personal development programs is a crucial element if SMEs are expected to succeed. Demographic factors, such as a growing young population, present challenges and opportunities in human capital development. Market access is critical for entrepreneurial success, influencing market size, growth potential, and consumer behavior. Policies that facilitate market entry and reduce barriers can significantly enhance entrepreneurial opportunities. In BRICS countries, diverse consumer markets present both challenges and opportunities. For example, China's massive market offers significant growth potential and intense competition (Khurram Ali et al., 2014). Understanding consumer behavior and competitive landscapes is essential for entrepreneurs to leverage their strengths. The role of formal and informal networks in fostering entrepreneurial success cannot be overstated. This is because networks facilitate knowledge sharing, resource access, and collaboration, which are crucial for navigating the complexities of market entry and growth. Entrepreneurs in BRICS countries can leverage technology and trade agreements to access international markets, enhancing their competitiveness and profitability. Understanding the interdependence of these domains is crucial for developing effective strategies to foster entrepreneurship in BRICS countries. By addressing barriers to finance, creating supportive policies, cultivating a positive culture, enhancing human capital development, improving market access, and building robust support systems, policymakers can create a more conducive environment for SMEs to thrive. This holistic approach will empower entrepreneurs and contribute to sustainable economic growth in developing economies.

Research Findings

The study employed a qualitative research method. Examining government policies as a critical factor in shaping the entrepreneurial ecosystem is relatively under-explored, especially in the Indian context. By conducting a systematic literature review, the study identifies distinctive features and measurement approaches of the EE, contributing to policy debates and enriching the existing body of knowledge. A descriptive research design was used to study the EE in the BRICS member countries. The descriptive design is ideal for addressing the what, where, when, and how aspects of EE in the various countries in the study. In the context of this study, it has been applied to demonstrate the role played by policies in ensuring a functioning EE in BRICS member countries. A limitation of the method is that it does not answer the why part. The technique, however, assists in describing the nature of a demographic segment and making recommendations (Reiter, 2017). This method was relevant because EE occurs under different circumstances for each country or region; therefore, unique elements in each area influence that particular country's EE. Therefore, policy recommendations will differ considering sector and country specificities, contexts, and strengths. Systematic literature review as used in the study, unfolding EE elements according to Daniel Isenberg (2011) and features of each element. It further gives clarity of concepts and contributes to the efforts towards advancing policy debates and enriching the knowledge on EE, conceptualizing and paving the way for future research studies. The theoretical framework was guided by Isenberg's entrepreneurship ecosystem (2011), which proposes a six-element framework. As indicated above, an empirical study involved gathering qualitative data from secondary sources and interrogating existing policies on determinants using Isenberg EE elements. Studies surfaced from ResearchGate, OECD, World Bank, IMF, and government websites with limited open access studies available on Scopus and Web of Science to source relevant literature. The literature search was done information using a keyword search. The focus was on research studies from 2016 to 2024 for relevance and accuracy. It became imperative that each member country is analyzed in terms of its economic context as a factor that can support or hinder the sustainable performance of the EE.

Core Ecosystem Enablers: Individual Country Contexts

Brazil

The Brazilian economy is highly reliant on the services sector, which makes up 72.8% of its GDP, after which is the industry sector at 20.4% and agriculture at 6.8% (IBGE, 2020). With the growth of the services industry in Brazil and the government's increased focus on nurturing and supporting MSMEs, hose status is becoming increasingly important. The rising cost and shrinking economic growth, in Brazil has resulted in mergers and acquisitions of smaller companies by large ones, (OECD (2020).

Finance

Micro and small enterprises (MSEs) are essential to the Brazilian economy, accounting for 98.5% of all registered companies (11.5 million), 27% of GDP, and 41% of the total payroll. There has been an increase in interest rates for SMEs than for large companies. This further discourages entrepreneurship across sectors. In 2016, the interest rate was reduced by the Central Bank to the benefit of SMEs. , OECD (2020)On equity finance, the regulatory framework for angel investors was revised in 2016 and further adjusted in 2017, removing some long-standing barriers for investors in SME markets, in particular by using legal protection in their favor as an incentive, covering incidents of company closures, ensuring more flexibility in the type of investment and information sharing between investors and recipients. In addition, new regulations on investment-based crowdfunding and Fintech were introduced in 2017 and 2018. Between 2007 and 2019, micro and small enterprises created 12,4 million jobs; in 2020, they employed 293 200 employees, against the dismissal of 193 600 workers by larger firms. A high self-employment rate in Brazil of 32.9% in 2017 pushed Brazilian policymakers to focus on improving the support for SMEs, (OECD, 2017). Due to the lack of tax incentives, the Government in Brazil now provides a number of incentives for micro-entrepreneurs and SMEs. Angel investment, crowdfunding, and Fintech are alternatives to mainstream SME funding. In South Africa, there is SEFA, which provides financing for SMEs that are unable to deliver their products due to financial challenges. Despite the above initiatives, the domains below reverse gains that could be achieved if there was effective implementation.

Policy

According to OECD (2020), Brazil is facing mounting pressure to better the environment for MSMEs. Some of this pressure comes from investors as they raise concerns over Brazil's inability to push MSMEs toward reaching their full potentioal despite these notable policy improvements. Establishing a conducive environment for MSMEs promulgated in 1984 heightened Brazil's preferential treatment for micro and small businesses. It provided legal ground for the activities of SMEs. Systema S's implementing agent/institution worked closely with SME sectors and its public interest activities through government policy implementation. Its purpose was to upgrade the labor force's skills during rapid industrialization and social transformation. Federal Government (2021) strengthened its engagements to improve partnerships for cross-pollination of knowledge with SMEs and entrepreneurship through focused policy placed in a dedicated Unit, OECD (2022). The collaborations between government departments, its agencies, and the business sector enhanced the consolidation of Simples Law (the legal framework) giving a competitive advantage and preferential treatment to MSMEs at national, provincial, and district levels (RFB, 2018). The Support Service for Micro and Small Enterprises (SEBRAE) positively impacts the state of SMEs, increasing the number of established firms from 2.5 million to 11.6 million (SEBRAE, 2017). Through Simples Nacional, eight taxes were unified into one, making paying of taxes simpler, (OECD, 2020). On business support, the Brazilian public policies need to be geared towards implementing a program to position universities and other institutions of higher learning at the center of EE (regional approach).

Support

In Brazil, the government in all spheres strongly supports the SME sector. At the national level, the Ministry of Economy is entrusted with Brazil's entrepreneurial policy and SME interests. It was established in January 2019 after the merger of four departments in the previous government that is the Ministry of Industry, Finance, Foreign Trade and Services, some part of the Ministry of labor, as well as Planning, Development and Management, Finance, the central part of the Ministry of Labour, as well as the Ministry of Planning, Development and Management, OECD, 2020). Provincial and local governments are involved in the policy of SMEs and entrepreneurship. Despite the presence of these supporting systems, a study by Junior et al. (2016) identified the lack of knowledge exchange between universities and the Brazilian entrepreneurial ecosystem. This points to fragmentation in the EE of Brazil and also these partners are not investing in the capacity development of SMEs, a sector that has the potential to create greater economic results for Brazil. This can result in business stagnation in the value chain, which will help drive competitiveness and innovation.

Culture

The Brazilian EE performs superior to the BRICS average in risk acceptance, networking, cultural support, technology absorption, opportunity perception, and start-up skills. This means a great attitude to tap into opportunities as they unfold. At an individual level, a general fear of failure is associated with starting a business. This fear is further exacerbated by the gap between public institutions and political organizations, administrative procedures, and compliance rules set before starting a business, Junior et al. (2016). In Brazil, culturally there is low acknowledgment of SMEs. Several factors are considered by those who want to start a business, here to obtain baseline statistics, market size, location, and access to clientele among other resources. This is due to the low appreciation of entrepreneurs. Despite these fears, some populations consider entrepreneurship as a great option. This means that more support is needed to strengthen regional economies so that individual entrepreneurs can gain confidence when starting businesses.

Human Capital

During the entrepreneurial skills analysis, the dimension is another bottleneck for the Brazilian EE. Businesses that thrive in the Brazilian EE make products that are still scarce in the market. Companies have started tapping into unsaturated markets. At the individual level, Brazil has individuals who claim to possess the necessary skills and capabilities to start a business; however, the Brazilian EE has a challenge regarding individuals with technical and higher education, OECD (2020). There are low enrolment and completion rates at the University and Vocational levels (polytechs). There is lower performance in Human Capital. In terms of advanced and graduate training, Brazil's EE is in the medium-low quintile.

Markets

Brazil's low-quality average institutional interaction with social context is the main hindrance in the national EE, (Junior, Autio, Morini, Gimenez, and Dionisio (2016). However, its entrepreneurial ecosystem performs superior to other BRICS members, especially in the pillars of Start-up skills, opportunity perception, networking, cultural support, risk acceptance, technology absorption and technology absorption. It also has weaknesses in human capital, innovation, internationalization (markets), product innovation, process innovation, and high growth (Junior et.al. 2016). Exports are another challenge facing SMEs in Brazil, owing to trade flows, tariff policies, non-tariff barriers, and direct investment rates. Institutionally, Brazil has favorable conditions for the internationalization of firms; despite this, very few SMEs have aspirations to tap into other markets. Some initiatives are in place by the federal government to assist SMEs' exports.

Russia's SME Context

The start-up economy induced a robust foothold in a volatile Russian economy hit by a recession in 2008-2009(monetary crises), in 2014 (abrupt fall in oil costs), and imposed sanctions following Russia-Crimea- Ukraine. Thus, this scares foreign investors away from Russia, with investors focusing on less volatile markets (White, 2016). Start-ups suffer the knock-on effects. However, Russia has declared SMEs a national priority. Like other developing countries, the pressure to create jobs is equally heavy on Russia. Providing tax breaks through entrepreneurial support policies, creating products, and higher value-added services can help the Brazilian EE improve the productivity of the sector.

Finance

Many researchers put emphasis on access to finance as a key factor to entrepreneurial success, particularly bank credit (Kuzilwa, 2005; Nielsen, 2014). Lack of funding as a hindrance cannot be overemphasised, particularly since the contribution of SMEs is ell documented across sectors, (Aparicio et al., 2016).

Policy

In Russia, SMEs and entrepreneurship policies are biased towards micro and medium-sized enterprises (SMEs)through a dedicated national project until 2024. The Russian startup EE has improved and grown when compared to ten years ago. Its growth trajectory moved up from 2016. Notable ones such as the Skolkovo project, with its 'Innovation City' combined with universities, acceleration labs, and incubators to sustain a large community, reflect how the Russian government approached its policy implementation to ascertain privately-run organizations to support startups. Skolkovo Foundation, at the center of the Skolkovo project, is one of these. The foundation gives funding and academic support to startups, World Economic Forum (2014). Government SME policies as institutional factors of entrepreneurial activity are essential to a thriving SME sector.

Support

Several studies have been conducted to establish the effectiveness of support to the SME sector in Russia, (Anokhin, Schulze, 2008; Xheneti, Bartlett, 2012; Yakovlev, Zhuravskaya, 2013). These studies discovered the importance of business security against crime, high interest rates, inhibitors to expansion, business operational risks, corruption, and crime, Chepurenko, (2017)

Culture

Russian culture contains a code of secrecy, which might make it difficult to determine a robust, supportive, and cooperative network of innovators. There is generally a culture of bitterness and negativity towards the elite in Russia, feeding into the narrative of individualism. Despite these cultural issues, there are noticeable strengths and weaknesses within the startup ecosystem. Russians are big on scientific knowledge. Russians have long been well-known for their scientific knowledge. People have become exceptional problem solvers. Due to the historical and environmental challenges of residing in Russia. This has made the populace self-reliant as they are rooted in their ancient ways of solving problems, identifying market gaps, and providing products to solve them, (White, 2016).

Human capital

While SMEs in Russia are all endowed with innovation and skills, there is a need to enhance and continuously capacitate the sector participants. (Barinova, Zemtsov, and Tsavera , 2018; Lee et al., 2004).

Markets

A number of studies conducted reflected gaps in the market access segment of Russia's EE, (Hanson, 2005; Zemtsov & Baburin, 2016; Brown et al., 2008. Results reflect a short-term lifespan of all created companies, surviving between 5– 10 years, particularly in areas that have a high potential for market and success. Access to high-end technology is another challenge faced by SMEs in Russia particularly those operating outside the cities.

India's Entrepreneurial Ecosystem

According to the World Economic Forum (2014), cited in Jha (2021), the EE in India is the third largest in the world. The number of new companies established has increased since 2010. The funding picture also looks positive. Without clear exit strategies, liquidity becomes scarce, resources stay locked up, and entrepreneurial recycling that can support the next generation of startups needs to be better formed (Johnson & Nguyen, 2020). India has a culture of low tolerance of failure, (Jha, 2021). India still has several social and cultural stereotypes to deal with in order to have a vibrant entrepreneurial ecosystem. India is a patriarchal society; people/parents tell their children what they should do, pushing them towards traditional education and employment (Mehta & Raghavan, 2022)

Finance

The State government in India set up the Tamil Nadu start-up fund, which national finance agencies manage. The financial and entrepreneurial ecosystem in India is highly favorable to entrepreneurs.

Many resources are invested to support SMEs strongly. There is greater access to entrepreneurial finance, and India is at the top compared to GEM economies. GEM Report, (2020/21)

Policy

The entrepreneurial policy Context in the last decade has mainly focused on the importance of the EE and its entrepreneurial policies. Entrepreneurial policies enhanced the establishment of the entrepreneurial ecosystem through the government in forming a sustainable EE for existing enterprises and start-ups, (Junior et al., 2021). The entrepreneurial ecosystem gained importance in innovative entrepreneurs compared to traditional entrepreneurship. As a result, various state governments have formulated policies for new and existing innovative entrepreneurs.

Support

All government programs are performing very well in providing a favorable ecosystem for entrepreneurs. In addition, there are enough government programs and support from business incubators and scientists. The government is well vested in ensuring that the work of entrepreneurs is showcased on every platform, be it through exhibitions, events, or business expos.

Culture

India's cultural consideration is that no entrepreneur expects anything from the government, as each must be able to solve problems, innovate, and scale up before they reach the government. This reduces expectations and pressure on the government. Challenges entrepreneurs face include a tall order of regulations on how to establish a company, managing people, drafting policies and marketing products, and many other issues in businesses (Jha, 2021). India has made significant regulatory changes in its foreign direct investment, finance, investment, and legal structuring to benefit entrepreneurs, across industry sectors. It also aids entrepreneurs in developing business plans based on the funder's scope without looking at growing their product (Sonkar & Sarkar, 2021). The challenge of fundraising contributes to the plethora of operating-related challenges, regulations, and compliances with investors' requirements. Startups are given attention only when they raise funds or apply for funding. EEs established in rural areas in India have a better chance of survival as the attention is more concentrated in cities, given technological advancement and growth. This is possible if the investors target those EEs operating in rural India, such as Bharat. Therefore, investors need to review their strategy. The Indian diaspora at the leadership level competes in the global space to get momentum regarding the policy framework.

Human capital

The government provides formalized programs to augment academic research and campus environment for students, faculty, and entrepreneurs, Sonkar and Sarkar (2021). The government's focus now is to support new and growing firms. The government has also worked on the expertise in the programs that would train the entrepreneurs and support them by enhancing their skills.

Markets

India has a good ecosystem in the context of market dynamics. There is an even bigger market for business-to-business transacting, which is growing drastically. The market is an outstanding domain in the Indian EE, GEM Report (2020/21). All dimensions of EE are equally favorable for entrepreneurs, most of which are affordable office space, followed by access to physical communication and affordable essential utilities. What needs improvement is the support an entrepreneur can get through physical infrastructure. All factors have improved except communication and access to utilities.

Chinese SME Ecosystem

According to the World Economic Forum, (2021), China has transformed its economy deriving most contributions from manufacturing.

Finance

China established The Government Guidance Funds through collaborations with national, provincial, and local governments. On the entrepreneurial side, the government has introduced tax, incentives for innovation and productivity as well as incubation policies that simplify establishing a new company, (World Economic Forum 2021).

Policy

Government policies have driven mainly China's progression from a manufacturing hub to a technology hub, GEM (2020/21). Government policies have transformed China's economy from manufacturing to nurturing and enabling a high-tech innovation environment. The partnership between the manufacturing sector and learning institutions in China's Silicon Valley created a safe environment for start-ups. China is leading the world in artificial intelligence, robotics, and computer vision. This start-up scene is enabled by stakeholders such as the government, state-owned enterprises, large corporations, and universities.The Chinese government laid a foundation for innovation by developing innovation-friendly policies. Through its new Open Door Policy, the government lured foreign investments and capital, encouraging foreign businesses to establish their factories in China.

Academia and industry collaboration enabled through the "Open Door Policy" paved the way for Zhongguancun to become China's Silicon Valley and a center of innovation. An example of Lenovo can be drawn as a brand that came out of the Chinese Academy of Sciences. Intel, AMD, Google, and Oracle established their headquarters and research centers in China, (World Economic Forum, 2021)

Support

The partnership between the manufacturing sector and institutions of higher learning in many parts of China has created an encouraging environment for new firms. China has innovative-friendly policies, strong academia and industry collaboration, a large market, faster response times, and an excellent entrepreneurial culture.

Culture

Historically viewed as a risk-averse society, the culture of risk-taking for a country has made China a leader in technology and advancing the 4th Industrial Revolution. Entrepreneurs are proactive and experiment with innovative ideas within the market. They are operating with a 'try quick and fail fast' attitude. These are performed among additional flexible legal surroundings within the Western terms of information privacy and security (World Economic Forum, 2018).

Human capital

China has 200 million pupils, and entrepreneurial skills are taught at school age. This is four times the number in the United States of America, which is deemed a large country. China provides unique opportunities for entrepreneurs in education, which fastracks growth. The start-up culture is highly competitive and fast, resulting in the need to offer differentiated products while remaining agile, Wang 2021).

Market

The domestic market is sufficient for startups due to its population of 1.5 billion, an attractive market size that provides an opportunity for scale, easing pressure to take up the global market. There are more than 200 million school-age students in China, a unique opportunity for start-ups in the education sector. However, the start-up culture is hyper-competitive and fast, meaning offering differentiation while being agile is vital. Interactive artificial intelligence (AI) solutions for education, finance, manufacturing, and public services are rapidly maturing start-ups that have been forced to cancel due to regulators' excessive criticism of the technology sector.

The South African Ecosystem

Currently, the SME survival rate in South Africa is 70% to 80%, whereas small businesses fail within five years. Msomi et al. (2019) acknowledged the crucial SMEs' role in the development and sustainability of the nation (Statistics SA Report, 2018), with a GDP contribution of 70 to 95%, making SMEs the bedrock of the country's economy. Compared to other countries in the sub-Sahara, South Africa has a more robust economy (World Bank South Africa, 2019), although structural and non-structural factors hamper the country's EE (Eshetie, 2018). The dominance of the economy by large companies, widening income inequality, bureaucratic procedures, inadequate infrastructure, poor education system, and several other structural factors exacerbate the current EE situation in the country (SAB Foundation 2017). The dual economy, social inequality, and wealth inequality are other challenges facing South Africa (SAB Foundation 2017). The Company Intellectual Property Commission (CIPC) has increased the number of companies registered even though some are being de-registered due to inactivity due to a tall order in terms of compliance with legislation and policy in the business sector. Key obstacles that hinder SME success include legal compliance, registration requirements, excessive bureaucracy on compliance with labor laws, tax-related issues, database registration processes, and documentation are critical obstacles experienced by SMEs, Nieuwenhuizen (2019) Research has placed importance on EE, highlighting the need for a comprehensive and dynamic approach to SME support (Alvedalen & Boschma, 2017; Spigel, 2017; Mason, 2019; Motoyama & Knowlton, 2017; Cavallo, Ghezzi and Balocco, 2018). This view is echoed by Belitski and Heron (2017), who specify that this must be at individual, institutional, and firm levels within an entrepreneurship context. Looking at the current SME performance, it is projected that by 2030, the current share of SMEs will grow substantially in output.

Finance

Several studies on South African EE found that poor access to finance and related resources is a vital hindrance in Africa and South Africa (Chimucheka & Mandipaka, 2015; Leboea, 2017; Msimango-Galawe and Majaja, 2022; Leboea, 2017 and Makiana et al., 2015). This came out as the foremost essential element in supporting manufacturing SMEs.

Policy and regulatory environment

The Department of Trade and Industry and the Department of Economic Development play a significant role in developing policy and setting up support structures for SMEs in South Africa. Despite the availability of these policies, implementation remains a hindrance to SME growth. At the national level, The National Development Plan (NDP) is underpinned and used as a delivery machinery of the Constitution of the Republic of South Africa, Act 108 of 1996. The NDP informs provincial and local government plans. The National Development Plan is the overarching strategy from which all planning for government flows. The South African government has Chapter 9 institutions set up to protect democracy. There are also government agencies on the judiciary, electricity supply, economic development, SME support across industries, finance, etc., and government departments. On the legislative side, the Government and businesses alike obtain incentives for compliance with the legislation below, particularly on the Preferential Procurement Act, which ensures that previously disadvantaged people are given first preference on contract. Again, Broad, The Black Economic Empowerment policy provides preference points for those doing business with historically disadvantaged individuals or companies.

Figure 2: Regulatory Policy Framework for Businesses in South Africa

Source: National Treasury (2021)

The role of government begins and ends with creating a conducive environment by developing policies, reviewing them, and ensuring that they are effective in their purpose, Madzikanda, Li, and Dabuo (2022).

Support

South African government established a number of institutions to support SMEs. These were developed through the Act of Parliament, The Constitution. However, their effectiveness cannot be fully evaluated comprehensively as they are held in different organizations. The South African government established the Socio-economic Development Agency (SEDA), SEFA, through the National Small Business Amendment Act (Act 29 of 2004) to provide business development and support services for SMEs. While the established policies and support institutions are acknowledged, regulatory and bureacratic hindrances remain a challenge for SMEs at any phase of their development, (Tshikovhi et.al, 2023). The study goes further to recommend consolidation of the registration and funding systems, cutting the red-tape by a noticeable margin. The relationship between enabling legislative environment, good governance, clear policy direction, and entrepreneurship concentration has yielded sound entrepreneurial outcomes in many countries and the Brazilian government has made progress in implementing the recommendations by the scholars.

Culture

There is a need to facilitate a culture of entrepreneurship in South Africa, (GEM, 2022). This will help present entrepreneurship as a valuable career option. Currently, entrepreneurship in South Africa is viewed as a second job one can do and a fallback when all else fails.

Human capital

In South Africa, there has been an increase in the number of entrepreneurial or business-related training programs offered in recent years. This is due to the pressure exerted on the government to create jobs. The country has seen a higher establishment of non-governmental organizations aiming to skill people towards entrepreneurship as a career option. Technical and Vocational schools are more geared towards business studies than public management courses. This reflects a country facing reality in terms of the role of entrepreneurship. As a result of this, South Africa faces one of the worst inequalities in the world. (The World Bank in South Africa 2019, ILO (2016).

Markets

The South African government established organizations that promote entrepreneurial work through Proudly South African, facilitating access to markets within and outside the country's borders. The government also entered into trade agreements with several countries to support entrepreneurs in South Africa. The entrepreneurial ecosystem approach is still in its new stages, as there is no proper monitoring and evaluation of its effectiveness. Several programs are in place to promote entrepreneurial activities. These include Trade Expos, Festivals, and institutional events for exposure and opportunity sharing. With all these developments, South Africa was among those hit the hardest by the COVID-19 lockdown restrictions as compared to other countries within the BRICS bloc. Cele, Tshikovhi & Netswera (2024) assert that a number of companies were not prepared for a crisis and had no business metrics to measure and quantify their business strategy effectiveness, successes of failures. This challenge led to permanent closures in the SME sector. With systems that facilitate cross learning particularly in relation to accessing markets, product diversification and navigating crisis, the South African government has to improve its proactivess.

Discussion of Results

The study is undertaken with a clear understanding of the uniqueness of the environments within which each EE is set up in the BRICS member countries. Understanding the nature of challenges and diverse needs of BRICS entrepreneurs required more than mapping the entrepreneurship ecosystem, identifying gaps, and proposing focus areas to strengthen each EE; it enhanced how BRICS countries strengthen their cooperative advancement to transform and promote EE by solving the underlying bottlenecks, Bate (2021). The literature review reveals the importance of SME support coordination, policy development, implementation, and focused and biased support institutions around the industry. From this study, policymakers can focus on developing a tool to assist policy-makers in developing their policy with demographic and local needs in mind. The findings indicate that while BRICS countries have made strides in creating supportive ecosystems for SMEs, significant gaps need addressing.

Finance

Across the BRICS member countries, access to finance is one of the critical elements in the EE, apart from skilled human capital and a favorable regulatory framework. Financing challenges for small and medium enterprises (SMEs) across BRICS countries exhibit significant variation due to differing economic structures, regulatory frameworks, and governmental support mechanisms. This analysis will focus on Brazil, India, and South Africa, drawing upon recent data to highlight vital emphatic points in the financing landscape of these nations.

Brazil

In Brazil, SMEs are critical to the economy, comprising 98.5% of registered companies and contributing 27% of GDP (OECD, 2020). However, they face significant financing challenges. The Brazilian Central Bank's measures to reduce interest rates have historically benefited SMEs, but the current trend of higher interest rates for SMEs than larger firms discourages entrepreneurship (OECD, 2020). Additionally, despite the introduction of regulatory changes to facilitate angel investments and crowdfunding in 2016 and 2017, SMEs still struggle with access to finance due to a lack of tax incentives and persistently high interest rates (Aparicio et al., 2016). The structural challenges, including high self-employment rates, emphasize the necessity for policies that further enhance the business climate for SMEs (OECD, 2017).

India

Contrastingly, India's financial ecosystem is markedly more supportive of entrepreneurship. The Tamil Nadu Start-up Fund and various public-private investment initiatives bolster access to finance for SMEs, positioning India favorably in the global entrepreneurial landscape (GEM Report, 2020/21). The Indian government has established collaborative funding models that not only support emerging technologies but also aim to digitize traditional industries, thereby enhancing the growth potential of small enterprises (World Economic Forum, 2021). This proactive approach and increased access to financial resources distinguish India as a leader in fostering entrepreneurial activity within the BRICS framework.

South Africa

South Africa presents a mixed scenario where governmental initiatives such as the Small Enterprise Finance Agency (SEFA) aim to bridge the funding gap for SMEs. Despite these efforts, poor access to finance remains a pressing issue, often attributed to credit market inefficiencies and information asymmetries (Chimucheka & Mandipaka, 2015; Leboea, 2017). Although the government has relaxed eligibility criteria for loans, including collateral requirements, significant barriers persist that require adequate access to funding (Msimango-Galawe & Majaja, 2022). This situation forces many SMEs to rely on informal finance options, which may need to support their growth trajectories sufficiently.

Comparative Analysis

The comparative analysis of financing challenges reveals that Brazil struggles with high interest rates and limited access to formal funding. At the same time, India benefits from a robust entrepreneurial ecosystem supported by government initiatives and collaborative funding structures. On the other hand, South Africa is caught in a cycle of inefficiencies despite attempts to improve access to finance for SMEs. In summary, while the BRICS nations each face unique financing challenges for SMEs, the disparity in governmental support, access to financial resources, and economic conditions underscores the need for tailored strategies to nurture entrepreneurship effectively. Bridging the financing gap remains critical for unlocking the potential of SMEs across these diverse economies.

Policy

Across BRICS member countries, the study places, at the fore, policy framework as a critical factor for a thriving entrepreneurial ecosystem. The bureaucracy and red tape should not inhibit EE from performing optimally through meaningless rules and regulations. Instead, it must facilitate a system to speed up the decision-making and implement single window clearances. The success of startups depends on the strength of progressive policies that create an enabling environment for small businesses to thrive. Madzikanda et al. (2022) assert that high entry barriers, corruption, poor national strategies, and excessive taxes pressure SMEs and put innovative entrepreneurship out of business. Socio-cultural elements and government policies encourage entrepreneurship, but that support is insufficient to contribute positively towards economic growth.

Support

The environment is enabled through significant SME policies, such as Simples Nacional of Brazil, The SME Business forum of Brazil exists to monitor the implementation of policies and programs supporting the business sector, OECD (2020). Many multinational companies are now flocking to India to avoid the risk of being left out of the globalized world economy. This is where, apart from tight policies, governments in other BRICS member countries need to strengthen, monitoring the effectiveness of the policies for impact, not only compliance to it.

Human capital

Across BRICS countries there is a need for enhanced skills development. China and India are leading in the establishment of Entrepreneurial ecosystems and providing support, However, cultural dynamics might hinder the success of these ecosystems. There is cross-learning that can be derived from each country's EE. Resilience, risk appetite, and management practices need to be shared as Russia, Brazil, and South Africa face similar risks of safety, funding, lifespan, crime, corruption and skills gaps.

Market

In Brazil there is low innovation, few high-growth enterprises, internationalization of companies, and innovation in products and processes. However, Russian startups need more innovation, technology, and global market orientation know-how, (Szerb and Trumbull (2018). There is a need to enhance those conditions within each EE that hinder business growth. This so implies that among BRICS, there are strategies that every member country can borrow from the opposite towards an efficient ecosystem. South Africa has identified a need for the government to create a conducive environment for SMEs to thrive and make their mark in the global market.

In summary, the study highlights the critical role of a conducive environment in supporting the growth and performance of small and medium-sized enterprises (SMEs) within BRICS countries. Key results include Legislative and Regulatory Frameworks: BRICS nations have established legislation and policies that, while not intentionally obstructive, require SMEs to comply with various regulations before receiving support. This compliance can act as a barrier to growth. Impact of COVID-19: The pandemic underscored the necessity for business diversity and multiple income streams, prompting policymakers to focus more on entrepreneurship to drive economic recovery. Entrepreneurial Ecosystem (EE) Components: Successful entrepreneurship policies should address the education gap, regulatory burdens, and the need to monitor support mechanisms effectively. Challenges Faced by SMEs: Significant barriers include government resource constraints in supporting SMEs, inadequate funding, and ineffective monitoring of existing support mechanisms. These challenges hinder SMEs' potential to generate employment and reduce poverty. Cultural Influences: Cultural attitudes towards entrepreneurship vary across BRICS countries, affecting risk-taking behavior and innovation. For instance, India has seen a cultural shift towards accepting entrepreneurship as a viable career path. Human Capital Development: A "skills gap" exists in many BRICS nations where educational systems do not adequately prepare individuals for entrepreneurial roles. This gap is particularly evident among youth facing high unemployment rates. Market Access: Access to markets is essential for entrepreneurial success; policies that facilitate market entry can significantly enhance opportunities for SMEs. Policy Effectiveness: The complexity of existing policies often results in unintended consequences that stifle rather than promote entrepreneurship. Simplified tax systems and coherent regulatory frameworks are necessary to foster a conducive business environment. Support Mechanisms: A dual approach involving hard (infrastructure) and soft (mentorship, networks) support systems is crucial for enhancing SMEs' operational efficiency. Collaboration among local entrepreneurs, educational institutions, and NGOs can strengthen these support networks. Cultural Shifts: Promoting a culture that values entrepreneurship is essential for increasing participation rates among potential entrepreneurs. Societal attitudes towards risk-taking must evolve to encourage innovation. Human Capital Investment: Addressing the skills gap through targeted educational programs is vital for preparing the workforce for entrepreneurial challenges. Programs to enhance entrepreneurial skills should be prioritized to improve success rates among new ventures. Market Dynamics: Understanding consumer behavior and competitive landscapes is critical for entrepreneurs in navigating market entry effectively. Policies should aim to reduce barriers to market access while fostering networks that facilitate knowledge sharing.

The study advocates for a holistic approach that integrates these findings into actionable strategies tailored to the unique contexts of each BRICS member country. By addressing barriers related to finance, policy coherence, cultural attitudes, human capital development, and market access, these countries can create a more enabling environment for SMEs to thrive and contribute significantly to economic growth.

Policy Recommendations

Finance

To create an empowering entrepreneurial ecosystem, it is essential to establish robust connections between venture capitalists, angel investors, and startups. The government should develop comprehensive laws and policies that not only provide tax breaks but also offer incentives such as grants for innovation, access to land, and essential infrastructure (e.g., roads and international airports) to attract global investors. Furthermore, implementing an Open Door policy similar to that of China advocating for equal opportunities for all countries trading with China should be prioritized when member countries resolve their current infrastructure challenges, enabling them to attract better and retain foreign investment.

Policy

In South Africa, government policy should prioritize long-term sustainability and consistency. Frequent policy changes can lead to confusion and sector stagnation. Therefore, a comprehensive SME Strategy and Action Plan must be created, detailing policy objectives, targets, and support measures, emphasizing monitoring for impact rather than mere compliance. Policies should categorize businesses by size to ensure equitable support and partnerships. They must enhance the entrepreneurial environment, particularly for early-stage companies, through initiatives to improve management skills, export capabilities, technological application, and innovation. Active collaboration between universities and entrepreneurs is crucial, fostering partnerships that benefit both sectors. Regular evaluation of SME and entrepreneurship programs should be instituted to build an evidence base for future policy development.

Support

Clear roles and responsibilities for ministries and agencies involved in SME governance must be established. A forum similar to the Permanent Forum on SMEs should be created to facilitate dialogue on SME policy at the institutional level and promote state-level discussions. All policies should clearly articulate and prioritize essential components of an enabling EE, such as infrastructure, access to funding, land, regulatory frameworks and water.

Human Capital

Recruiting experienced and passionate staff is crucial to effectively implementing SME programs. Additionally, the number of entrepreneurship-focused academic programs in South Africa and Brazil should be expanded, learning from other BRICS nations where these programs flourish, particularly in India, China, and Russia. Collaborative programs that integrate practical entrepreneurship training with academic learning should be prioritized.

Culture

Several studies cutting across various sectors highlight different phases of entrepreneurial development—including challenges, breakthroughs, and success stories—that should be compiled and shared widely. This documentation will play a vital role in cultivating a positive entrepreneurial culture by showcasing real-life examples and best practices.

Markets

A value chain should be developed to significantly reduce startup approval and processing times, taking cues from Brazil's successful models. Encouraging product diversity is critical, as it fosters innovation and generates solutions to real-world challenges. Furthermore, countries like India should prioritize internationalization to expand beyond domestic markets, taking inspiration from South Africa's strategies for accessing global markets. Collaborative initiatives that enhance market access and create sustainable networks among BRICS nations can also facilitate this goal.

Future Research Directions

Based on the findings and discussions presented in the study, several future research directions are proposed to explore further and enhance the understanding of entrepreneurial ecosystems (EEs) in BRICS countries. Further exploration will help bridge the gap between the most successful entrepreneurial ecosystems and the less, taking lessons from India, which has the 3rd largest EE in the world, and China. The following are areas of focus in those studies:

Impact of Policy Frameworks on SME Growth

Investigating the specific impacts of various policy frameworks on the growth and sustainability of SMEs within BRICS countries. This could include examining successful initiatives like Brazil's Simplified

Tax System and analyzing their applicability in other BRICS contexts. In this comparison, it would be beneficial to consider the operating environment of those SMEs in each of the BRICS countries.

Role of Technology in Enhancing Market Access

Exploring how technology can be leveraged to improve market access for SMEs in BRICS countries. Research could focus on e-commerce, digital platforms, and social media as tools for expanding market access and connecting entrepreneurs with consumers outside their borders.

Cultural Influences on Entrepreneurship

Cultural issues hinder EE's effectiveness in each of the BRICS member countries. Therefore, cultural factors influencing entrepreneurial attitudes and behaviors in BRICS countries must be examined. These studies could also assess how societal values impact risk-taking, innovation, and the perception of entrepreneurship as a viable career choice.

Human Capital Development Strategies

Several factors influence human capital development, such as duplication of the same training programs offered by different supporting institutions to comply with their annual targets without considering the needs of each SME or sub-sector in which it operates. SME firms find no benefit in that. Investigating effective strategies for bridging the skills gap in BRICS countries and focusing on educational reforms that align with entrepreneurial needs will help supporting institutions create a level ground for all SMEs to thrive. Therefore, research studies could evaluate existing educational programs and propose new curricula that foster entrepreneurial skills among youth.

Monitoring and Evaluation of Support Mechanisms

SME-supporting institutions play a dual role in policy development, implementation, and monitoring and evaluation of their policies, which can result in bias. Future research studies can examine frameworks for monitoring and evaluating the effectiveness of support mechanisms for SMEs. These frameworks should exclude the government as policy developers to reduce bias and influence. This research could identify key performance indicators that measure the success of government initiatives that foster entrepreneurship.

Longitudinal Studies on Entrepreneurial Outcomes

One contribution future research studies can make to the EE paradox is to conduct longitudinal studies to track entrepreneurial outcomes over time in response to policy and economic conditions changes within BRICS countries. This research would provide valuable insights into the long-term effects of different strategies on SME growth.

Cross-National Collaboration Initiatives

Explore opportunities for cross-national collaboration among BRICS countries to share knowledge, resources, and best practices related to entrepreneurship support. Research could focus on establishing networks that facilitate learning and collaboration across borders.

By pursuing these research directions, future research studies can contribute to a deeper understanding of how to effectively support SMEs within BRICS countries, ultimately fostering sustainable economic growth and innovation across these diverse economies.

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The Relevance of BRICS in the Period of Turbulence

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Abstract

The emergence of BRICS is seen as an important shift towards multipolarity, putting significant pressure on the existing hegemony in multilateral institutions such as IMF, World Bank, and the dollar-dominated monitory system. The inaugural BRIC Summit in 2009 at the Russian Federation came up with focused issues of reform in the global financial structure. Starting with the financial issues of mutual interest, BRICS's objectives have widened over time. It encompasses major global issues such as terrorism, Climate Change, food and energy security, international economic and financial situation, reform of the Bretton Woods institutions, trade protectionism, and hegemonic control of multilateral institutions that were held responsible for the great divide between North and South owing to a critical flaw of the unequal representation of developing countries in the global economy. The opening of the 21st century witnessed a financial crisis, bilateral trade wars, sanctions, unilateral actions, and global inequalities in access to finance, technology, resource mobilization, and trading capacities gave impetus to the rise of BRICS. BRICS have shown their concern about the serious setback to the Global Economy caused by the COVID-19 scenario and the hardships suffered by humanity, which had an impact on the economy.

The current research paper is based on secondary source of data collection. This is a subjective investigation that intends to discuss the significance of BRICS in contemporary global society as an initiative of collaboration in the areas of economy and trade, innovation, and strategic cooperation. Its objectives are to broaden, deepen, and intensify cooperation for more sustainable, equitable, and mutually beneficial development. It is an attempt to understand the affirmative role of BRICS Nations, it's future perspectives, and the role of India in BRICS.

Keywords: Multilateralism, Sustainability, Pandemic, Global Governance, Quintessential

Introduction

BRIC an acronym coined by Goldman Sachs economist "Jim O'Neill" in 2001 in his global economics paper 'The World Needs Better Economic BRICs' on an econometric analysis of Brazil, Russia, India, and China projecting that the four economies would individually and collectively occupy far greater economic space and would be amongst the world's largest economies in the next 50 years or so. Genesis of BRIC formally took place in Yekaterinburg, Russia, on 16 June 2009. With the inclusion of South Africa into the group it became BRICS in 2010 and summit-level dialogue was initiated to push for democratization of the global economic & financial architecture, though it developed latter in a platform to also express shared political perspectives. This association of five countries represents 41% of the global population, 24% of global GDP, and 16% of global trade (BRICS, 2021). Normally if we go for historical analysis we find that every association or organization came into existence to solve some problem or crisis faced by humanity "For ex.- Bretton Wood Twins was created to provide funding for the reconstruction of the world after Second World War" in the same way BRICS started with the objective of co-operation amongst BRICs nations to provide economic stability in the time of turbulence of Financial Crisis of 2008. In the very first BRICS Summit, the member nations set forth their objectives of 'reforming the multilateral institutions such as IMF and World Bank so that they reflect the structural changes and pro-active role in the world economy. 'Over the years, unabated distortionary subsidies by the developed nations, non-tariff barriers, the lack of transparency, dumping, freezing of dispute settlement architecture, inequitable treatment of greater economies to developing nation of South were a few factors responsible for the genesis of BRICS (Chaturvedi, 2022).

The current paper is an attempt to analyze the relevance of BRICS in a time of turbulence and its future prospects. It explores the relevance of BRICS in Global Economic Governance as its key objective focussed on reforming the global financial structure and also the most pressing persisting global issues viz; Energy security, Climate change, food security, elimination of poverty, health, and development. It also attempts to understand in brief the issues of constraints and future prospects of the Organization.

The Paper is based on secondary sources of data collected from various sources, scholarly articles, and reports of the BRICS summits. This is a subjective investigation that intends to discuss the significance of BRICS in contemporary global society as an initiative of collaboration in the areas of economy and trade, innovation, and strategic cooperation, its objectives to broaden, deepen intensify cooperation for more sustainable, equitable and mutually beneficial development. It is an attempt to understand the affirmative role of BRICS Nations, their future perspectives, and the role of India in BRICS.

BRICS with two of 5 permanent members of the UNSC – China and Russia and three emerging nations that are democracies- Brazil, India, and South Africa is often dismissed as an ineffective and disparate group. But BRICS as a group has shown cohesion and consistency in its deliberations on global governance and has provided an alternative narrative on key areas such as:

- Development assistance without stringent Bretton Woods Institutions conditionality
- Internet governance and international payment systems

BRICS has been able to set aside ideological differences and rivalries to focus on issue-based cooperation in the broader context of making the international order more inclusive (Lal, 2022). The approach of BRICS is not anti-West but it is pro-Global South, providing a platform for the underprivileged and underrepresented countries of the global south to express and progress in their objective and pursue their goal more effectively. It's an emerging investment market and global power bloc. Today world is polarised between those countries who better know that there are problems in the field of Climate change, food security, energy security, and loss of peace & stability in the region, but they are not ready to act on these problems and those countries who are at receiving end of these crises and want change as effectively as possible. Since its inception in 2009, BRIC focused on the issue of reform of the global financial architecture. The BRICS agenda has not been only reforming global financial structure, BRICS has expanded its agenda and has focussed on the most pressing issues of contemporary relevance viz; health, and education, it encompasses some more objectives such as food security, elimination of Poverty, energy security, climate change, and development aid and also seeks to deepen, broaden and intensify cooperation within the grouping and among the individual countries for more sustainable, equitable development. BRICS has emerged as a potential and promising political-diplomatic entity with diverse objectives. BRICS nations have concluded agreements in the areas of Economic and Trade Cooperation; strategic cooperation between the BRICS Business Council, Contingent Reserve Agreement, and the New Development Bank. These agreements contribute to the realization of the shared objectives of deepening economic cooperation and fostering integrated trade and investment markets.

BRICS cooperation operates on two pillars – 'consultation on issues of mutual interest through meetings of Leaders as well as of Ministers of Finance, Trade, Health, S&T, Education, Agriculture, Communication, Labour, etc. and practical cooperation in a number of areas through meetings of Working Groups/Senior Officials. Regular annual Summits as well as meetings of Leaders on the margins of G20 Summits are held'. In the 2022 summit in Beijing, BRICS Nations reaffirmed support for an open, transparent, inclusive, non-discriminatory, and rules-based multilateral trading system, as embodied in the World Trade Organization (WTO). The Declaration reads as-

"We will engage constructively to pursue the necessary WTO reform to build an open world economy that supports trade and development, preserve the pre-eminent role of the WTO for setting global trade rules and governance, supporting inclusive development and promoting the rights and interests of its members, including developing members and LDCs. We recognize that special and differential treatment as established in WTO rules is a tool to facilitate the achievement of WTO objectives with respect to economic growth and development. We call upon all WTO members to avoid unilateral and protectionist measures that run counter to the spirit and rules of the WTO. We emphasize the top priority and urgency of launching the selection process of the Appellate Body members to restore the binding two-tier multilateral dispute settlement mechanism. We agree that the Appellate Body crisis should be resolved without further delay and should not be linked with other issues. We endorse BRICS Statement on Strengthening the Multilateral Trading System and Reforming the WTO (www.mea.gov.in,2022).

In the contemporary world, the most pressing issues of global concern persist in the fields of Energy, Climate change, War and Health, poverty, and underdevelopment. In such an uncertain situation, the role of BRICS as a group has become indispensable to resolve these issues & play a quintessential role in providing a path for the peaceful growth of humanity. BRICS along with other Multilateral organizations like the World Bank, IMF, WHO, etc. are expected to play a proactive role to support the development needs of the Global South. To Combat the Situations like COVID-19 Pandemic multilateral institutions are required to generate a consensus to overcome such a crisis. The Covid pandemic brought World Health Organization (WHO), under intense scrutiny and also the historical role played by the Institution in securing public health. 'The continued challenges faced by poor and developing countries in access to medicines, treatments, and vaccines are stark reminders of the existent inequalities. ……… The crisis has also put the focus back on the WHO's funding mechanisms to allow greater flexibility in times of need. India has recommended several measures related to governance and organizational structure to reform the WHO. COVID crisis taught the whole world that the entire world is interconnected, a crisis in one part of the world can impact the other portion in the same manner. Therefore, the Nation's specific solution in isolation in the matter of health, climate change, energy, trade, etc. cannot be a better choice for the greater good of humanity. The objective of the Paris Climate Treaty to limit the warming of Earth to 2°c and reduce it to 1.5°c can't be fulfilled without the positive contribution of BRICS which represents 41% population and 26% of the total land area on Earth. Therefore, the whole world has to think and work on these common issues of humanity as a single unit or entity. India's slogan of "Vasudhaivakutumbakam" which means the entire humanity is one large family is represented by this fact.

BRICS' Role in Cambating Climate Change

In the 21st century climate change is a serious issue facing the whole world which has adversely influenced the world and humanity. Floods in India, heat waves in China & EU countries, forest fires in the Amazon, etc. have been all the result of catastrophic climate change. Global warming will impact humanity, because of global warming famous cities like Bombay, Shanghai, St. Petersburg, and Rio-di Janeiro which are low-lying coastal cities may be submerged because of rising sea levels. The rising sea level will have a significant economic impact as well as will impact about some 600mn people living along the coast (nearly one-quarter of the total BRICS population) (Lawson, Heacock, and Stupnytska, 2007).

Agriculture remains an important factor in the growth of BRICS economies which accounts for an average of 34.3% of share in global agricultural production in 2014 (Bricsmagazine.com, 2015). Arable land per capita is below the world average in all the BRICS countries except Russia, so changing weather patterns because of climate change will put the food security of not only the BRICS countries but the whole world at risk because the BRICS countries are also a major exporter of the food grain in the world.

Forest plays a vital role in the improvement of climate by absorbing CO2 from the atmosphere. Within BRICS "Russia and Brazil" are the most forest-rich countries in the world with China and India also amongst the top 10 list. Overall BRICS account for 40% of the world's total forest area, but only between Aug 1, 2021, and July 31, 2022, an area of around 11,568 sq. km. (equivalent to the size of Qatar) was cleared in Brazil according to a preliminary analysis of satellite image released on Nov. 30 by the country's National space research institute (INPE) (The Associated Press, 2022).

IPCC 6th Assessment report "Working Group IIs Contribution" was released on Feb 28, 2022. It provides one of the most comprehensive examinations of the intensifying impacts of climate change and future risks. The key findings of the report are the following:

- Climate change is already causing widespread disruption in every region in the world with just 1.1degree C. (2degree F.) of warming. Droughts, extreme heat waves & unseasonal floods already threatened food security & livelihoods for millions of people. Since 2008, devastating floods & storms have forced more than 20 million people from their homes each year. Since 1961 Crop productivity growth in Africa shrunk by a third due to climate change
- Higher temperature is also the major factor behind the spread of various vector-borne diseases like West Nile virus, Lyme disease, Malaria, and Dengue as well as waterborne diseases like cholera.
- The IPCC estimates that in the next decade alone climate change will drive 32-132 million more people into extreme poverty.
- The report finds that every tenth of a degree of additional warming will escalate threats to people, species, and ecosystem.
- Right now, 3.3 billion to 3.6 billion people live in countries highly vulnerable to climate impacts with global hotspots concentrated in small islands, developing states like the Arctic, South Asia, Central and South America and much of Sub-Saharan Africa.
- 'Inequity, conflict & development challenges such as poverty, weak governance and limited access to basic services like healthcare not only heighten sensitivity to hazards but also constrain communities' ability to adapt to climate change. This challenge is especially acute in Sub-Saharan Africa where 60% of the urban population lives in informal settlements & in Asia where 529 million people reside in these vulnerable areas (IPCC, March 20, 2022).

From these points, it is clear that climate change is a major issue for the whole of humanity in the 21st century, and BRICS as a grouping that represents 41% of the world population and 26% of the total land area on earth is not immune from this. So as a Group focused on the greater welfare of the world and humanity, BRICS countries have to speed up their commitment and action towards climate change which was also highlighted in the statement of "BRICS High-level meeting on climate change" organized virtually on "13 May 2022". The BRICS high-level meeting on climate change aims to jointly address climate change, explore approaches to accelerate low carbon and climate resilient transition, and achieve sustainable balanced, and inclusive recovery and development. All BRICS countries already gave their commitment to achieve carbon neutrality in UNFCCC which are as following-China and Russia by 2060, India by 2070, and Brazil and South Africa by 2050 (Mfa.gov.cn, 2022).

BRICS & Energy Security

Within BRICS India and China are the two major importers of crude and coal in the world, 80-90% of the energy needs of both the country are dependent on energy imported from outside so the situation of the world directly impacts the economy of these countries. BRICS as a group of developing countries requires a continuous supply of energy for the growth and welfare of the countries. To fulfill their needs countries usually get energy from two sources, renewable and non-renewable. While renewable sources are environmentally sound, unfortunately, non-renewable sources like fossil fuel and coal are the big source of energy consumption in the BRICS. According to an ENERDATA report 2020 (Wang et al., 2022)

- BRICS countries' coal consumption increased from 1761 metric tons in 1990 to 5217 mt. in 2019
- BRICS countries' oil consumption increased from 641 mt. in 1990 to 1138 mt. in 2019, a growth of about 77.5%
- BRICS countries' gas consumption increased from 506 billion cubic meters to 910 billion cubic meters in 2019

The current need is the development of alternative sources of energy keeping in view the climate and environmental concerns. The BRICS community has focused on the need for advanced technologies to develop sustainable, clean, and green energy thus shifting towards renewable energy sources as the only option left to the countries to meet the required and increased consumption of energy giving impetus to developmental initiatives

These greenhouse gases will harm the environment and will be the major factor behind increasing global temperature. Therefore, keeping the welfare of the Planet and humanity in mind, shifting towards renewable energy will be the only option left to the countries.

The Beijing Initiative of the BRICS Business community released during the "BRICS Business Forum 2022 on June 22" stressed the need for the promotion of global sustainable development and speed up towards green transition. The establishment New Development Bank (NDB)presents a glimpse of the BRICS initiatives to tackle the infrastructure and development challenges faced by emerging economies while advancing UN's 2030 Agenda for Sustainable Development. NDB will provide $ 30 billion of financial support to member countries from 2022 to 2026 with 40% funds to be used for mitigating global energy (Globaltimes. cn, 2022).

NDB has so far already approved 70 infrastructure and sustainable development projects worth US$25.07 billion across all member countries in the past 5 years, these projects are the areas of sustainable infrastructure, clean energy, renewable and green energy, water and sanitation, etc (Brics2021.gov.in, 2021). In conformity with the strategy for BRICS Economic Partnership adopted at the "BRICS Ufa Summit" in 2015, the first BRICS Energy Ministerial was held marking the institutionalization of energy cooperation with BRICS.

In the Xiamen Declaration of 2017, BRICS leaders encouraged regular dialogue on the formation of a "BRICS Energy Research Co-operation Platform (BRICS ERCP)" which led to the formation of the BRICS ERCP platform: which was agreed upon and acknowledged in the Johannesburg Summit Declaration in 2018. Today's BRICS ERCP is a global platform for the promotion of energy-based sustainable development, sharing of advanced energy technologies, expansion of cooperation on educational programs as well as the exchange of statistical data and plans on the development of national energy systems and information on best practices and regulatory framework in the energy sector (Brics2021.gov.in, 2021).

BRICS Energy Ministers Meeting held on 02 Sept. 2021 in India acknowledges the crucial role of energy in promoting social and economic development as well as environmental protection, because in 21st century world, energy without clean and sustainable part is a threat to human health and survival which is also recognized and to be achieved by the countries as UN SDG17. In the meeting BRICS leaders reiterated 'their commitment to modernize national energy systems, increasing the role of clean energy including renewables and to continue the use of all fuels and advanced technology to satisfy the energy needs of their population and economies (Pib.gov.in, 2021). Ensuring access to affordable, reliable, sustainable, and modern clean energy for all is crucial for Social and economic development and lifting people from poverty. The 2021 BRICS Summit emphasized the importance of various clean cooking solutions to improve the health, productivity, and quality of life of people, particularly women, children and youth. Summit recognized the role International Solar Alliance (ISA) established during the 21st session of UNFCCC of COP-21 in promoting clean energy through decentralized off-grid solar power.

BRICS Energy Technology Report 2021

It is the Outcome of collaborative efforts of the Bureau of Energy Efficiency (BEE) and the Indian Council for Research on International Economic Relations (ICRIER). This report made under Indian chairmanship is a result of joint efforts by sector experts from all member countries. Carrying the exercise forward Indian Presidency has proposed a Questionnaire on similar lines focusing on the demand side and proposed that a study on energy demand to be undertaken with the theme of "what technologies will be critical for achieving deep decarbonization of energy demand BRICS (Sept,2021)". In the 2021 BRICS technology report three demand sectors were covered such as:

- Industry (Iron Steel and Cement)
- Transport (Heavy Duty Freight and Light Duty Passenger Vehicles)
- Buildings (Residential and Commercial)

The primary objective of the report is to identify the critical technologies that are required, deliberate on the next step that needs to be undertaken explore avenues of joint technological collaboration, recognize potential barriers, and inform policy makers regarding the kind of policy push that may be required. The report is focused on the search for new technology that can be used to replace the amount of carbon released in the atmosphere which was released by traditional methods of production in the above-mentioned sectors.

BRICS & Its Role in World Trade Stability

BRICS Countries are an essential part of world trade, and their supply and consumption lines account for 17% of global trade and 1/3rd of global GDP. China and India, the most populous countries in the world, are the major consumers of various goods and suppliers of various produce to the world. Russia with its huge natural resource became the major exporting country in energy and food grains like wheat and sunflower to the world. Brazil and South Africa are also major sources and suppliers of key minerals and food grains in the world. 'BRICS grouping with 47% of the population of the whole world is also an important market for the production and consumption of many essential goods without which world growth could not be sustained. Within BRICS with USD 100 billion in trade with 3 of 4 possible countries in the BRICS and a turnover of USD 416 billion, China is indisputably the major player in terms of trade (Silk Road Briefing, 2023).

BRICS have shown their resolve to reduce the North-South gap. Finance Ministers and Central Bank Governors of BRICS met on June 6, 2022, and declared- 'We are concerned that global development is suffering from severe disruption, including the widening North-South development gap, divergent recovery trajectories, pre-existing developmental fault-lines, and a technological divide. This is posing huge challenges to the implementation of the 2030 Agenda for Sustainable Development as economic and health scarring, particularly for emerging markets and developing countries (EMDCs), is projected to persist beyond the current pandemic (Ministry of Commerce, 2022).

In the BRICS summit held in 2022 in Beijing, the BRICS outreach would now feed into BRICS PLUS to push BRICS emerging market and developing countries (EMDCs) to closer cooperation and transform the grouping into an "International Platform dedicated to improving global economic standards for trade, investment, and Govt. through technology and innovation". Thirteen other countries have asked to officially join the BRICS, such as recent G20 host Indonesia (The Hindu, 2022). During COVID-19, the supply chain of essential commodities is a major problem for the whole world, such as the supply of Active Pharmaceutical ingredients (API), food items, medical equipment, and travel from one country to another. That's why after the COVID-19 pandemic every country in the world is trying to ensure a safe supply line for some essential goods that are quintessential for the country also countries are focused on diversifying their supply chain to reduce reliance on any single country for the supply of essential goods and services. BRICS countries have committed in the BRICS Summit 2022 in the "Strategy for BRICS Economic Partnership 2025" to enhance supply chain connectivity by identifying bottlenecks in regional supply chains to ensure more efficient operations of supply chains (The Hindu, 2022).

BRICS & Its Share in Health-Related Problems and Solutions

BRICS countries with 40% of the world population also have 40% of the global burden of disease. BRICS accounts for half of the 8.6 million people developing TB every year. Air and water pollution is also at a high level in major cities of BRICS countries like New Delhi (India), Shanghai (China), Rio de Janeiro (Brazil) etc. 'The BRICS countries account for 50% of the world's poor population and health inequity will have serious consequences for the poor population if left unaddressed (Acharya, 2014). The marginalized sections were marred by economic inequality; health inequality suffered largely during the COVID-19 pandemic. The poor and migrant workers from all over the world were the main victims of the pandemic due to the non-availability of guaranteed employment and income and health amenities as well. They had to face the same scarcity of medical requirements in that pandemic that the rich were facing, which made their situation even worse. A Large population of poor during Covid time died not because of the non-availability of medicinal facilities, but because of scarcity of food and employment. COVID-19 presented a scenario before the whole world that no matter which country is more developed in terms of economy, industry, or GDP, the pandemic affects the whole of humanity in the same manner. It became quite evident that without working jointly as a single unit no country can address the problem of health crisis in isolation.

The issue of health appeared for the first time in the 3rd BRICS summit held in 2011 in Sanya (China) concerning HIV/AIDs., Since then BRICS has held Ministerial level meetings on health issues regularly every year. In the 1st meeting of BRICS health ministers in Beijing in July 2011, it was agreed to institutionalize the dialogue among BRICS Ministers of Health. A working group for discussing proposals of BRICS Collaboration and Co-operation in health was also established.

The 2nd and 6th BRICS health Ministers' meeting was held in New Delhi on 11 Jan. 2013 and 16 Dec. 2016 respectively. At the 2nd meeting, discussions were focused on reform of WHO to better respond to global health challenges and renewed their commitment to strengthen world co-operation in health especially "South-South Co-operation", with a focus to support efforts in developing countries and to promote health for all. The dialogue focused on TRIPS flexibilities with public health perspectives. At the 6th BRICS Health Ministers Meeting (2016) BRICS countries resolved to continue cooperation in the health sector through the working group and "BRICS Framework for Collaboration on Strategic Project on Health". The theme of the 10th meeting of the BRICS health minister was "Era of Covid-19: Global BRICS Solidarity for Health Safety in 2020". Health Ministers of the BRICS agreed to deliver decisive, coordinated, and inclusive multilateral efforts to fight the COVID-19 pandemic. At the 12th BRICS leader summit, the Hon'ble PM of India in his remark stated that India would focus on consolidation of Intra-BRICS cooperation including in the field of traditional medicine and Digital health (Brics2021.gov.in, 2021).

The COVID-19 pandemic overwhelmed the multilateral institutions inflicting huge material and human costs and reflected on poor preparedness of the nations and WHO pertaining to such pandemics. India recommended several measures related to governance and organizational structure to reform the WHO (Chaturvedi, 2022). India's concern towards reforming the Organizational structure of WHO reflected in the suggestions regarding 'strengthening the Public Health Emergency of International Concern declaration process; ensuring transparency in funding mechanism and accountability framework; enhancing the response capacities of the WHO and its member states; improving the WHO's governance structure; improving the implementation of international health regulations; providing access to therapeutics, vaccines, and diagnostics; creating a global framework for management of infectious diseases and pandemics; and enhancing the role of 'hosted partnerships' in pandemic management

WHO declared COVID-19 as a Global pandemic on March 11, 2020 (The Hindu, 2020). Since then BRICS countries like India, China, and Russia supplied medicine, masks, PPE kits, and vaccines to most of the countries in the world including not only the nations of the Global South (Developing and underdeveloped) but also the developed countries like USA, Italy, Germany and U.K. etc. Even in Oct. 2020 India and South Africa at WTO's TRIPS council proposed that the WTO waive the application of certain provision of the TRIPS agreement for the duration of pandemic with a view to facilitate wider access to technologies necessary for the production of vaccines and medicine (The Hindu, 2022); so that poor and least developed countries who have no major manufacturing base of vaccine and medicine can be provided medicines and vaccines on least possible cost. During Covid, BRICS Countries like India and China supplied vaccines to many countries in south Asia and Africa free of cost. It is quite evident that in future, world has to prepare for a crisis like COVID-19, to better manage and handle the situation because the kind of helplessness felt by the world communities during the pandemic is a lesson to the whole world that a country's specific solution in isolation will not work in handling the situation. The whole world has to become a single unit in dealing with such a level of crisis, because in the 21st with a such high level of Globalization and interdependence of countries on one another and mobilization of people from one country to another for trade, education, health, job, etc. that's why the whole world countries should understand that "No one is safe unless everyone is safe". BRICS have the responsibility of supporting post-pandemic growth and development in emerging countries and pushing for much enhanced multilateral efforts by furthering its deep connection with the Global South.

Debate on Unipolarity and Multipolarity and Its Side Effects

In the post-Cold War scenario shift towards unipolarity was witnessed during a short span of time. Consequently, multilateral institutions like WHO, WTO, IMF & WORLD BANK have become biased towards the developing world in their decision and funding and trade patterns. For ex.- "The President of World Bank and IMF was always from USA and EU countries". Instead of having larger population bases and markets, BRICS countries like China and India which became the second and fifth-largest economy in the world, never got the opportunity to head these institutions. Even in providing loans and support to developing countries, these institutions are guided by the countries of the Western world. In that unipolar situation, the BRIC grouping came into existence to bring multipolarity in the world governance with an objective to make it more democratic. 'BRICS summit-level dialogue was initiated to push for the democratization of global economic and financial architecture, though it developed later into a platform to also express shared political perspectives (Raghavan, 2022). Despite several efforts over the last two decades to reform these Multilateral institutions, not much has been achieved toward serving the requirements of developing countries and a lot has been required to be done to make these institutions more democratic and transparent in their functioning. The financial crisis of 2008, BREXIT, Trade wars, Sanctions, Unilateral action, COVID-19, and the rise of inward orientation, Protectionism, etc. hampered the democratic functioning and growth of Multilateralism and global governance.

While global inequalities in access to finance, technology, health, resource mobilization, and trading capacities are multiplying, Climate change and security challenges have also been intensified. To address these issues BRICS launched NEW DEVELOPMENT BANK (NDB) during the BRICS Fortaleza summit in Brazil on July 15, 2014, and established CRA (Contingent Reserve Arrangement) whose functioning was similar to IMF in 2015. BRICS initiative to establish NDB intended 'to mobilize resources for infrastructure and sustainable development projects in BRICS countries and other developing countries, in addition to the existing efforts of multilateral and regional financial institutions to support global growth and development (Kumar, 2022). The role and relevance of BRICS go far beyond the often-said economic transformation of the member countries. As the BRICS countries started to play a proactive role in global governance, their efforts and contribution to supporting the development needs of the global south can also be amplified. While global poverty is set to intensify due to the pandemic, unemployment, and inequity in health resources, the role of the BRICS grouping in dealing with those situations also increased.

Role Played by India Under BRICS

In the recently released "World Population Prospectus 2022" by the UN Department of Economic and Social Affairs Population Division, Global Population is projected to reach 8 billion by Nov.15, 2022, from 7.9 billion which could grow to around 8.5 billion in 2030 and 9.7 billion in 2050. In this report, it is also underlined that India will surpass China as the most populous country in the world in 2023. With more population comes more responsibility and problems, because providing food, health, education, sanitation, and infrastructure and focusing on the all-round development of the country is not an easy task. Indian Govt. is already engaged with vigor in addressing these issues by the means of various social and welfare programs for rural and urban upliftment like the Digital India mission and Bharat Net in the technology sector, Saubhagya Yojana and Ujjwala Yojana in providing rural and urban means of energy for household consumption, Ayushman Bharat, POSHAN Abhiyan and Swachh Bharat mission in health sector, etc. some of these schemes are even applauded by a multilateral organization like the world bank and WHO. The performance and achievement of India in record-breaking vaccination of more than 220 crore doses of COVID-19 vaccines was also applauded by the whole world. Indian-made software platform "CoWIN" is already made open source for all countries in the world to access, adapt and use. PM of India at the Glasgow summit of UNFCCC in Nov. 2021 also made five major commitments popularly called “Panchamrit” for the green development of the country and increasing the role of India in the global action against climate change by setting the target of Net zero emission of GHG by the year 2070.

It is also a rare coincidence that the G20 which represents nearly 90% of the world GDP, 80% of global trade, and 67% of the planet’s population is headed by three BRICS members from 2023 to 2025 respectively (2023-India, 2024-Brazil and 2025-South Africa). G20 is a platform that nearly represents the whole world and the presidency of that organization holds a vital sway over shaping the many decisions of world governance and resolving various conflicting issues of the world by debate and discussion. The presidency of G20 for continuous three years to BRICS member countries would prove quite helpful in establishing and maintaining consensus on some of the major issues of world governance like the Reform of UNSC Membership and Multilateral organization, mutual and cooperative growth in world trade, cooperation in climate change, establishment of Multilateralism and resolution of various conflict in different part of the world. From the above points, it is clear that the role of BRICS in the coming future is going to be magnified and enhanced in shaping world governance and contributing in a positive manner to eradicating poverty, unemployment, food crisis, environmental issues, etc. and in the establishment of a peaceful world.

Tough Road ahead

BRICS nations are expected to play an effective role in Global Economic development. BRICS countries are developing economies that have the potential to play an effective role in global economic development. Member nations have their own issues, expectations, and challenges of economic disparity, poverty, and model of economy. BRICS started with an objective to reform the global financial structure, its role and relevance go far beyond the economic transformation of the member countries. it encompasses broader objectives such as food security, elimination of Poverty, energy security, climate change, and development aid and also seeks to deepen, broaden, and intensify cooperation within the grouping and among the individual countries for more sustainable, equitable development. As the BRICS countries started to play a proactive role in global governance, their efforts and contribution in supporting the development needs of the global south can also be amplified. While global poverty is set to intensify due to the pandemic, unemployment, and inequity in health resources, the role of the BRICS grouping in dealing with those situations has also increased.

BRICS as a group has a tough road ahead as it is a heterogeneous group with diversified interests, economy, political culture, nature of state, foreign policy preferences, and the like. Russia and China, in their search for multipolarity, treat this organization as an instrument to counter the dominance of the West, especially the US. Unlike Russia and China, India’s strategy is to garner support for reforming international institutions, accelerating partnerships for growth, sustainable development, and inclusive multilateralism, obtaining the support of the BRICS states to counter terrorism, enhancing economic cooperation with other BRICS states, and institutionalization of intra-BRICS initiatives. India articulated these objectives summit in Goa in 2016 (Stephen and Mathew, 2016). ‘The BRICS is thus often seen as a hedging strategy in the contemporary world. To quote Cooper and Farooq “status seeking” and “hedging” have been the core interests of India and China at the BRICS. China has tried to hedge against the United States, and India does the same against China (Cooper and Farooq, 2016).

China’s rise as an economic and military power in Asia ‘has unsettled the balances of power that have underpinned the region, India has maintained strong ties with Russia, pursued a strategic rapprochement with the United States, and sought to build stronger ties with countries in South East Asia and the wider Indo-Pacific region. In Asia, India has balanced China in an attempt to maintain its strategic autonomy in a manner consistent with its 'non-aligned' heritage'. BRICS members especially China and India, need an effective diagnosis of the regional rivalries for the smooth functioning of BRICS. Efforts to a conclusive dialogue on terrorism, peace, stability, respect of sovereignty and integrity and autonomy should become a part of the BRICS Initiative. BRICS need to ensure to "Foster High-quality BRICS Partnership, Usher in a New Era for Global Development" as declared in the Finance Ministers and Central Bank Governors of BRICS countries, meet on June 6, 2022, under the Chinese Presidency (BRICS Finance Ministers and Central Bank Governors' Joint Statement, 2022).

Conclusion

BRICS cooperation has started well and has in its agenda the key global issues that need to be addressed for equitable growth and sustainable development. BRICS have reiterated its commitment to multilateralism with the intent of Strengthening and Reforming Global Governance to maintain peace and security, advance sustainable development, ensure the promotion and protection of democracy, human rights and fundamental freedoms for all, and promoting cooperation based on the spirit of mutual respect, justice and equality. In the 14th BRICS summit 2021 the commitment of the member states has been on making multilateral organizations more responsive, effective, transparent, democratic, objective, action oriented. In the different summits, the BRICS nations have stressed the need to use innovative and inclusive solutions, including digital and technological tools to promote sustainable development and facilitate affordable and equitable access to global public goods for all, strengthening the capacities of individual States and international organizations to better respond to new and emerging issues.

Finance Ministers and Central Bank Governors of BRICS meet on June 6, 2022, declared- 'We are concerned that global development is suffering from severe disruption, including the widening North-South development gap, divergent recovery trajectories, pre-existing developmental fault-lines, and a technological divide. This is posing huge challenges to the implementation of the 2030 Agenda for Sustainable Development as economic and health scarring, particularly for emerging markets and developing countries (EMDCs), is projected to persist beyond the current pandemic (BRICS Finance Ministers and Central Bank Governors' Joint Statement, 2022).

BRICS are progressing ahead with their initiatives strengthening People-to-People exchanges to foster closer cooperation in the areas of culture, sport, education, film and youth with a clear objective to forge new friendships; deepen relations and mutual understanding between BRICS peoples in the spirit of openness, inclusiveness, diversity and mutual learning. Young Diplomats Forum, Parliamentarian Forum, Trade Union Forum, Civil BRICS as well as the Media Forum are a few innovative steps to ensure and broaden mutual cooperation for a more equitable and fairer world capable of addressing to the issues of Global South.

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The Impact of Social Media Marketing on the Indian Skincare Industry with Special Reference to the Ahmedabad (Gujarat) Region

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Abstract

Social media has become a key transformative marketing tool in the Indian skincare industry, directly influencing consumer behavior and shaping beauty routines. With the sector rapidly growing along with an increasing demand for sustainable skincare, skincare brands are adapting to the preferences of younger and tech-savvy audiences. This study further explores the impact of social media platforms on the skincare product purchasing decisions in Ahmedabad, Gujarat, while also focusing on different demographic groups. The research methodology is based on an empirical quantitative approach. The data gathered is done through electronic surveys to examine how platforms like YouTube and Instagram influence consumer interactions and purchasing behaviors. This study aims to explore the influence of various social media platforms on consumer behavior towards skincare brands and products in the Ahmedabad region of Gujarat, India. The study further seeks to understand how different demographic segments engage with skincare brands on online platforms. This study addresses the void in understanding how social media affects skincare purchases across demographic segments in Ahmedabad, Gujarat. The study concludes that diverse social media platforms, especially through influencers and user-generated content, significantly impact consumer behavior. Younger consumers are more influenced by YouTube. It is seen that brands that engage through the means of personalized content hold stronger loyalty in the market.

Keywords: Skincare Industry; Social Media Marketing; Consumer Behavior; Influencer Marketing

Introduction

The skincare industry in India is rapidly evolving, with both global and local brands vying for a share of this growing market. In particular, India's metropolitan, upwardly mobile youth—predominantly of Gen Z, Millennials, and Gen X—are increasingly focused on wellness and skincare, seeking new ways to express themselves while embracing a more conscious and sustainable approach to beauty. As a consequence of this change, brands now have a great chance to appeal to a global as well as socially conscious consumer base. To thrive in this cutthroat personal skincare market, brands need to develop messaging that appeals to these groups, who are not only technologically literate but also very active on digital channels.

In the current digital age, social media has evolved into a vital tool for marketing, transforming the way organizations interact with their intended audiences. Its channels, encompassing websites, applications, and diverse online services, play a pivotal role for businesses by facilitating networking, spreading information, and sharing content. These platforms have significantly enhanced the power of word-of-mouth marketing, allowing customers to interact with brands and share their views immediately. In today's digital landscape, social media has emerged as a crucial marketing channel, changing how businesses interact with their customers. Social media, which includes websites, applications, and various digital platforms, fosters networking, exchanging information, and disseminating material, making it essential for businesses. These platforms allow customers to interact with companies and instantly share their experiences, which has greatly boosted the power of word-of-mouth marketing. Social media has consequently transformed the skincare sector by giving companies unparalleled access to a worldwide audience. The day, when customers had to rely on personal connections or local sources to find skincare items from other countries, was over. Customers can now peruse a variety of skincare products from the comfort of their homes thanks to the growth of affiliate marketing and influencer relationships.

The Indian skincare market has experienced tremendous growth, with a market size valued at \$2,478.4 million in 2017 and projected to reach \$5,033.7 million by 2027, reflecting a compound annual growth rate (CAGR) of 9.5%. This expansion is driven by a diverse consumer base that includes different age groups, from Gen Z to Millennials, each with distinct preferences for skincare products. The growth is further fueled by the increasing demand for sustainable and holistic beauty routines, with consumers prioritizing skincare that supports not only physical beauty but also overall well-being. In this context, online channels, especially social media, have become an essential medium for brands to engage with potential customers. Platforms like YouTube, Instagram, and Facebook have emerged as key tools for beauty brands, allowing them to influence consumer behavior through tutorials, product reviews, and influencer recommendations. Social media also plays a significant role in the rise of beauty influencers, who shape trends and foster a sense of community around skincare and wellness.

A significant shift is evident in consumer behavior, as people are moving away from traditional forms of media, such as TV, towards digital platforms. According to the 2020 Connected Beauty Consumer Report by Google, Kantar, and WPP, Indian skincare consumers are increasingly relying on social media, particularly YouTube tutorials, to make informed skincare purchases. The study revealed that 81% of surveyed consumers engaged with YouTube creators, with 26% making a purchase directly as a result. These findings suggest that social media, especially video content and influencer marketing, plays a pivotal role in influencing purchasing decisions in the Indian skincare market. As consumers continue to embrace the convenience of online shopping and the authenticity of digital content, skincare brands must adapt their marketing strategies to stay aligned with consumer preferences.

This research focuses specifically on the Ahmedabad region of Gujarat, where there is a unique demographic mix. Understanding the role of social media in shaping consumer behavior towards skincare products in this market is crucial. Given the rapid digitalization and the growing influence of social media in India, this study aims to examine how different demographic segments—especially Gen Z, Gen X, and Millennials—interact with social media marketing in the skincare sector. By exploring these patterns, the study aims to provide actionable insights for brands to optimize their marketing strategies, catering to the needs and preferences of the diverse consumer base in Ahmedabad. The findings will not only contribute to a deeper understanding of social media's influence on consumer behavior but will also assist skincare brands in refining their approaches to engagement, brand positioning, and product promotion in an increasingly competitive market.

Literature Review

The Role of Social Media in Modern Marketing

According to (Mangold and Faulds, 2009), social media is now a crucial component of the promotion mix, offering brands a direct way to engage with consumers. This article explains social media is a mixture composed of technological advancement because, from a customer perspective, it authorizes companies to communicate with their customers, while from a traditional perspective, it qualifies customers to talk to each other straightforwardly. The information availability, timing, and recurrence of the discussions happening through social media between consumers are outside supervisors' immediate control. This stands in contrast with the traditionally incorporated marketing pattern worldwide by which a high level of control is present. Accordingly, directors should figure out a way to shape consumer interactions so that they align with the association's central goal and execution objectives. It, therefore, becomes of prime importance for the management of an organization to carve and control consumer interaction in a way that benefits the company's mission and goals. The paper further discusses a few methods that can be used to accomplish such managerial goals, some of which are blogs, company campaigns, and networking platforms.

Social Media Utilization in the Beauty and Skincare Industry

Social media marketing: An evaluation study in the wellness industry (Grundén and Väst, 2013). The review is a piece of the examination project "Proficient learning for quality in the wellness business". The examination strategy in this assessment study is subjective in-depth interviews completed with employees liable for the social media exercises on the concentrated companies. The interviews are examined by the content analysis method. The principal results are that the inception of the utilization of social media in organizations by and large was begun by an "enthusiastic employee" in the organizations.

Consumer Behavior and the Purchasing Intentions of Skincare Products

The Effects of Cosmetic Industry Marketing-mix Strategies on Consumers' Purchasing Behaviors, this study researched the impacts of 4P's of marketing on buying intention, consumer loyalty, and customer loyalty to analyze the influence of the marketing mix for cosmetics on consumers. For this, a poll was conducted on an aggregate of 350 clients living in Busan, Ulsan, and Gyeongnam. All clients reviewed had purchased beauty care products previously. The gathered information was inspected with the utilization of reliability analysis, exploratory factor analysis, and frequency analysis using SPSS 18.0. The outcomes were the result of the marketing blend factors showing the fundamentally lower influence on the variables of inclination, quality, and usefulness of buying conduct, working with factors impacting the overall ease of purchase. The result of the marketing mix factors altogether left a significant impact on consumer loyalty. Results also discovered that 4P's of marketing impacted consumers' purchasing habits toward beauty care products (Seo, Sheen and Oh, 2016).

Influencer Marketing and Its Impact on Consumer Behavior

The Impact of Social Media Marketing on Customers´ Purchasing Intention in the Cosmetics Industry- This examination explores the effect of digital media on consumers buying expectations in the skincare and cosmetic business, with an emphasis on influencer-based marketing and web surveys. Moreover, the study expects to find out which of the two strategies, influencer-based marketing or online reviews, affects purchasing behavior to a greater extent. To investigate these impacts, the researcher has picked a quantitative technique and has led a study. The poll arrived at a sum of 126 members acquired through convenience sampling, who replied to questions regarding social media, online audits influencer marketing, as well as their buying preferences. The hypothesis was analyzed by playing out a Spearman Correlation and analysis of fluctuation on the exact information obtained from the study. The acquired outcomes show that social media influencer marketing and online audits altogether affect the members' purchasing conduct. The discoveries likewise uncovered that web-based reviews impact the buying choice more than influencer marketing (Höfer, 2021).

The progression in innovation has made noticeable changes to the world of purchasing. The web has become a significant part of facilitating people with things that they search for. With the development of online entertainment stages and Instagram specifically, it has transformed into a significant shopping platform among adolescents. There is a constant rise in consumers purchasing products recommended by Instagram influencers, which has led several companies to prioritize establishing their social media presence and creating impactful influence through various methods. The research studies the responses of 200 female consumers from India and the key influences driving them towards creating a purchase. The research aims to investigate various influencer marketing campaigns and their impact on the general public's purchasing intentions. It also aims to study the significant impact of introducing celebrities and blogger influences (Negi and Pabalkar, 2020).

Instagram as a Major Marketing Platform for the Indian Skincare Industry

To study the influence of Indian organic beauty brands on young women via Instagram marketing. At a time when technology is inescapable, beauty brands are thriving all over online media. Instagram as a platform is flourishing, especially for the natural beauty industry. The research focuses on the influence of Instagram as an application on the skincare industry and female consumer purchase intentions. The paper aims to understand the way that Instagram content affects clients' purchasing intentions and what helps Instagram create the right target messages for its consumers. This examination is a two-step investigation of natural beauty items being an accepted occurrence peculiarity among young ladies. To further intend to comprehend if the Indian Organic skincare brands have yet to transform the Instagram world and whether Instagram marketing significantly influences young ladies to purchase Indian Organic skincare items (Ravishankar and Dhekle, 2021).

Regional Insights: Social Media and Consumer Behavior in Emerging Markets

Journal of Business and Management Studies. The Effectiveness of Social Media Influencers in the Cosmetic and Skincare Industry to the Purchase Intention of Generation Z Filipinos, 180–188- The article explores the viability of influencers on social media in the skincare industry. The analysts led a quantitative investigation utilizing Pearson Product Moment Correlation to look at further and distinguish the adequacy of social media-based influencers in the skincare business on the buying aim of Filipino shoppers. This exploration focuses on the emerging and quickly advancing beauty and skincare industry in the Philippine market. The review has featured four principal speculations. These variables incorporate Perceived Credibility, Trust, Brand Attitude, and Perceived Image as the impacting factors for Generation Z Filipino customers. Discoveries from the information accumulated have shown that every one of the hypotheses generated a critical and positive relationship towards buy expectation (Castillo, Jaramillo and Sy, 2022).

Research Methodology

The study is conducted in Ahmedabad with a sample size of 132 respondents. An empirical research design was used for the study and the primary data was collected with the help of a structured questionnaire method, the sampling technique used was the convenience sampling technique. The research focuses on both quantitative data collection and analysis. Secondary sources of data have been collected to increase the overall efficacy of the study. Sources like articles, student research papers, and government documents have been referred to.

The theories which have been used for the research are as follows-

1. Social behavior theory- Psychologist Albert Bandura developed this theory that suggests that one's observation and imitation of others' behaviors form their own social behavior. This means that the way a person perceives others and their behavior patterns is how they form their behavior patterns (Social and Behavioral Theories, n.d.)
2. Diffusion of innovation theory- This theory makes sense of the speed at which customers will engage with another product or service. Subsequently, the hypothesis serves advertisers with an understanding of how patterns happen and helps organizations in surveying the probability of disappointment or accomplishment of their new introduction (Sirk, 2020)

Objectives

- To study the prominent social media platforms concerning the skincare and wellness industry in the Ahmedabad, Gujrat (India) region.
- To study different demographics and their preferences concerning their usage of social media platforms and purchase habits.

Research hypothesis

- H0.1- there is no significant impact of social media platforms and influencers on the skincare industry.
- H1- there is a significant impact of social media platforms on the skincare industry.
- H0.2- There is no significant difference in the demographics of the Ahmedabad region for uses of social media and purchase habits concerning the skincare industry.
- H2- There is a significant difference in demographics of the Ahmedabad region for uses of social media and purchase habits concerning the skincare industry.

Findings

Respondents' classification based on age

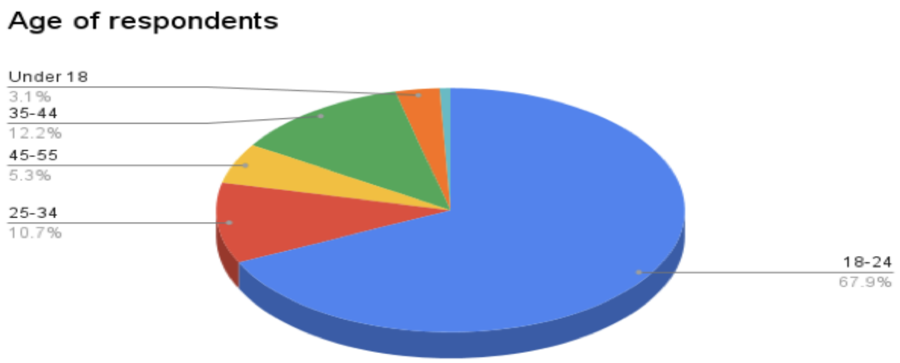

Figure 1: Age of respondents
Source: Data collected by the author, 2022

Respondents classification based on gender

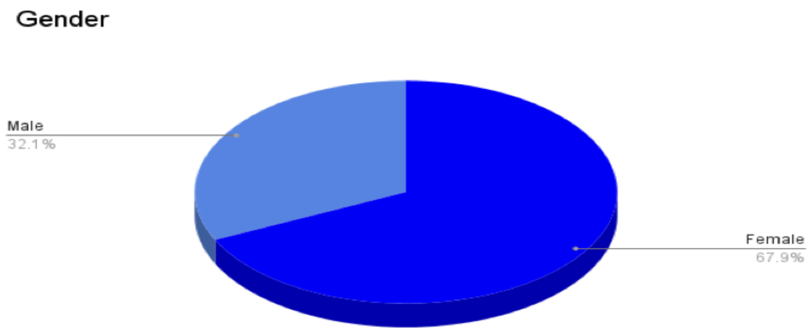

Figure 2: Gender of respondents
Source: Data collected by the author, 2022

Survey Question- "Where do you see the most beauty product advertising"

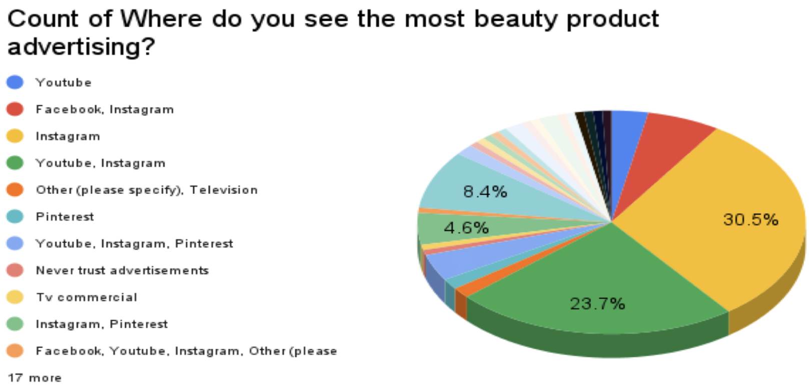

Figure 3: Response for "where do you see the most beauty advertising"

Source: Data collected by the author, 2022

Interpretation

Out of all surveyors, 3.1% of respondents were under 18 years of age, 12.2% were aged between 35-44 years, and 5.3% were aged between 45-55 years of age. 10.7% of people were aged between 25-34 years and 67.9% of the responders were aged between 18-24 years. The highest percentage of respondents were aged between 18-24 years. Out of the population surveyed 67.9% were females. The rest 32.1% were males. Maximum surveyors were females. When asked about whether they have purchased beauty products based on social media influences, irrespective of requirement, over 68.9% of people agreed that they have purchased a product based on influences irrespective of the requirement. 31.1% of people stated that they have not purchased any beauty products based on only influence as a factor. The rest of the respondents were unsure whether they purchased a product based on influence. It can be seen that Instagram is the most demanded social media platform for advertisement engagement in the audience followed by YouTube. They together comprise 54.2% of the votes. Other options consist of a mixture of TV commercials, Pinterest, Facebook, YouTube, and Instagram.

Survey Question- "Where do you see the most beautiful product advertising which platform do you find the most reliable for product reviews?

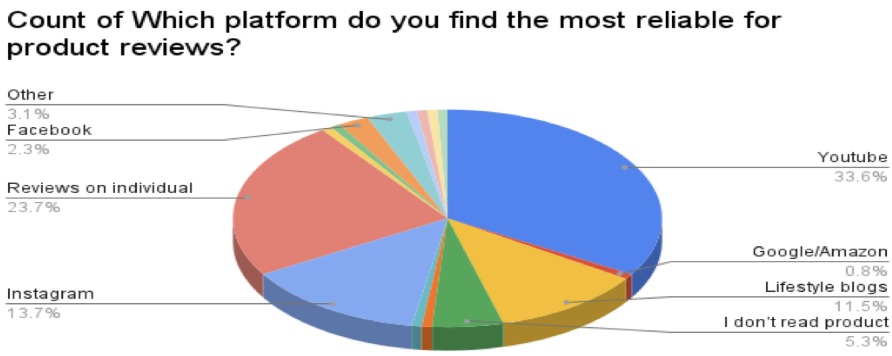

Figure 4: Response for most reliable platforms for product reviews

Source: Data collected by the author, 2022

Interpretation

When asked about reliability, 33.6% of the population found YouTube the most reliable source for reviews, followed by individual reviews on websites at 23.7% votes and Instagram at 13.7 per cent votes. 11.5% of voters found lifestyle blogs reliable, 2.3% of people found Facebook as a platform more reliable than other platforms, and 0.8% of people found Google/ Amazon to be a more reliable platform. 5.3% of people stated that they do not read product reviews before purchasing the products. About 3.1% of people opted for other platforms which included Snapchat, TikTok and Pinterest.

Table 1: Chi-Square Cross Tabulation 1

Chi Square Cross tabulation 1 - Gender * Have you ever purchased a beauty product based on social media's influence? Either online or in-store

Gender * Have you ever purchased a beauty product based on social media's influence? Either online or in-store				
Count				
		Have you ever purchased a beauty product based on social media influences? Either in-store or online		Total
		Yes	No	
Gender	Female	67	23	90
	Male	24	18	42
Total		91	41	132

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.003[a]	1	0.045		
Continuity Correction	3.236	1	0.072		
Likelihood Ratio	3.902	1	0.048		
Fisher's Exact Test				0.068	0.037
Linear-by-Linear Association	3.973	1	0.046		
N of Valid Cases	132				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.05.					
b. Computed only for a 2x2 table					

Source: Data collected by the author, 2022

A chi-square analysis was conducted to find if gender as a demographic factor will cause any difference in purchasing behavior.

It concludes that there is a significant impact of gender over purchasing decisions of beauty products. Women are more likely to purchase products based on social media influences as compared to men. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted.

Table 2: Chi-Square Cross Tabulation 2

Chi-Square Cross tabulation 2- Age * Have you ever purchased a beauty product based on social media influences? Either in-store or online. Cross Tabulation

Age * Have you ever purchased a beauty product based on social media's influence? Either online or in-store. Cross Tabulation				
Count				
		Have you ever purchased a beauty product based on social media's influence? Either online or in-store		Total
		Yes	No	
Age	Under 18	4	0	4
	18-24	59	30	89
	25-34	12	2	14
	35-44	12	5	17
	44-55	3	4	7
	55 and above	1	0	1
Total		91	41	132

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.629[a]	5	0.250
Likelihood Ratio	8.173	5	0.147
Linear-by-Linear Association	0.237	1	0.626
N of Valid Cases	132		
a. 7 cells (58.3%) are expected to count less than 5. The minimum expected count is .31.			

Source: Data collected by the author, 2022

A chi-square analysis was conducted to find if age as a demographic factor will cause any difference in purchasing behavior. It concludes that there is no significant impact of age on purchasing decisions of beauty products. Thus, null hypothesis is accepted and the alternative hypothesis is rejected.

Table 3: Cross-tabulation 3

A. Age * Which platform do you find the most reliable for product reviews? Cross Tabulation

Age * Which platform do you find the most reliable for product reviews? Cross Tabulation									
Count									
		Which platform do you find the most reliable for product reviews?							Total
		Youtube	Instagram	Lifestyle blog	Facebook	Reviews on individual retailer's website	I don't read product reviews	Others	
Age	Under 18	1	1	0	0	2	0	0	4
	18-24	38	10	11	0	22	3	5	89
	25-34	3	2	2	0	3	2	2	14
	35-44	1	5	1	2	4	0	4	17
	44-55	1	0	1	1	0	2	2	7
	55 and above	0	1	0	0	0	0	0	1
Total		44	19	15	3	31	7	13	132

Source: Data collected by the author, 2022

It was found that people aged between 18-24 years preferred YouTube as the most reliable platform as followed by reviews on individual retailers' websites followed by lifestyle blogs. Surveyors between 35-44 years found Instagram to be the most reliable platform for product reviews followed by reviews on individual retailers' websites. The rest of the age groups preferred almost all platforms equally when considering product reliability.

Discussion

The survey findings show that the 18-24 age group dominates, reflecting the younger generation's significant engagement with beauty products and social media platforms. They are more likely to follow influencers, participate in trends, and purchase products impulsively based on social media content. The higher female participation reflects the general trend in beauty product consumption, where women are the predominant consumers. However, the notable percentage of male respondents suggests that brands might target men more effectively than before, particularly in areas like skincare or male grooming products. The high percentage of respondents who have made purchases based on social media influence reflects the power of digital marketing, influencers, and trends. Social media platforms, especially Instagram, have transformed beauty shopping habits, encouraging impulsive buys, trend-following, and the discovery of new products. Instagram's visual-centric platform makes it ideal for showcasing beauty products, as users can see the products in action, check out influencer reviews, and engage with brand content. YouTube also benefits from longer video content, where influencers can provide in-depth reviews or tutorials, helping drive purchase decisions.

Traditional media like TV and Facebook have less engagement, especially with younger audiences who gravitate towards social platforms for product discovery. YouTube is chosen as the most trusted platform (33.6%) for product reviews, likely due to its in-depth, visual content and the credibility of influencers offering detailed demonstrations. Individual reviews on websites follow closely (23.7%) as they provide authentic feedback from verified buyers. Instagram (13.7%) ranks lower in reliability because of its promotional nature, while lifestyle blogs (11.5%) offer comprehensive but less widely followed insights. Platforms like Facebook (2.3%) and Google/Amazon (0.8%) are seen as less reliable due to potential bias and manipulated reviews. Additionally, 5.3% of respondents don't read reviews, and 3.1% rely on newer platforms like TikTok and Pinterest, which are still growing in trustworthiness.

The chi-square analysis (table 2.1 chi-square cross-tabulation 1) reveals a significant impact of gender on beauty product purchasing decisions, with women being more likely to purchase products based on social media influences compared to men. This result is consistent with the broader trends observed in the beauty industry, where women are the primary consumers of beauty products and are more engaged with social media content, particularly influencer marketing. Social media platforms, especially Instagram and YouTube, are heavily utilized for beauty-related advertisements, and women, particularly in younger age groups, are more likely to follow beauty influencers and engage with content related to skincare, makeup, and fashion. On the other hand, men tend to be less influenced by social media when it comes to beauty product purchases, often due to less engagement with beauty influencers and social media trends. As a result, the null hypothesis (that gender does not affect purchasing decisions) is rejected, and the alternative hypothesis (that gender significantly impacts purchasing decisions) is accepted, reflecting the stronger role of social media influence on female consumers in the beauty market.

As seen through the findings for Table 2.3 Cross Tabulation 3, the preference of social media platforms through the influence of reviews differs by age group. For the younger audience aged between 18-24, YouTube stands out to be the most trusted platform, likely because of its video content and influencers' detailed reviews. The next most preferred platforms are individual retailer websites and lifestyle blogs. In contrast, older audiences between the age group of 35-44 preferred Instagram for product reviews reflecting a higher engagement with visual and influencer-driven content. Other age groups (under 18 and 45-55) reflect a balanced preference across platforms while preferring a more traditional approach to product reviews. Overall young adults favor YouTube and Instagram while the older audience groups rely on a mix of platforms.

Conclusion

This study aimed to investigate the impact of social media marketing on consumer behavior within the Indian skincare industry with a particular focus on the Ahmedabad region of Gujarat. The findings provide insight into the platforms that influence consumer purchasing decisions in the skincare sector, which include Instagram, YouTube, and Facebook. The most trusted platform for product reviews was identified as YouTube, followed closely by individual retailer's websites and Instagram. More than 37% of respondents agreed that being influenced by social media advertisements often leads to impulsive purchases irrespective of the uncertainty about the quality of the product. This finding highlights the growing power of digital marketing in the skincare industry.

In terms of demographics, it is revealed that women are more likely to be influenced by social media for purchases, particularly beauty-related. On the other hand, men typically make need-based and intentional purchases. The audience's age group did not have a significant impact on purchasing behaviors, however, one commonality is that the audience members between the age group of 18-44 years are more likely to trust YouTube and Instagram for product reviews.

Taking everything into account, the research underscores the intense influence of social media channels on the skincare industry in Gujarat. The findings suggest that brands must strategically make use of platforms to enhance their marketing effectiveness.

Recommendations

To effectively engage with consumers in the Ahmedabad region, skincare brands should focus on influencer collaborations on platforms such as YouTube and Instagram as these are the most attractive and engaging platforms for audiences between 18-44 years. Tailoring content and campaigns to targeted demographics and genders is crucial, as it can be seen that women respond more to emotionally influencing content while men prefer a practical advertisement or review. Influencer partnerships will further support in building trust and credibility in the viewers. Encouraging user-generated content can further boost brand authenticity, real perspective, and views, along with consumer engagement as the content feels more realistic and builds audience connections. Exploring newly emerging platforms such as TikTok and Pinterest will assist brands to be trendy. Lastly, maintaining a transparent approach by providing a list of ingredients, along with its sources will foster long-term consumer trust and loyalty while also ensuring a stronger and sustainable consumer relationship management.

Future Research Directions

For further research, it is recommended that the studies should expand their scope geographically to include multi-cultural regions that could give an insight into the global audience perspectives. Studies could also focus on the differing consumer behaviors on different social media platforms. A deep examination of various creative content types could provide extensive details about what influences and resonates with consumers.

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Brazil Assumed the Presidency of BRICS in 2025

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Brazil assumed the presidency on the back of a successful presidency of the G20, both dovetailing around the pursuit of political and economic cooperation of the Global South, encouraging the development of a sustainable and inclusive global governance, promoting intra-BRICS economic cooperation, advancing technology for development, and exploring financing tools against climate change.

Leaders of BRICS nations during the 2023 Summit in Johannesburg. From left to right: President Luiz Inácio Lula da Silva (Brazil), President Xi Jinping (China), President Cyril Ramaphosa (South Africa), Prime Minister Narendra Modi (India), and Minister of Foreign Affairs Sergey Lavrov (Russia).

Source: https://brics.br/en/brazil-assumes-the-presidency-of-brics-in-2025

On January 1, 2025, Brazil officially took over from Russia the Presidency of BRICS, the prominent forum for political and economic cooperation. This follows closely after Brazil handed over the presidency of the G20, the forum of the major global economies, to South Africa, a fellow BRICS country in early December 2024.

BRICS, originally made up of Brazil, Russia, India, China, and South Africa, recently expanded its membership by including Saudi Arabia, Egypt, the United Arab Emirates, Ethiopia, and Iran. This enhanced its representativity, its economic weight and its political significance during changing times in global political economy.

Brazil's 2025 BRICS Presidency chose as its motto, the following: "Strengthening Global South Cooperation for More Inclusive and Sustainable Governance".

It picked two super priorities: (i) Global South Cooperation and (ii) BRICS Partnerships for Social, Economic and Environmental Development. It identified six core areas of cooperation and discussion for decisions in 2025:

*A - **Global Health Cooperation**: encourage real cooperation projects among BRICS nations to promote sustainable and inclusive development in various sectors, particularly in health, to ensure access to medicines and vaccines; launch the BRICS Partnership for the Elimination of Socially Determined Diseases and Neglected Tropical Diseases.*

*B - **Trade, Investment and Finance**: consider the governance and reform of financial markets, local currencies, and payment instruments and platforms as a means of increasing and diversifying trade, financial and investment flows; advance the Partnership for the New Industrial Revolution and adopt the 2030 Strategy for the BRICS Economic Partnership.*

*C - **Climate change**: adopt the BRICS Climate Leadership Agenda, including a Leaders' Framework Declaration on Climate Finance aimed at guiding structural change in the financial sector.*

*D - **Artificial Intelligence Governance**: promote inclusive and responsible international governance of artificial intelligence in order to unlock the potential of this technology for social, economic and environmental development.*

*E - **Multilateral Peace and Security Architecture**: promote a global reform of the multilateral peace system and security architecture in order to ensure effective action in dealing with conflicts, preventing humanitarian disasters and preventing the outbreak of new crises; rebuild mutual trust and understanding, resume diplomacy and promote peaceful solutions to conflicts and disputes.*

*F - **Institutional Development**: improving the structure and cohesion of the BRICS.*

As the host nation, Brazil oversees the organization and coordination of more than 100 meetings, from February 2025 through the 7July Summit in Brasília. These gatherings bring together officials, policymakers, and experts to deliberate on the presidency's priorities. Brazil's mandate runs until December 31, 2025.

Rotational Leadership

The BRICS presidency rotates among member states in the order of the acronym, but with the inclusion of new members, the bloc is expected to revisit its rotational formula. The changes reflect BRICS' evolving dynamics as it continues to adapt to the shifting geopolitical landscape.

This data in this article come from the official BRICS 2025 website: https://brics.br/en/brazil-assumes-the-presidency-of-brics-in-2025