ARDEN UNIVERSITY

Leadership & Management
At Arden University

Holistic and Sustainable Digital Transformation

School of Leadership and Management Annual Conference Proceedings

Organised by the Leadership and Management Research Group (LMRG)

ISSN: 2977-1919 (Online)

Volume 1
Issue 1
2023

Welcome to the inaugural set of conference proceedings following the Holistic and Sustainable Digital Transformation Conference hosted by the School of Leadership and Management at Arden University on Thursday 1st June 2023

Digital technologies are increasingly being utilised in higher education institutions (HEIs) and the corporate business world as a means for social change, democratising learning, and adding value to business performance by solving the challenges of time, space, inflexibility, and accessibility. However, there is a gap yet to be filled; empowering graduates and employees with the digital capabilities (digital, green, and social skills) to thrive in a digital global economy. Today's HEI and corporate business leaders must reconfigure and optimise their practices to thrive in a digital technology-dominated "new normal" world, especially after the COVID pandemic reshaped the world economy.

Indeed, since the global shutdown, which accelerated the adoption of digital technologies, HEIs are striving to learn from environmental challenges, what and how they can contribute to society and business, specifically in transforming the traditional approaches to learning to produce career-ready graduates. Moreover, there is a greater need to explore how digital transformation can be applied as sustainable evolutionary processes that enable education and business models to adapt and optimise value more efficiently and effectively.

In this context, the UN's Sustainable Development Goal (SDG) number 4 requires that education providers "*Ensure inclusive and quality education for all and promote lifelong learning*." While Principle 1 of UNPRME challenges HEIs to "…*develop the capabilities of students to be future generators of sustainable value for business and society at large and to work for an inclusive and sustainable global economy*."

Professional, Statutory, and Regulatory Bodies (PSRBs) acknowledge the need for embedding digital transformation and sustainability in the core curriculum as reflected in the QAA Subject Benchmark Statements for business and management covering undergraduate and postgraduate UG and PG programmes. Thus, HEIs are increasingly under pressure to form partnerships with students, industry corporations, alumni, research, and local communities to develop new innovative knowledge transfer initiatives from more sustainable practices that benefit society, the environment, and the economy.

Underpinned by the PSRB requirements and UN goals, the conference seeks to address the following overarching question:

> "*In the advent of digital technologies, how should we reconceptualise, redesign, and reconfigure educational and business practices to produce green- and digital first-ready graduates, business leaders, and society*?"

The conference presented a platform for academics and practitioners to collaboratively explore and challenge the role HEIs play in sustainable development and digital transformation. We invited contributors to interrogate the application and practices of sustainability and digital transformation by academics and practitioners.

The Aims of the Conference

The 1st Holistic and Sustainable Digital Transformation Conference was aimed at calling attention to and facilitating a collaborative response from academics, students and practitioners to the following challenges:

1. The development of frameworks that enable businesses to devise scalable initiatives to address sustainability and climate change and generate sustainable stakeholder values.

2. The deployment of scalable digital technology-driven responsible management education learning models that enhance the capabilities of graduates to be future generators of sustainable value mutually beneficial to stakeholders.

3. Developing effective and scalable frameworks for deploying technology as a force for social democratic change to drive the equality, diversity, and inclusion agenda in learning and corporate practices.

4. Development of scalable, innovative, technology-driven partnership initiatives between HEIs and SMEs to enhance SMEs' leadership, creativity, innovation, and adaptability capabilities to generate mutually beneficial sustainable value for a more sustainable and climate change-sensitive future world.

The Themes of the Conference

Theme 1: Sustainability and Climate Change

- Embedding sustainability into corporate practices.
- CSR & ESG - Transforming from shareholder to stakeholder value creation.
- Students as agents for climate change transformation.
- Tracking carbon emissions in the downstream of supply chain operations.

Theme 2: Digital First (AU Strategic Vision)

- Digital Poverty - Bridging the digital divide.
- Embedding sustainability into hybrid curriculum.
- Digital technologies for sustainable development of Higher Education.

Theme 3: Equity Diversity, inclusion (EDI)

- Using technologies to enhance inclusive learning.
- Equality, Diversity and Inclusion support for sustainable business practices.
- Supply chain diversification, digital transformation and sustainability.

Theme 4: Entrepreneurship and SMEs

- Sustainable Innovation & Digital Transformation in SMEs.
- Creativity and Leadership of Entrepreneurship in SMEs.
- Inflation and supply chain disruption in SMEs.
- Remote working.

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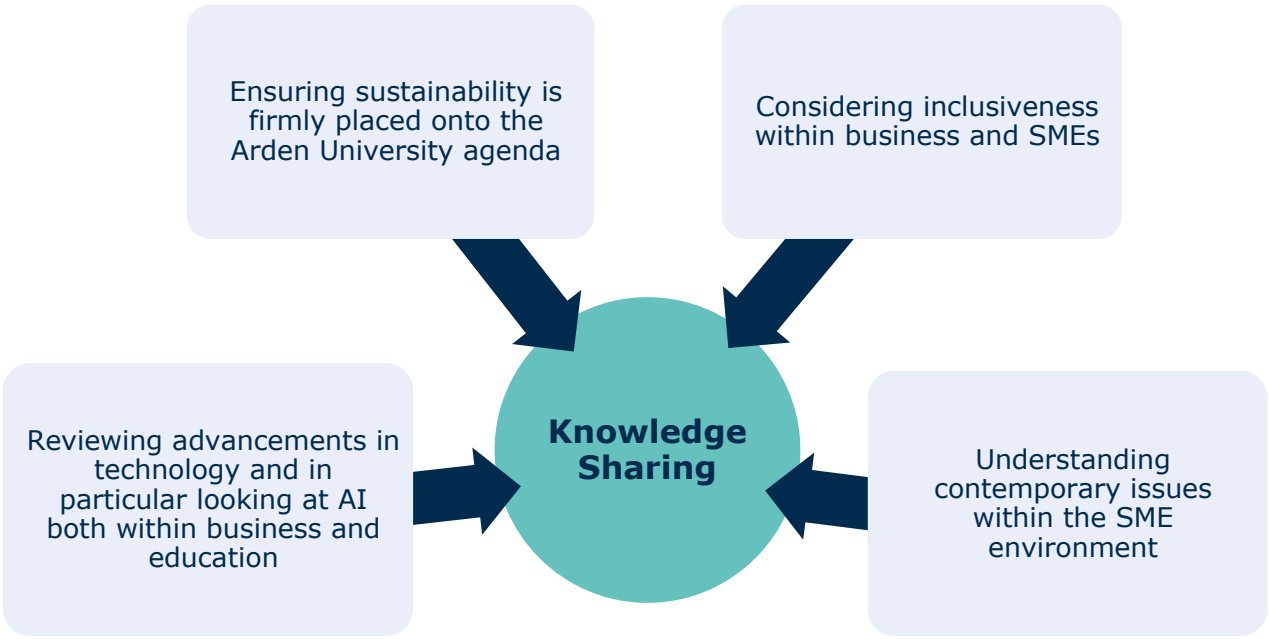
The Conference Proceedings' Foreword

The 1st Holistic and Sustainable Transformation Conference was held on the 1st of June 2023, hosted by the School of Leadership and Management. The day was facilitated by the Leadership & Management Research Group (LMRG) and provided a virtual space whereby experts around the globe could discuss current contemporary management issues and opportunities.

The main purpose of the school conferences is to promote knowledge sharing through:



This was a collaborative conference and participation was seen from academics, industry, students, and professional services. The conference was accessible to all of Arden University students including international partners. Lecturers were encouraged to stream sessions into their classrooms and integrate the speakers' research into their lesson plans for the day. The conference provided an opportunity for researchers to share their knowledge and contribute to current thinking across a range of industries and sectors. These Proceedings will equip our students and therefore future leaders with insights into sustainable developments within the business environment.

Dr Alison Watson
Head of School of Leadership and Management, Arden University

Dr. Alison Watson is the Head of School for Leadership and Management. Having taught at Arden University (formerly RDI) and other higher education institutions for 18 years, she has supported many students on various management courses. Prior to this, Alison was an operations and project manager for several large retailers, and therefore has a wealth of experience in the field of business and management. Her PhD was focused on segmentation strategy and student recruitment, however, her current research interests lie in sustainable leadership and preparing responsible leaders for the future.

Conference Proceedings Editorial Board

Dr Emmanuel Murasiranwa, CMBE, MIH, SFHEA

Emmanuel is a senior lecturer at Arden University. He is a Senior Fellow of the Higher Education Academy, a Certified Management and Business Educator and a member of the Institute of Hospitality (MIH). His research interests include service quality, business performance and blended learning. He is an active reviewer for Emerald and Elsevier. His most recent scholarly activities include establishing a school research group, launching the inaugural research Café webinar series and school conference. He holds a PhD in Organisation and Management, an MA in Social Science Research Methods and an MSc in Hospitality and Tourism Management all from Sheffield Hallam University.

Dr Feng Jiao

Feng is designated as a lecturer and exerts primarily as module leader for MBA International Programme at Arden University. After completing his PhD in Operations Management from Newcastle University, U.K, he has served with numerous academic institutions in the U.K. and engaged in research. Feng is currently working on various projects to aid medical service suppliers and other private healthcare organisations in the UK and China.

Conference Theme 1
Sustainability and Climate Change

Research indicates that the combination of increasing climate change, rising income inequality, the Covid-19 pandemic and geopolitical conflicts are creating a perfect storm of challenges to how businesses and economies are run. Consequently, companies are taking sustainability seriously, setting ambitious goals and targets and launching sustainability initiatives at an unprecedented pace. However, despite sustainability becoming a new corporate imperative, many initiatives still need to scale, indicating that there is still a considerable gap between ambition and action. How can the gap be addressed?

Paper 1 (*Work in Progress*): The role of Artificial Intelligence in integrating sustainability in Higher Education - A Case of United Kingdom

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Abstract

The study provides an overview of how AI can be used to promote sustainability in higher education (HE) using the UK HE sector as a case study. Currently, many people in the academic community have written off the use of AI for academic purposes. Many believe it can affect the quality of the education system. At the same time, there are growing demand for incorporating sustainability into the education systems. The aim of the current study is therefore to assess the benefit of using AI to incorporate sustainability into the HE sector.

The study used a systematic literature review for the data collection across a range of academic literature. The initial findings have shown the potential of using AI to incorporate sustainability into the HE sector.

1. Introduction

The emergence of artificial intelligence (AI) is transforming activities carried out in many sectors, including higher education (HE). Even, studies have shown that it can influence the application of sustainable development goals (Vinuesa et al. 2020; Raghuvanshi, 2022). For example, Raghuvanshi, (2022) believes that "AI is touted to hold the potential to address the varied challenges in the education sector today and speed up progress towards Sustainable Development Goals."

The importance of incorporating sustainability in HE has now gained a lot of attention from various educational professional bodies, including the QAA. For example, According to Advance HE (2020), "Education for Sustainable Development provides formal and informal learning opportunities which enable all students to develop the knowledge, skills, attitudes and values required to contribute to a sustainable future."

While a lot is known in the academic literature about the importance of incorporating sustainability into the curriculum and the impact of AI in promoting teaching and learning in HE, little is known about how AI can be used to integrate sustainability in HE setting in the UK. Consequently, the current study addresses this gap in the literature. Thus, this study aims to investigate the role of Artificial Intelligence in integrating sustainability into Higher Education. A Case of United Kingdom.

The specific objectives are as follows:

1. To assess the potential of using AI to incorporate sustainability in teaching pedagogies at HE
2. To find out how AI can help to address the current challenges involved in incorporating sustainability in teaching and learning at HE
3. To recommend better ways of promoting sustainability in HE through AI.

2. Literature Review

2.1 Definition of AI

According to Zeide (2019:2), "Broadly, artificial intelligence (AI) is the attempt to create machines that can do things previously possible only through human cognition." Currently, there is a lot of debate going on about the consequences (benefits and drawbacks) of incorporating AI into education (Viljoen, 2023). For example, Viljoen (2013) thinks that some of the AI "Benefits could include more personalised and efficient learning experiences and increased accessibility to information. Challenges may well centre on privacy concerns, ethical considerations, and the potential for AI systems to preserve existing biases."

Given the challenges associated with AI, many people do not see the benefits of incorporating AI into education as it has the potential of contributing to more academic misconduct (plagiarism) and other poor learning practices. Even, some universities across the world are banning the use of AI for academic activities. (Hooper, 2023).

Although AI has potential drawbacks for education especially at the HE level, it can offer benefits to both students and educators or lecturers. Some of the benefits educators or lecturers can get from using AI identified by Hooper (2023) include time-saving, idea generation, answering students' questions, analysing students' performance, motivating and engaging students. In terms of the benefits associated with AI for students include analysis of learning gaps, personalisation, questions answered instantly, timely feedback & just-in-time learning, engagement, time-saving, improved accessibility and neurodiversity (Hooper, 2023).

A1 and sustainability

Currently, A1 is transforming many activities carried out in various sectors across the globe. Given this, AI can help to offer an innovative solution for problems the world is experiencing like climate change, poverty and inequality (Frąckiewicz, 2023). For example, Frąckiewicz (2023) argues that "AI holds immense potential for revolutionizing sustainability education and empowering individuals to contribute to a more sustainable future."

AI connection with SDGs

A study carried out by Vinuesa et al. (2020) concluded that AI can offer positive and negative impacts on sustainable development, although not a specific study has discovered how AI can impact various aspects of 17 sustainable development goals and 169 targets globally agreed in the 2030 Agenda for Sustainable Development. Given this, the authors argue that "This is a critical research gap, as we find that AI may influence the ability to meet all SDGs." However, they claim that "relevant evidence shows that AI may act as an enabler on 134 targets (79%) across all SDGs, generally through a technological improvement, which may allow to overcome certain present limitations."

2.2 A theoretical framework for AI applications in HE

Figure 1. AI Applications in Higher Education – Source: EDUCAUSE

3. Methodology

The current study adopted a systematic literature review (SLR) to collect secondary data (both qualitative and quantitative) on AI and sustainability related to the UK higher education context. SLR approach is known to be important in discovering, examining and interpreting research materials to a particular research question, or a topic or a phenomenon of interest (Kitchenham, 2004). The main reason for choosing SLR in this study is that it is known help to generate data that is seen as replicable, scientific and transparent in its process (Vaio et al., 2020). Similarly, the SLR procedure allowed for the collection of information on the research topic thereby helping the study to conform to pre-determined eligibility criteria with appropriate answers for the formulated research questions (Mengist, 2019).

Also, secondary data was preferred in the current study to primary data to avoid duplication of work or study as a lot of studies are currently ongoing on AI and sustainability. Moreover, secondary data sources were discovered to be cheaper and quicker to access compared to Primary data collection sources (Tripathy,2013).

The steps followed for the data collection through SLR are depicted in Figure 2:

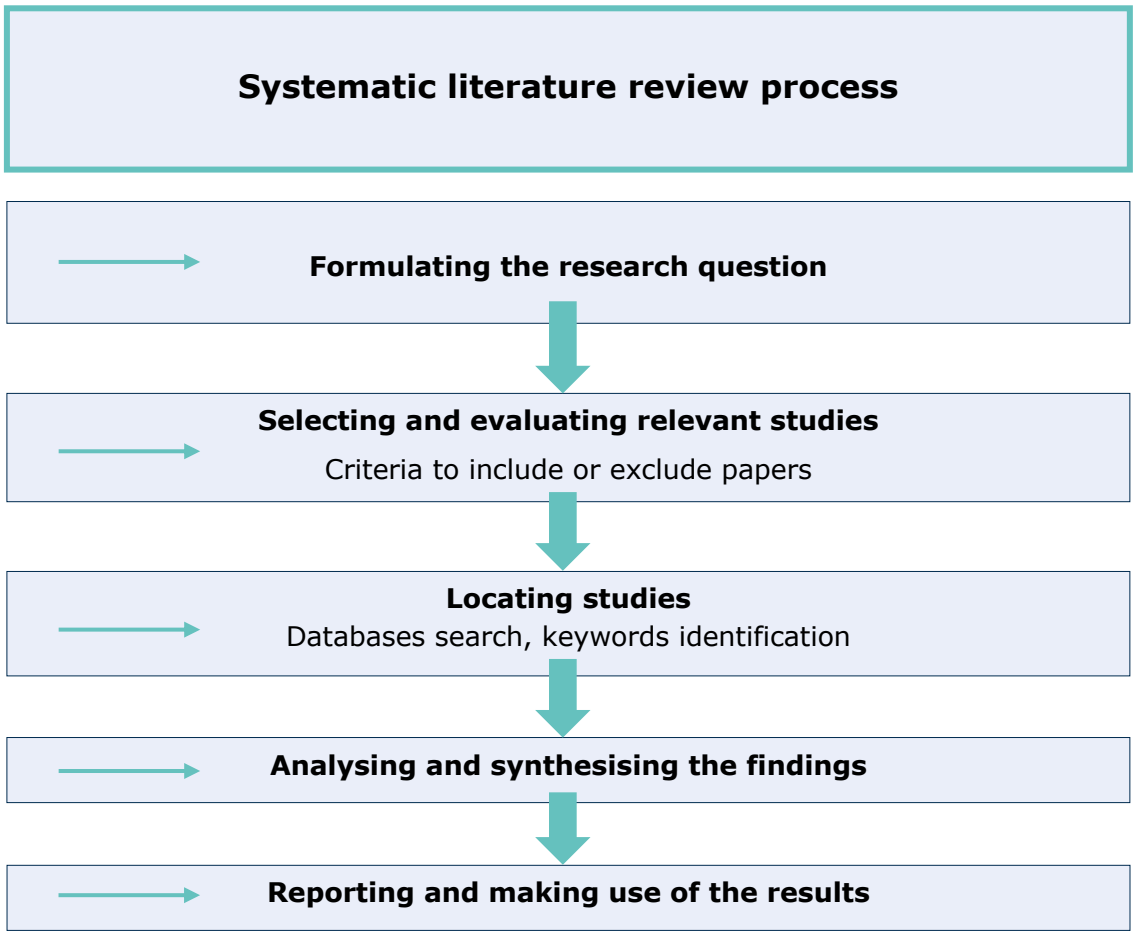

Figure 2. Systematic literature review approach – Source: Adapted from Denyer & Tranfield (2009)

The first step was the formulation of the research question for the SLR. This was followed by setting out the inclusion and exclusion criteria for the literature to be collected. The criteria devised for the SLR was that only academic literature focusing on AI application on SDGs, and AI application for promoting sustainability in Higher Education institutions (HEIs). Other literature looking at AI and sustainability outside education was excluded.

The next step following setting up criteria for the SLR was the location of relevant academic sources or databases. The relevant data was collected through SLR from the databases.

Data analysis

The data collected from the database were analysed and synthesised to address the research objectives using SPSS. SPSS was chosen or preferred in the current study to other statistical software as, it is easier to use to interpret data in a range of formats, such as graphs and tables.

The data analysis is still ongoing now. The results from the data analysis will help to conclude the findings on the possibility of using AI to integrate sustainability into HEIs in the United Kingdom.

The practical, theoretical, and social implications of the study

The findings from the study can help to integrate sustainability into corporate practices, including teaching pedagogies in HE. Also, the proposed study addresses the knowledge gap incorporating sustainability into HE pedagogies through AI in the UK.

There is a debate throughout the technology community and beyond about ethics in artificial intelligence and most university degree programs are integrating courses on AI ethics into their curriculum. The ethical dimension poses exciting possibilities for AI in education.

4. Findings

We are at the early stages of the study (No findings yet). However, much of the literature reviewed as part of this study shows the potential of A1 to integrate sustainability into Higher Education. For example, a study (Frąckiewicz,2023) shows A1 has the potential for revolutionising sustainability education and equipping individuals with the necessary skills to contribute to a more sustainable future. Similarly, A1 is known to act as an enabler on 134 targets (79%) across all SDGs (Vinuesa *et al*., 2020).

5. Conclusion

There is ongoing debate about the benefits and challenges of A1 in the academic community and the public. A1 offers both negative and negative impacts on sustainability education. It seems the positive impact outweighs the negative impact when using A1 to integrate sustainability into Higher Education.

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Paper 2: Open Data as a Catalyst for Human Capital Development

A Regression Analysis of Global Trends

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Abstract

This study examines the relationship between the availability and quality of open data (OD) and the development of human capital, as defined by the Human Development Index (HDI), in Asia and Africa. Guided by two hypotheses, the research finds a significant positive relationship between OD and HDI supporting $\mathbf{H_1}$: that open data availability and quality positively correlate with human capital development. However, the relationship in Africa, with an R-squared value of only 0.06, confirms $\mathbf{H_2}$: that there is a variation in this relationship across different global regions. These findings highlight the role of open data in enhancing human capital and the importance of region-specific strategies. The results have wide-reaching implications for governance, technology, education, and international development, emphasizing open data as a pivotal tool for human capital advancement. Further research is encouraged to explore the nuanced interplay of factors influencing these relationships in different cultural and economic contexts.

Keywords: Open Data; Human Development Index (HDI); Human Capital; Global Trends; National open data

Introduction

In an age where data drives decisions, the accessibility and utilization of open data have become pivotal in shaping numerous aspects of societal growth (Ekundayo, 2021). From governmental policies to business strategies, open data's influence permeates multiple sectors, but perhaps one of the most profound impacts is observed in the realm of human capital development. This article seeks to investigate the relationship between open data and human capital development, utilizing a regression analysis of global trends to unravel the intricate dynamics at play.

Open data refers to data that is freely available for everyone to access, use, and share without restrictions (Ekundayo, Dr. Bhaumik and Dr. Chinoperekweyi, 2023). In the context of this study, the variable representing open data will be measured using secondary data from Open Data Watch. Open Data Watch provides an array of metrics that assess the coverage and openness of open data across various countries and sectors. By leveraging indices such as the Open Data Inventory (ODIN), the study will quantitatively gauge the prevalence and characteristics of open data in different regions, enabling a nuanced exploration of its role as a catalyst for change relative to Human capital development - HDI.

Human capital development (HDI), on the other hand, is a multifaceted concept that encompasses the growth and enhancement of human skills, knowledge, abilities, and other attributes (Njoku and Onyegbula, 2017). For the purposes of this research, human capital will be measured using the UN Human Capital Index, a composite index that reflects a country's ability to nurture, develop, and deploy its human capital (Khuskivadze and Totladze, 2022). The index combines elements such as education, health, employment,

and capacity-building, providing a comprehensive picture of human capital development in various socio-economic contexts.

The study will employ a statistical methodology utilizing regression analysis to assess the relationship between open data and human capital development.

By correlating the indices from Open Data Watch with the UN Human Capital Index, a multifaceted relationship will be explored. The regression model will allow for the interpretation of how changes in open data availability and quality correlate with shifts in human capital growth across different countries and over time. This approach will not only illuminate the intricate relationship between the variables but also provide actionable insights for policymakers, educators, and business leaders. The use of established indices ensures reliability and validity in the measurement, while the adoption of regression analysis offers a robust framework for understanding the complex interactions at play. By employing this rigorous quantitative methodology, this article seeks to contribute to the existing body of knowledge, offering empirical evidence of the intricate relationship between open data and human capital. In doing so, it paves the way for future research, policy interventions, and strategic decisions that align with the shared goal of sustainable growth and development.

Research Question

What is the correlation between the availability and quality of open data and the development of human capital, and how does this relationship vary across different global regions?

Hypotheses

H_1: There is a significant positive relationship between the availability and quality of open data and the development of human capital across different global regions.

H_2: There is a variation in the relationship between the availability and quality of open data and the development of human capital across different global regions.

Objective of study

The overarching aim of this study is to investigate the relationship between open data and human capital development, elucidating the multifaceted dynamics that intertwine these two critical components of contemporary society. To achieve this aim, the study has set forth the following specific objectives:

- To empirically examine the relationship between open data and human capital development, employing a rigorous regression analysis to understand how changes in open data availability and quality correlate with shifts in human capital growth.
- To carry out a detailed examination of how the relationship between open data and human capital development manifests across different geographical regions, highlighting similarities, differences, and unique regional characteristics.
- To articulate the practical implications of the study's findings for policymakers, educators, business leaders, and other stakeholders, pinpointing opportunities for leveraging open data as a tool for human capital enhancement.
- To add to the existing body of literature on open data and human capital development, providing a cohesive and analytical perspective that integrates diverse global experiences.

- To identify gaps and unexplored areas within the current research landscape, proposing avenues for future scholarly investigation that can further deepen our understanding of this complex relationship.

This study's objectives reflect a comprehensive and multifaceted approach to understanding the relationship between open data and human capital development. By exploring this relationship from a global standpoint and diving into specific regional analyses, the study seeks to uncover nuanced insights that can inform both academic discourse and practical decision-making.

Significance of the Study

The present study holds substantial significance in both academic and practical realms, as detailed below:

Academic Contribution - By exploring the relationship between open data and human capital development, this study adds new dimensions to existing scholarship, bridging gaps between data governance, education, healthcare, and economic development. The utilization of regression analysis in measuring the relationship provides empirical robustness, contributing valuable quantitative evidence to a field often dominated by qualitative assessments. The study's focus on variations across different global regions enriches the understanding of how cultural, economic, and political contexts shape this relationship, offering a more nuanced perspective.

Practical Implications - The findings may inform policymakers in designing strategies that leverage open data to enhance human capital, fostering sustainable growth, innovation, and social welfare. Insights derived from the study can guide educational institutions in aligning curricula and training programs with the opportunities presented by open data, thus enhancing workforce readiness. Businesses may glean insights into how open data can be employed to develop human capital, allowing for more informed decision-making, talent management, and competitive positioning.

Global Relevance - By examining the relationship across various regions, this study transcends geographical boundaries, offering insights applicable to diverse global contexts. The study aligns with broader global initiatives, such as the UN's SDGs, by highlighting the role of open data in achieving inclusive and equitable quality education and promoting lifelong learning opportunities.

Future Research Directions - This study can serve as a foundation for future research, encouraging further exploration of the intricate dynamics between open data and various aspects of human capital, including health, education, employment, and social mobility.
Overall, this study significance lies in its ability to provide empirically grounded insights that can shape strategies, enhance understanding, and drive future exploration in an area that is pivotal to modern society's evolution and well-being.

Literature Review

The nexus between open data and human capital development is an evolving area of interest, where a series of studies have been conducted to explore the intricate dynamics at play. Globally, open data has emerged as a vital instrument for transparency and accountability. Studies by Gurstein, (2011) and Charalabidis et al., (2018) highlight the

significance of open data in enabling citizens' participation and driving innovation across various industries. Human capital, the collective skills, and abilities within a population, is fundamental to economic growth. Ramli, Hashim and Marikan, (2016); Naroș, (2019); Almutirat, (2022) provide seminal insights into the role of education and training in human capital formation, fostering economic development.

In North America and Europe region, Open data initiatives in the USA have led to innovative educational programs and skill development. Jetzek, Avital and Bjorn-Andersen, (2014) explore how open data drives sustainability and educational growth, fostering human capital. Turner et al., (2018) underscores the UK's efforts in harnessing open data for transparent governance, indirectly contributing to an educated populace and enhancing human capital.

Conradie and Choenni, (2014) examine Germany's open data initiatives in healthcare, which have implications for well-being, a vital component of human capital development. In Asia region, Singapore embraces of open data in smart city initiatives (Shaji, Doctor and Dore, 2021) has enabled education and training programs that cater to a technologically advanced workforce. Japan's education reform through open data (Abdukosimovna, 2021) emphasizes lifelong learning, aligning with a globalized economy and fostering human capital.

In Africa region, Africa's leaders in open data - Kenya's initiatives are analyzed by (Mutuku and Colaco, 2012), highlighting both the potential and limitations in human capital enhancement. In South Africa, open data has been leveraged for health and education (Plantinga and Adams, 2021; Hey, 2022), contributing to holistic human capital growth. In Latin America region, Brazil's commitment to open data has fostered citizen engagement and education Pinho and Peixoto, (2020), contributing to a more informed populace and indirectly building human capital. In Chile, open data has been utilized to enhance public services, including education (Gonzalez-Zapata and Heeks, 2015, 2016) ,thereby aligning with human capital development goals.

In the Middle East, The UAE's drive towards a knowledge-based economy has seen open data play a key role in education and skill-building (Ekundayo and Isaac, 2023), enhancing human capital. In the Oceania, Open data's potential in Australia has been analyzed in relation to environmental sustainability and public education (Zuiderwijk, Janssen and Dwivedi, 2015), revealing indirect pathways to human capital growth.

This expanded regional analysis underscores the myriad ways open data intersects with human capital development across the globe. The landscape is varied, reflecting different cultural, economic, and political contexts. While the developed world has often leveraged open data for sophisticated applications in governance, education, and healthcare, emerging markets show promise in harnessing this resource for holistic development.

Thus, these regional insights set the stage for the present study, which aims to empirically investigate the relationship between open data and human capital development, transcending geographical boundaries. By synthesizing these diverse regional experiences, the study aspires to contribute a nuanced and comprehensive perspective to the global discourse on open data's role as a catalyst for human capital growth.

Gaps and Opportunities

Several studies have begun to explore the direct link between open data and human capital development. (Janssen, Charalabidis and Zuiderwijk, 2012) provide an analytical framework for understanding how open data can be employed in education and workforce development. Similarly, Pinho and Peixoto, (2020) demonstrate the importance of open data in building adaptive human capital in Brazil. Despite the growing body of research, there exists a need for empirical and comprehensive analyses that delve into the relationship between open data and human capital, especially from a global perspective. The present study aims to fill this gap by employing a rigorous regression analysis, synthesizing data from Open Data Watch and the UN Human Capital Index.

Theoretical Framework

The theoretical foundation for this study is grounded in the Open Data for Development (OD4D) Theory, which postulates that strategic utilization of open data can propel social and economic development(de Beer, 2017).

The core of this theoretical framework is aimed at understanding how open data specifically relates to human capital development and the accomplishment of UN-SDG3 targets.

The key elements of the OD4D theory as they relate to this study include:

- *Open Data Accessibility:* This element examines the governance, policy landscape, and technological infrastructure that enable or inhibit access to open data. Such accessibility is essential for the various stakeholders, including governmental entities, academia, healthcare institutions, and the broader community.
- *Open Data Usage:* This part focuses on the competencies and capabilities of different stakeholders to interpret and deploy open data effectively. It involves assessing the skills, knowledge, and tools required for transforming data into actionable insights.
- *Open Data Impact on Human Development:* At the heart of this framework lies the investigation of how open data affects human development and health outcomes. This component seeks to unravel the direct and mediated influences of open data on the indicators of human well-being, such as education, healthcare, and economic prosperity.

The theoretical perspective recognizes the multidimensional nature of the impact of open data, acknowledging that social, political, economic, and technological contexts intertwine in shaping outcomes.

Conceptual Framework

In alignment with the theoretical underpinning, the conceptual framework for this study delineates the relationships between the critical variables:

- *Independent Variable (Open Data):* Comprising the provision, accessibility, quality, and strategic utilization of open data. These factors are seen as drivers for innovation, transparency, and decision-making.
- *Dependent Variable (Human Development):* Encompassing various facets of human development as articulated in the UN's Human Development Index (HDI). Specifically, it includes the standard of living, health and wellness, education, and knowledge dissemination.

- Moderating Variables: Such variables might include regional differences. These aspects can either enhance or diminish the effect of open data on human development.

This conceptual framework elucidates the anticipated relationships and connections between the key variables, providing a robust guide for empirical exploration. The schematic representation below encapsulates these relationships, offering a visual guide to the interactions and dependencies within the research model. See Figure 1.

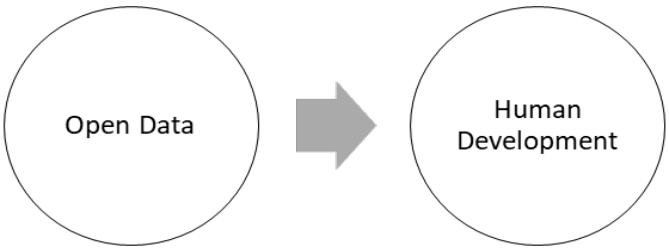

Figure 1. Study's conceptual framework, Source: Author

This revised theoretical and conceptual framework, grounded in the literature review, provides a robust and comprehensive basis for examining the pivotal role of open data as a catalyst for human capital development. By delineating the key variables and their interconnections, it offers a strategic roadmap for both analysis and future research in this crucial field of study.

Methodology

Research Design

Following the Saunder.et.al research onion framework, this study philosophical stance of the research will be rooted in positivism. This approach aligns well with a quantitative study, as it emphasizes objective observations and statistical analyses to develop generalizable conclusions (Saunders, Lewis and Thornhill, 2007). A deductive approach will remain appropriate, as the study will start from a theory (the OD4D Theory) and move towards empirical testing through numerical data analysis. Hypotheses can be formulated and tested against the collected data. The study will use an archival research strategy, utilizing existing quantitative data sources: the global open data inventory and the UN Human Capital Index. By analysing secondary data, the study can provide insights into the correlation between open data and human development across diverse countries (*Saunders Research Onion – A Step-By-Step Guide To Structuring Research Methodology Chapter For PhD And Master-Level Researchers - UK Dissertation Writers*, 2019). Given the quantitative nature of the study, a mono-method choice will be employed, focusing entirely on quantitative data analysis techniques. A cross-sectional time horizon will be maintained, examining the data at a single point in time, which aligns with the use of existing datasets (Assadpour, Ghalehnoee and Bahramian, 2023).

Data collection will involve extracting relevant information from the global open data inventory and the UN Human Capital Index for year 2020. Data analysis will employ statistical techniques such as regression analysis, correlation, and factor analysis to explore the relationships between variables. While primary data collection is not involved, ethical considerations will still be maintained in terms of responsible data handling and

adherence to intellectual property rights. Attribution to the original data sources will be ensured. The validity and reliability of the study will be ensured through the use of recognized and reputable data sources, as well as the application of appropriate statistical techniques. Rigorous data cleaning and testing for assumptions will further enhance the robustness of findings. Overall, the revised research design reflects the quantitative focus and specific data sources identified for this study. By aligning with the principles of positivism and employing a deductive approach, archival research strategy, and mono-method choice, the study is poised to provide a robust empirical examination of the role of open data in human development across 181 countries. The design ensures methodological rigor and is tailored to the unique requirements of this particular inquiry, paving the way for valuable insights and contributions to the field.

Data analysis – Model Construction

As earlier indicated, this study employs a rigorous, two-stage model to scrutinize the impact of Open Data (OP), as sourced from the Open Data Watch and on the Human Development Index (HDI) obtained from the United Nations Development Programme (UNDP). The following steps indicates Data analysis – Model construction stage.

As indicated in appendix 1, each analysis follows four steps. (1) Data preparation to ensure statistical analysis. (2) Descriptive statistics to assess the nature of the datasets. (3) Correlation analysis to determine the relationship and (4) Regression analysis to determine the nature of the relationship.

See appendix 1 in the DOI for the step-by-step analysis workout - DOI:10.17632/zj3rssz5d7.1

Results and Interpretations

H_1: There is a significant positive relationship between the availability and quality of open data and the development of human capital across different global regions.

Descriptive statistics

	Mean	Standard Error	Median	Standard Deviation	Sample Variance	Kurtosis	Skewness	Minimum	Maximum
OD	50.61	1.27	49	16.99	288.65	-0.17	-0.07	1.3	92
HDI	0.73	0.01	0.743	0.15	0.02	-0.8	-0.37	0.39	0.96

Table 1. Descriptive statistics

According to table 1, the descriptive statistical analysis of National Open Data (OD) and Human Development Index (HDI) reveals a moderate adoption of open data initiatives (mean OD of 50.61) and high human development levels (average HDI of 0.73) across the sample. The data shows a broad spread in OD initiatives, but relative uniformity in human development levels. The distribution appears centered around moderate values for OD and relatively free from outliers, with slight variations in HDI. This analysis paints a picture of a diverse global landscape concerning open data and human development.

From a policy perspective, these statistics could inform targeted interventions in countries with lower OD levels to drive improvement in HDI. The symmetry and similar spread in both variables may hint at a potential relationship between OD and HDI, which needs further analysis to confirm. Overall, this statistical overview offers a snapshot of the state of open data initiatives and human development on a global scale, supporting international

comparisons and policy planning, and laying a strong foundation for the further inferential statistical analysis. It also provides valuable insights for policymakers and scholars who are examining the intersection of open data initiatives and human development.

Pearson Correlation

	OD	*HDI*
OD	1	
HDI	0.63	1

Table 2. Pearson Correlation

According to table 2, the Pearson correlation coefficient of 0.63 between National Open Data (OD) and Human Development Index (HDI) signifies a moderate positive linear relationship. This correlation suggests that countries with higher open data initiatives are generally linked with increased human development levels. While this value does not infer a causal relationship, it indicates a tendency for both variables to increase together, highlighting the potential interconnectedness of open data accessibility and human development across different regions.

From an analytical standpoint, this correlation strengthens the argument for further investigating the relationship between OD and HDI.

It may encourage policymakers to consider how advancements in open data initiatives could be leveraged to promote human development. This finding provides preliminary evidence that national strategies focused on enhancing the openness and accessibility of data may have a positive impact on overall human development. It lays a foundational premise for the study, allowing further exploration through more rigorous modelling and analysis, such as regression, to understand the underlying causative factors and dynamics.

Regression Analysis

R. Squared	Adjusted R. Squared	F-statistics	Probability (F-statistics	Durbin Watson Statistics(P-value)
0.40	0.39	117.6	0.00	0.00

Variable	B (beta)	Std Error	t-Statistics	Probability
OD	0.01	0.00	10.84	0.00

Table 3. Regression Analysis

The linear regression analysis in table.3 reveals a substantial connection between National Open Data (OD) and the Human Development Index (HDI). The R-squared value of 0.40 implies that OD accounts for 40% of HDI's variability, indicating a significant but not exhaustive relationship. With an F-statistic of 117.6 and a probability value of 0.00, the model robustly supports the impact of OD on HDI. The beta value of 0.01 shows a direct

proportionate increase between OD and HDI. The Durbin-Watson Statistics confirms the residuals' independence, satisfying a key assumption of linear regression.

These findings have far-reaching implications. Firstly, they underscore the importance of investing in open data initiatives for policymakers aiming to enhance human development. The analysis highlights the tangible contribution of OD to human development, though it also emphasizes that OD is not the sole contributing factor. Therefore, integrating OD with other development initiatives could lead to more robust growth policies. Lastly, the unexplained variance in the model points to opportunities for further research to identify additional variables impacting HDI. Such exploration may provide a more nuanced understanding of the dynamics affecting human development, guiding future strategic planning and policy formulation. In summary, this regression analysis establishes a significant positive link between National Open Data and Human Development Index, a critical insight that can be leveraged in both policy design and strategic development planning.

H_2: There is a variation in the relationship between the availability and quality of open data and the development of human capital across different global regions.
NOTE: To validate H_2, two regions have significant amount of data for regression analysis – Asia (42 countries) and Africa (49 countries). See Table 5.

Descriptive Statistics

	Mean	Standard Error	Median	Standard Deviation	Sample Variance	Kurtosis	Skewness	Minimum	Maximum
Asia									
OD	51.36	2.40	50.50	15.59	242.90	2.07	-0.22	1.30	92.00
HDI	0.73	0.02	0.73	0.12	0.01	-0.25	-0.35	0.46	0.94
Africa									
OD	40.10	1.73	41.30	12.08	145.85	0.01	-0.37	9.50	64.70
HDI	0.57	0.02	0.55	0.11	0.01	-0.47	0.47	0.39	27.77

Table 4. Comparative Descriptive Statistics for Asia and Africa

According to table 4, in Asia, the mean OD score is 51.36, reflecting a more peaked distribution with a slight skew towards lower values. Africa's mean OD score is 40.10, with a nearly normal distribution and more pronounced negative skewness. The HDI in Asia averages at 0.73, indicating a flatter distribution with a bias towards lower values, while Africa's mean HDI is 0.57, with an even flatter distribution and a positive skewness. The ranges in both OD and HDI values highlight distinct regional characteristics.

Implications
The comparative analysis highlights distinct patterns in both OD and HDI between Asia and Africa. Asia's higher mean OD score suggests more extensive implementation of open data initiatives, possibly contributing to its higher mean HDI. Meanwhile, Africa's lower OD mean might explain its lower average human development. The more considerable skewness and kurtosis in Asia's OD may indicate specific countries or outliers heavily influencing the region's OD landscape. Simultaneously, Africa's broader range in HDI signifies significant disparities in human development across the continent, reflecting a more heterogeneous economic environment.

These insights imply the need for region-specific approaches to enhancing both open data initiatives and human development. Policymakers in Africa might draw inspiration from Asia's higher OD mean to invest more in open data initiatives, which could in turn positively impact HDI. However, the differences in distribution characteristics between the two regions caution against a one-size-fits-all approach, emphasizing the need for context-specific strategies that take into account the unique dynamics and challenges of each region.

Correlation Analysis

	OD	*HDI*
Asia		
OD	1	
HDI	0.53	1
Africa		
OD	1	
HDI	0.24	1

Table 5. Comparative Correlation Analysis for Asia and Africa

In table 5, the correlation coefficient between OD and HDI in Asia is 0.53. This positive value indicates a moderate positive relationship, implying that as the OD score increases, the HDI also tends to increase. In Africa, the correlation between OD and HDI is 0.24, representing a weak positive relationship. This suggests that the increase in OD scores is associated with a slight increase in HDI, but the relationship is less strong than in Asia. The moderate positive correlation signifies those open data initiatives may have a more considerable influence on human development in Asia.

The difference in correlation strength between the two regions points to distinct underlying factors influencing the relationship between OD and HDI. While Asia seems to benefit more directly from open data initiatives, the impact in Africa is more subdued. Policymakers in Asia may continue to invest in open data initiatives as part of a strategy to boost human development. In Africa, the weaker correlation suggests that while open data is essential, other factors need to be considered and addressed to substantially improve human development. A comprehensive, multifaceted approach may be more effective in Africa, taking into account the broader socio-economic context.

Overall, the correlation analysis underscores the complexity and nuance of the relationship between open data initiatives and human development in both Asia and Africa. It emphasizes the importance of region-specific approaches and provides valuable insights for policymakers, strategists, and researchers working to enhance both open data use and human development in these diverse regions.

Regression Analysis

Asia

R. Squared	Adjusted R. Squared	F-statistics	Probability (F-statistics	Durbin Watson Statistics(P-value)
0.28	0.26	15.73	0.00	0.00

Variable	B (beta)	Std Error	t-Statistics	Probability
OD	0.00	0.00	3.97	0.00

Africa

R. Squared	Adjusted R. Squared	F-statistics	Probability (F-statistics	Durbin Watson Statistics(P-value)
0.06	0.04	2.87	0.10	0.00

Variable	B (beta)	Std Error	t-Statistics	Probability
OD	0.00	0.00	1.70	0.10

Table 6. Comparative Regression Analysis for Asia and Africa

Table posit that in Asia, the linear regression model indicates that Open Data (OD) explains 26% to 28% of the variation in the dependent variable, showing moderate explanatory power, and the model is statistically significant. In Africa, the model reveals weaker explanatory power, with OD accounting for only 4% to 6% of the variability, and the significance is borderline. The beta value for OD is 0.00 in both regions, indicating a very small effect, and both models may have potential autocorrelation issues, as shown by the value of 0.00.

Implications

Comparatively, the model for Asia indicates that OD has a moderate impact on the dependent variable, as reflected in the R-Squared values. In Africa, the impact of OD is weaker, with minimal explanation of the dependent variable's variation. In Asia, the model is statistically significant, implying that OD can be an essential predictor. In Africa, the significance level is marginal, suggesting that the model may not be robust in explaining the relationship between OD and the dependent variable.

Policymakers and strategists in Asia may consider focusing on OD initiatives as part of a broader strategy to affect the dependent variable. Further investigation may be needed to explore other factors and improve the model. Given the weak relationship in Africa, a more comprehensive approach involving other factors might be necessary to understand and influence the dependent variable effectively.

Overall, the regression analysis reveals contrasting relationships between OD and the dependent variable in Asia and Africa. It highlights the importance of contextual understanding, region-specific strategies, and the need for further refinement. It offers valuable insights for researchers, policymakers, and business strategists working in these regions.

Discussion

The significant F-statistic and positive Beta coefficient confirm the substantial influence of OD on HDI. This relationship underscores the importance of OD initiatives in advancing human development goals in Asia. The low R-Squared and marginal F-statistic reveal a minimal impact of OD on HDI, illustrating that the relationship in Africa may be mediated or confounded by other factors not included in this study. As indicated by H2 analyses, the differences in mean values for OD (51.36 vs. 40.10) and HDI (0.73 vs. 0.57) between Asia and Africa allow us to accept the hypothesis of significant differences in these regions. The higher mean OD value in Asia suggests a more advanced utilization of open data. This difference may be attributed to variations in technological infrastructure, government policies, or societal acceptance of open data initiatives. A higher mean HDI in Asia reflects a comparatively higher level of human development. This difference could be linked to economic, social, and cultural factors distinct to each region.

The acceptance of the hypothesis for Asia, but its rejection for Africa, necessitates region-specific strategies. Policymakers and business leaders must recognize the unique influences and challenges in each region. The divergence in results between regions invites further investigation into potential confounding factors, possibly involving qualitative research to uncover underlying mechanisms. The insights from this study could guide governmental and organizational strategies in utilizing OD for human development, recognizing the need for tailored approaches that reflect regional nuances. The potential autocorrelation in regional analysis detected in both African and Asian models underscore the need for rigorous statistical checks in future research. Expanding the study to include other factors may enhance our understanding of the relationships explored.

Conclusion

This study contributes valuable insights into the role of Open Data (OD) in influencing the Human Development Index (HDI) across different regions. While the findings confirm a significant relationship in Asia, the relationship in Africa appears more complex and requires deeper exploration. The contrasting results highlight the importance of context, inviting policymakers, researchers, and practitioners to adopt a nuanced and regionally informed approach to leveraging open data for human development. Future research efforts may focus on uncovering the underlying mechanisms and contextual factors that influence these relationships, enabling more effective and responsive strategies across diverse settings.

Limitations of the Study

The study examining the relationship between Open Data (OD) and the Human Development Index (HDI) contains several potential limitations that may have impacted the results. First, the exclusion of other socio-economic, cultural, and political factors that might influence OD and HDI could have confounded the findings. Additionally, the utilization of linear regression, assuming a specific relationship between the variables, may not encapsulate the complexity of the OD-HDI interaction, suggesting that future studies might consider alternative modelling techniques. The reliance on available data might also be hindered by inconsistencies, inaccuracies, or biases in data collection and reporting across regions, thereby affecting the findings' reliability. Lastly, the study's cross-sectional nature offers only a momentary glimpse of the relationship, whereas longitudinal studies might provide deeper insights into the evolving connection between OD and HDI over time. However, it is important to note, that the limitations noted above do not diminish the

study's valuable insights but highlight areas where caution must be exercised in interpreting the findings.

Recommendations

The study's recommendations focus on several key areas for improving future research and policy development related to the relationship between Open Data (OD) and the Human Development Index (HDI) in Asia and Africa. For broader generalizability, future studies should incorporate diverse samples that include various socio-economic classes, urban and rural areas, and different political contexts. Investigating confounding variables such as governance structures, economic policies, and cultural factors may provide a more holistic understanding of the OD-HDI relationship. Utilizing advanced analytical techniques, like polynomial regression or machine learning algorithms, could further deepen this understanding. Policymakers are also encouraged to create region-specific strategies to harness open data for human development, acknowledging the distinct cultural, social, and economic contexts within Asia and Africa. The implementation of longitudinal studies and continuous monitoring will offer ongoing insights into how the OD-HDI relationship evolves. In regional investigations, researchers should address the issue of autocorrelation within the data, employing statistical corrections and model validations to increase the reliability of future findings. These recommendations aim to build upon the insights of the current study, recognizing its limitations and providing pathways for future research, policy development, and practice.

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Paper 3: Sustainable Finance and Green Energy in EU

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Abstract

The main aim of this paper is to investigate the role of green finance on sustainable development in Germany and the EU. This aim will be achieved by examining recent data in this field via regression techniques. When comparing Germany and the EU in terms of value of issued green bonds, the results show that Germany is behind the EU in reducing emissions despite several attempts and initiatives. One plausible reason could be the high level of energy consumption in Germany as compared to other EU states. However, the regression results reveal that in Germany, the total value of green bonds, national expenditure on environmental protection, and environmental tax revenue have a negative impact on emissions while in the EU-27, only environmental tax revenue is affecting the emissions. In both cases, fossil fuel support has a positive impact. These results have several policy implications.

Keywords: green finance, sustainable development, green bonds, fossil fuel

Introduction

Measuring the sustainable development goals (SDGs) of the United Nations has always been the core of research work by scholars across the world. Among the SDGs is the SDG13 which is related to the climate change and reducing greenhouse gas emissions (GGE). The reduction of greenhouse gas emissions has been a critical global challenge for long time. This issue has been reflected in various legal regulations and actions taken by international organisations aiming to reduce emissions in individual countries (Wojtowicz, et al, 2021; UN SDG13, 2022).

The concept of green finance has been defined in the literature but there is no common definition for it. In this article green finance is defined as green growth and transition to green economy while reducing the negative environmental impacts. To elaborate further, green finance refers to investments in green bonds, reduction in CO2 emission, and efficiency of the environmental tax by individual countries. However, green finance has also been defined by organic agriculture, water management, and waste management by the private and public actors. Sustainable finance has been defined by European Commission as a process of taking into account the environmental, social, and governance (ESG) considerations when making investment decisions. This leads to increased longer-term investments into sustainable activities. Sustainable finance is a powerful movement led by governments and institutional investors globally.

With the emphasis on green finance and sustainable development in the past two decades, it can be seen that the role of finance is changing from the neoclassical economic theory which emphasises on the maximization of profit, and shareholders' wealth towards a system which supports green economy, sustainable development, low carbon economy, and mitigation of climate change (Ryszawska, 2016).

Weber (2015) claimed that there is a need of US$363 billion to US$2.4 trillion to mitigate climate change (based on the estimation from the Stockholm Environment Institute).

This value shows that the financial sector plays a crucial role in fostering sustainable development and protecting the environment due to its capital provision function. The Financial sector as an intermediary sector, can channel capital into business projects with potential positive impacts on sustainable development. Therefore, it is important that the funded businesses are green in order to achieve this objective.

Sachs et al (2019) argued that the global investment in renewable energy declined by 3% in 2017 and the fossil fuels are still the main target for energy investment. These will threaten the development of green energy and alter the climate change goals. Finance is the engine for development and should be responsibly used to support the green projects. However, financial institutions show more interest in fossil projects than green projects due to (i) several risks associated with new technologies and (ii) the low return in green projects. But achieving the sustainable development goals requires serious attention to green finance that provide environmental benefits. In a similar study, Andrade et al (2021) show that the returns in the portfolio of the European green energy stock found to be better than the non-green counterparts (data from 2008 to 2020), but this difference has narrowed in the recent years. The study finally concludes that within the period of 2008 – 2020, green energy firms' performance could not significantly outperform the non-green energy firms' performance.

In this paper we are taking care of several initiatives to see if they could curb emissions and foster sustainable development. Those initiatives are the value of green bonds issued by several authorities within the country, national expenditure on environmental protection, environmental tax revenue, and fossil fuel support. Therefore, the main objective of this paper is to investigate the impact of these variables on green finance and sustainable development in the context of Germany and the EU-27. Greenhouse gas emissions is used as the proxy for sustainable development.

Literature Review

In 2019, Germany recorded the largest tax revenue (EUR 2.8 billion) from emission permits in the EU, followed by Italy (EUR 1.3 billion), Poland (EUR 1.2 billion) and Spain (EUR 1.0 billion) based on the European Commission data in March 2021.

The European Union expenditure on the environmental protection has significantly increased during the recent years (40% increase from 2006 to 2020). However, when this increase is compared to the GDP (measured as percentage of GDP), this expenditure remained relatively unchanged over the past 15 years. It means that the expenditure has just followed the GDP trends which indicates this amount is not sufficient to curb emissions to seek sustainable development. Figure 1 illustrates this fact.

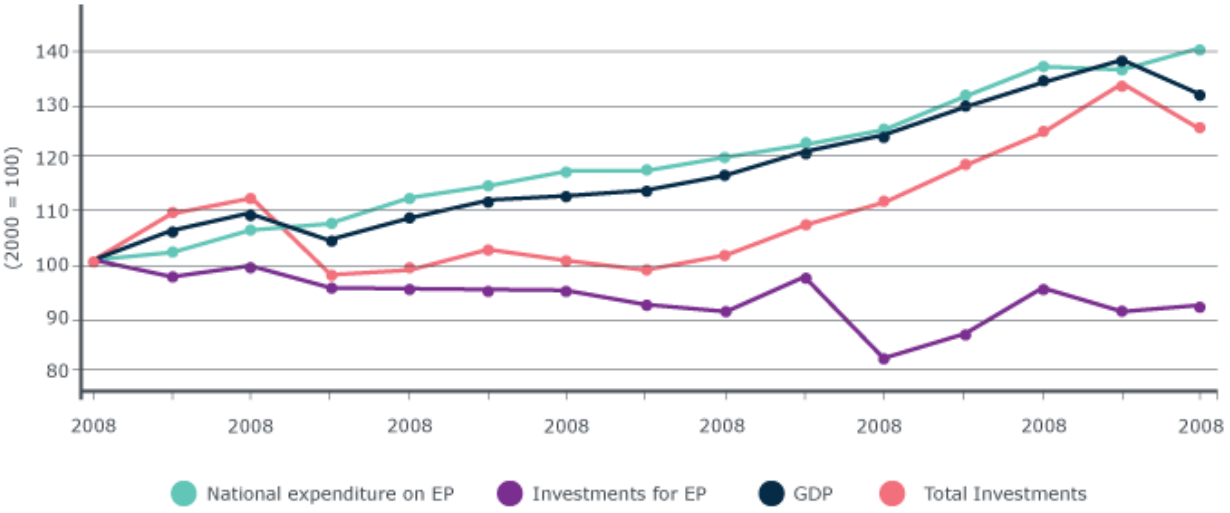


Figure 1. Environmental protection expenditure in the EU -Source: Eurostat 2022

The value of green bonds issued in Germany is 20% of that of total green bonds issued in EU in 2019. However, the greenhouse gas emission per capita in Germany is larger than that of EU, i.e., 10.1 metric tons (MT) in 2019 in Germany and 8.40MT in the EU in the same year. This has happened even though Germany has reduced the fossil fuel support and has increased the national expenditure on environmental protection. One of the plausible reasons could be the extent to which German industries are dependent on natural resources.

Wojtowicz, Szolno-Koguc & Braun (2021) examined the role of public expenditure on CO2 emissions in several Polish regions. They concluded that public spending contributes to lowering CO2 emissions, but environmental spending is counterproductive. This was observed in the regions with high level of socioeconomics development, high energy consumption, and higher carbon emissions. They claimed that the failure of environmental expenditure in these regions can be explained by the green paradox.

In a separate note, Afshar, Al-Gamrh & Gharleghi (2020) claimed that one of the key elements for improving environmental performance is embracing green innovation. In another study by Gharleghi & Afshar (2020) it was found that financial development has a positive impact on reducing income inequality and that will eventually lead to sustainable development.

Methodology and data

Since the concept of sustainable finance and green finance are relatively new, therefore there is not much of data available across the world. However, since the EU has been in the green business for quite some time, there is relatively a good range of data for the European countries. We are trying to utilise the most recent available data in this article so that it would shed some new lights into the field of green finance and sustainable development. The available data spans from 2013 to 2019. Table 1 describes the variables in this paper.

Table 1. Variables' definition

Abbreviation	Variable definition	Source
GBIG-GG	Volume of green bonds issued in Germany General government -Euro Billion	Eurostat
GBIG-DB	Volume of green bonds issued in Germany-Development Banks -Euro Billion	Eurostat
GBIG-FI	Volume of green bonds issued in Germany-financial institutions -Euro Billion	Eurostat
GBIG-Tot	Volume of green bonds issued in Germany-Total -Euro Billion	Eurostat
GBIEU-GG	Volume of green bonds issued in EU-GG -Euro Billion	Eurostat
GBIEU-DB	Volume of green bonds issued in EU-DB -Euro Billion	Eurostat
GBIEU-FI	Volume of green bonds issued in EU-FI -Euro Billion	Eurostat
GBIEU-Tot	Volume of green bonds issued in EU-Tot -Euro Billion	Eurostat
NEEP_G	National expenditure on environmental protection in Germany % of GDP	Eurostat
NEEP_EU	National expenditure on environmental protection in the EU-27 % of GDP	Eurostat
ETR_EU	Environmental tax revenues in Germany % of GDP	Eurostat
ETR_G	Environmental tax revenues in EU-27 % of GDP	Eurostat
FFS_G	Fossil fuel support in Germany % GDP	Eurostat
FFS_EU	Fossil fuel support in EU-27 % GDP	Eurostat
GGE_G	Greenhouse gas emissions in Germany per capita	European Environment Agency (EEA), Eurostat
GGE_EU	Greenhouse gas emissions in EU-27 - per capita	European Environment Agency (EEA), Eurostat

In fact, in this paper, we would like to examine if the recent initiatives had any impact on sustainable development. More specifically, the impact of newly developed tools with regards to the sustainable finance on the greenhouse emission will also be investigated. In brief, the following equation will be estimated for Germany and the next one would be for the EU:

$$GGE\_G_{t} = GBIG\_tot_{t} + NEEP\_G_{t} + FFS\_G_{t-1} + ETR\_G_{t}$$

$$GGE\_EU_{t} = GBIEU\_tot_{t} + NEEP\_EU_{t} + FFS\_EU_{t-1} + ETR\_EU_{t}$$

Results and Discussion

Figure 2 depicts the value of the green bonds issued in Germany by various institutions. The General Government did not issue any green bonds until 2020. The diagram further reveals that only financial institutions had a (almost) consistent increase in issuing green

bonds. It is also clear that the value increased dramatically in 2019 but again decreased in 2020.

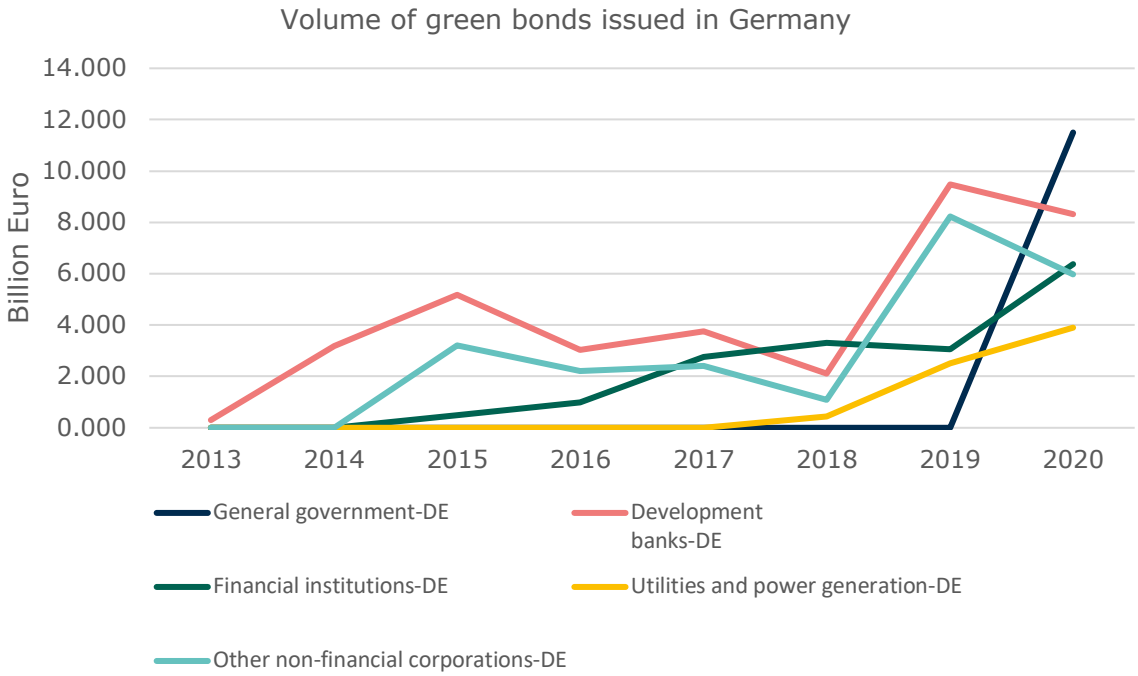


Figure 2. Volume of green bonds issued in Germany

Figure 3 depicts the value of the green bonds issued by different authorities in the EU-28 countries (Germany not included). The overall pattern for all issuers is (almost) steadily increasing until 2020 except for the development banks.

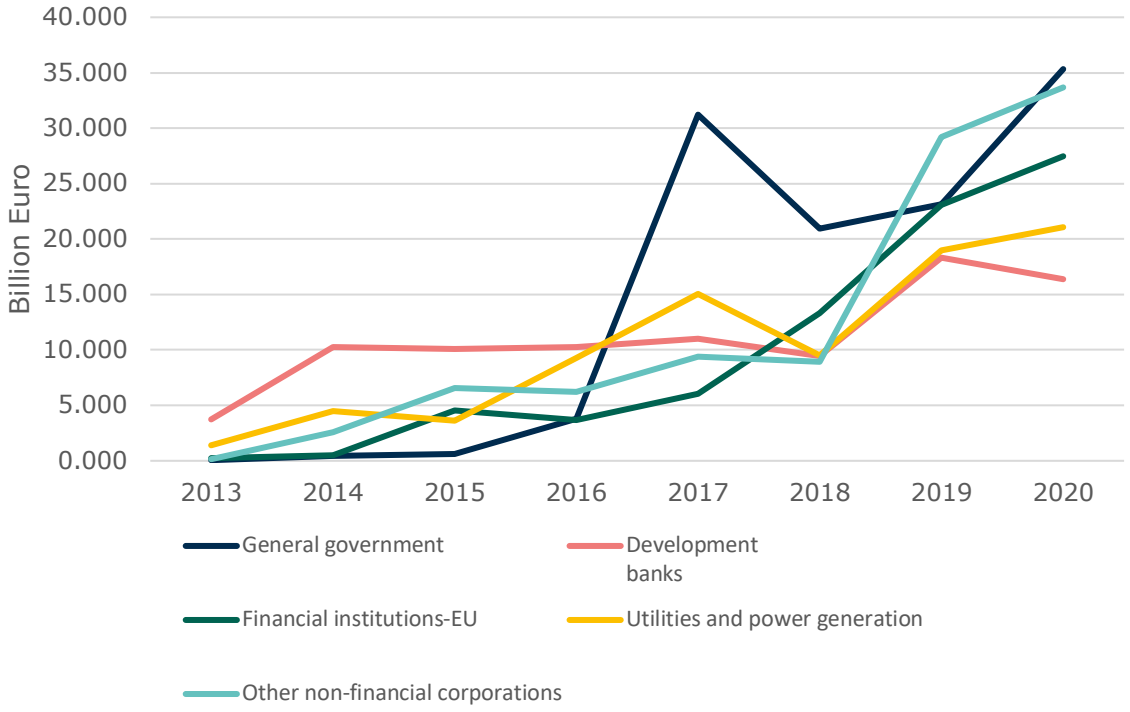


Figure 3. Volume of green bonds issued in EU-27

Figure 4 compares the total value of the green bonds issued in Germany and the EU-27 which indicates that both Germany and EU have increased their efforts towards green finance and green economy.

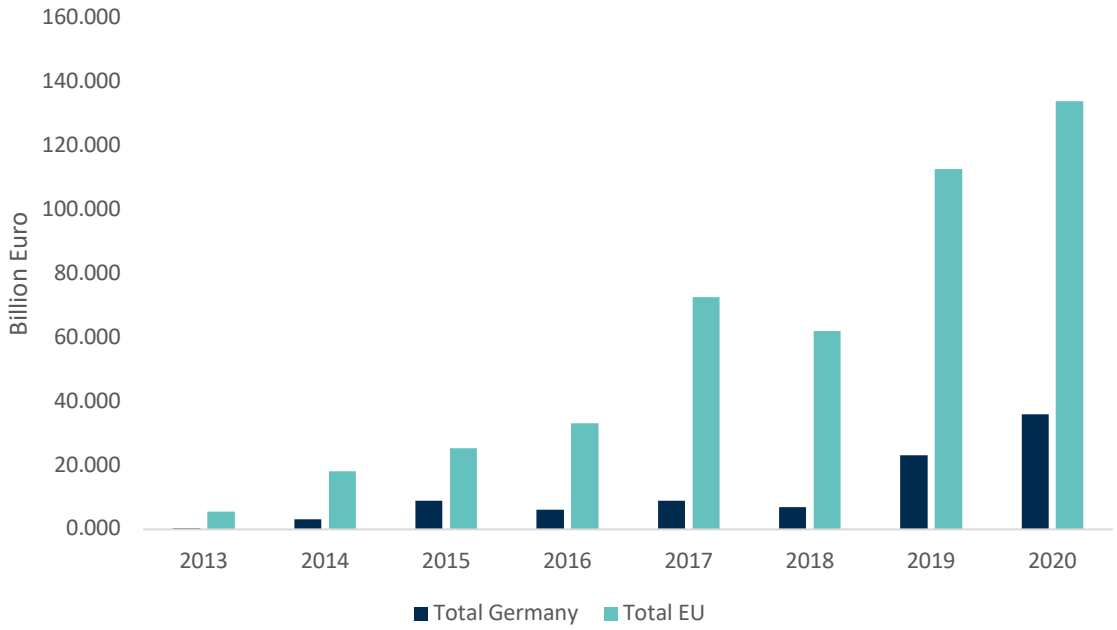


Figure 4. Total value of green bonds issued in Germany and EU-27

Figure 5 shows the national expenditure on environmental protection as percentage of GDP in Germany and the EU-27. We can observe that Germany has spent more as compared to the average of other EU-27 countries.

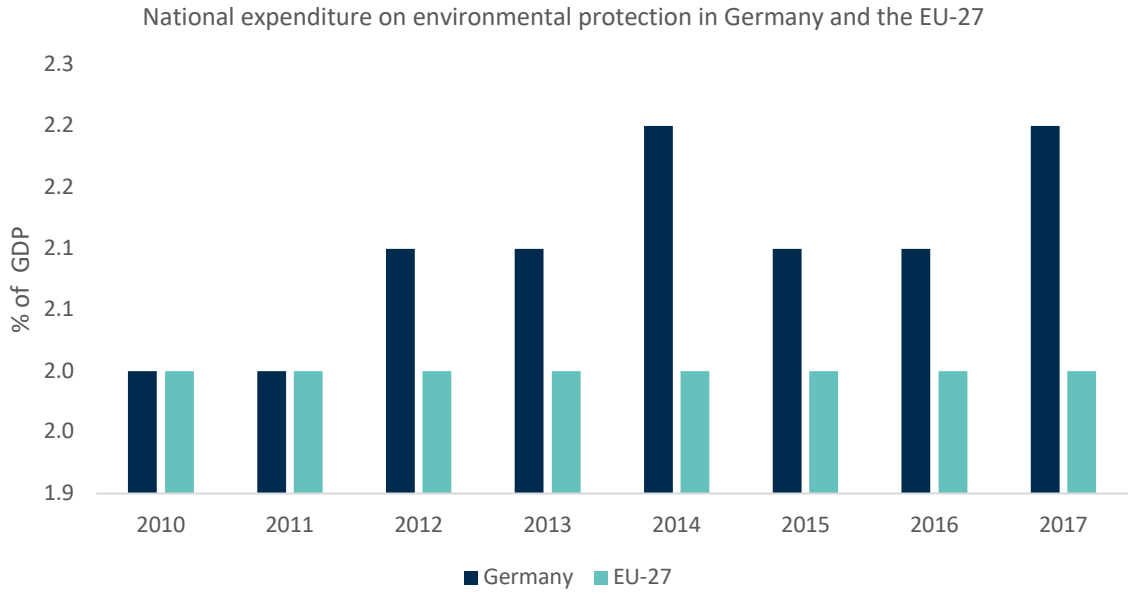


Figure 5. National expenditure on environmental protection in Germany and the EU-27

Figures 6 and 7 show that both Environmental tax revenues and the fossil fuel support have decreased in Germany and the EU.

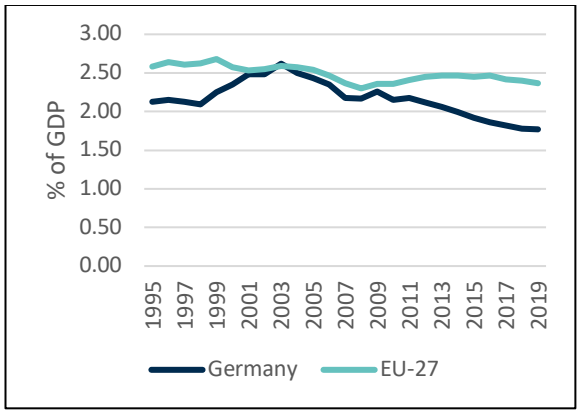


Figure 6. Environmental tax revenues in Germany and the EU-27

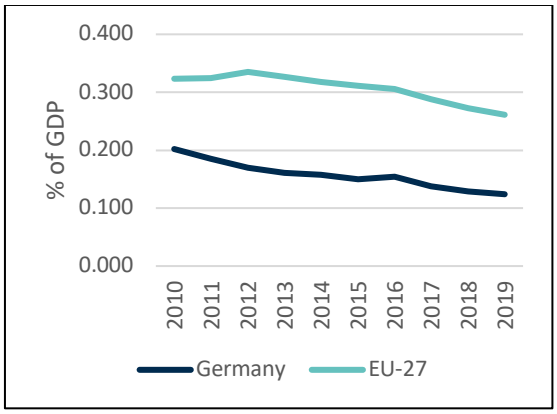
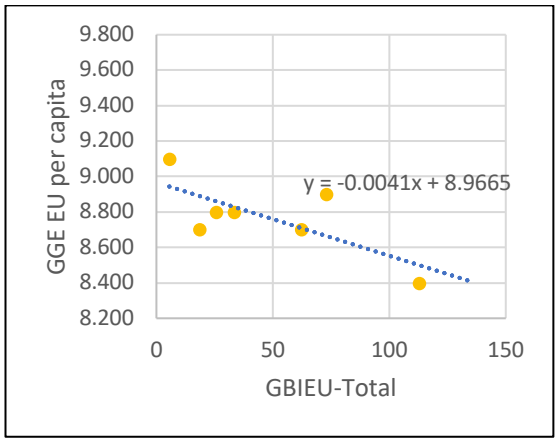


Figure 7. Fossil fuel support in Germany and the EU-27

Interaction between green bonds issued and Greenhouse Gas Emission in EU



Interaction between green bonds issued and Greenhouse Gas Emission in Germany

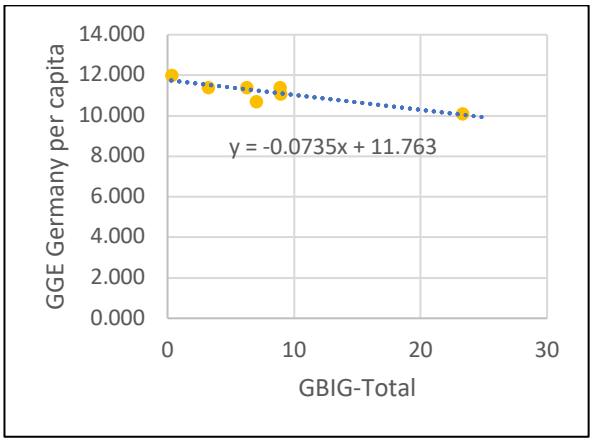


Figure 8. Interaction between green bonds issued and Greenhouse Gas Emission in EU & Germany

Figure 8 shows the relationship (interaction) between the total green bonds issued in Germany and EU with the greenhouse gas emissions. It shows that green bonds issued in the EU had a stronger impact on reducing emissions as the slope of the trend line is steeper. As mentioned earlier Germany alone issued a comparable 20% of green bonds when compared with the EU. These diagrams further show that Germany is behind the EU in terms of reducing the greenhouse gas emissions. The slope of the GGE in the EU is steeper than the slope of the GGE in Germany depicting the fact that despite attempts and investments to combat climate change and foster sustainable development, Germany is still emitting a lot which could be due to high energy consumption in the German industries.

Regression Results

This section presents the regression results. The data for the selected variables is very limited and it is only available from 2013 to 2019 for most of the variables. Table 2 depicts the descriptive statistics of the variables.

Table 2. Descriptive statistics (2013-2019)

Variables	Mean	Median	Standard Deviation	Min.	Max.	Count
GBIG_TOT	5,74	6,59	3,40	0,30	8,91	6
GBIEU_tot	36,23	29,34	26,04	5,58	72,69	6
NEEP_G	2,15	2,15	0,05	2,10	2,20	6
NEEP_EU	2,00	2,00	0,00	2,00	2,00	6
ETR_G	1,91	1,89	0,11	1,78	2,06	6
ETR_EU	2,45	2,46	0,03	2,40	2,47	6
FFS_G	0,15	0,15	0,01	0,13	0,16	6
FFS_EU	0,30	0,31	0,02	0,27	0,33	6
GGE_G	11,33	11,40	0,43	10,70	12,00	6
GGE_EU	8,83	8,80	0,15	8,70	9,10	6

Table 3. Impact of the selected variables on GGE in Germany (2013-2019)

Variable	Coefficient	Std.Error	t-stat	Prob.
GBIG_Tot	-0.047	0.0177	-2.70	0.225
NEEP_G	-3.165	0.587	-5.38	0.116
FFS_G(-1)	32.83	8.343	3.93	0.158
ETR_G	-1.379	1.180	-1.16	0.450
Intercept	15.94	2.169	7.35	0.086
R-square	0.979			

Note: **dependent variable is the greenhouse gas emissions** in Germany. Degree of freedom for this model is df=n-k therefore it is 6-5 = 1.

The outcome of the regression in Table 3 depicts the fact that the initiatives in Germany to reduce GGE have been successful for the sample period. It shows that total green bonds issued by all authorities (development banks, financial institutions, and general government), net expenditure on environmental protection, and the environmental tax revenue have a negative impact on the greenhouse gas emissions. The impact of lagged fossil fuel support (FFS) is positive as expected. However, this support has decreased during the past recent years. The reason why the lagged value is considered is that usually the outcome of FFS is not immediate and such outcome will take some time to be realized.

Table 4: Impact of the selected variables on GGE in EU (2013-2019)

Variable	Coefficient	Std. Error	t-stat	Prob.
GBIEU_tot	0.002	0.006	0.32	0.77
NEEP_EU	2.964	2.920	1.01	0.41
FFS_EU(-1)	12.66	10.55	1.19	0.35
ETR_EU	-2.955	5.86	-0.50	0.66

Intercept	6.07	14.62	0.41	0.71
Adjusted R-square	0.354			

Note: dependent variable is the greenhouse gas emissions in the EU. Degree of freedom for this model is df=n-k therefore it is 6-5 = 1.

Unlike the case of Germany, the initiatives taken in this paper for the case of EU exhibit different impact on GGE. The impact of environmental tax revenue, and fossil fuel support is similar to that of Germany, but green bonds and national expenditure on environmental protection do not exert any meaningful impact on reducing GGE. One plausible reason for these insignificant impacts is the green paradox, which states that intensive use of climate policy instruments (such as national expenditure on environmental protection, environmental tax revenue, etc) encourage the fossil fuel owners to extract raw materials faster and consequently accelerates global warming (Wojtowicz, Szołno-Koguc & Braun, 2021; Grafton, Kompas & Van Long, 2012).

Table 5. Impact of green bonds on GGE in Germany (2013-2019)

Variable	**Coefficient**	**Std. Error**	**t-stat**	**Prob.**
GBIG_DB	-0.106	0.031	-3.33	0.028
GBIG_FI	-0.259	0.062	-4.12	0.014
Intercept	11.96	0.14	83.93	0.000
Adjusted R-square	0.88			

Note: since the general government in Germany did not issue green bonds from 2013 to 2019, therefore this variable is omitted from the regression. Dependent variable is the greenhouse gas emissions in Germany.

The results in Table 5 reveals that both green bonds issued by development banks and financial institutions have a negative and significant impact on the greenhouse gas emissions.

Table 6. Impact of green bonds on GGE in the EU (2013-2019)

Variable	**Coefficient**	**Std. Error**	**t-stat**	**Prob.**
GBIEU_DB	-0.037	0.014	-2.53	0.084
GBIEU_FI	-0.010	0.008	-1.23	0.304
GBIEU_GG	0.005	0.003	1.35	0.267
Intercept	9.18	0.121	75.89	0.000
Adjusted R-square	0.81			

Note: Dependent variable is the greenhouse gas emissions in the EU.

The results from Table 6 also shows that both green bonds issued in the EU have a negative impact on the greenhouse gas emissions. However, unlike Germany, the green bonds issued by financial institutions in the EU countries has an insignificant impact on the GGE and the magnitude is also smaller (-0.010 as compared to -0.259).

Conclusion and policy implications

This paper examined the role of green finance (via different instruments) on sustainable development in the context of European countries, especially in Germany and the EU-27. The results reveal that initiatives in Germany have a stronger impact on reducing greenhouse emissions as compared to that of the EU-27. One plausible reason is that Germany aims to become greenhouse gas neutral by 2045. This is after it has set the targets for such a goal. The reduction in emissions is set to be at least 65% by 2030, and 88% by 2040 (compared to 1990 levels).

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Conference Theme 2
Digital First (AU Strategic Vision)

Digital technologies are a potential force for social change that provides the means to democratise education by solving the challenges of time, space, inflexibility, and accessibility for the benefit of the global society. Improving the digital capability of the most marginalised and vulnerable members of our society is key to people's ability to thrive in the challenging digital economies of the future. Theme 4 asks, "How should we use digital technologies to reconceptualise, redesign, and reconfigure blended learning for sustainability?"

Paper 1: The Social Taxation Hypothesis in the Context of the Post-Pandemic: Rapid AI and Social Network Expansion

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Abstract
One of the UN SDG goals is to provide free access to AI and social media platforms for everyone. This goal aims to bridge the digital divide and ensure that everyone has equal opportunities to benefit from technological advancements. It also recognises the importance of these tools in promoting education, communication, and innovation. The study aims to explore the impact of social platforms on the economy and how compulsory taxation can be used to regulate them. It also examines the potential benefits and drawbacks of such a taxation system in this digital era. A deontological intervention is required to rebalance the relationship between individuals and social platform users. This type of intervention would focus on establishing ethical guidelines and principles for social platform use, with a focus on respecting individual rights and privacy. It would also involve holding social platforms accountable for any violations of these principles. This intervention could take the form of regulations or policies designed to promote fair and sustainable competition while also protecting users' privacy and data. It may also entail platforms incentivising content creators and other stakeholders to share profits. This can be accomplished by enacting procedures that ensure equitable profit distribution and user data protection. One possible solution is to impose regulations on data collection and usage by platform companies. Another approach could be to establish public ownership of the data and require companies to compensate individuals for their data contributions. Furthermore, this paper discusses how higher education in digital literacy can provide users with the knowledge they need to make informed decisions and embrace platforms accountable for their activities.

Keywords: AI Tools, ChatGPT, Digitalisation, Ethics, Post-COVID-19, Social Media Platforms, Taxation

1. Introduction

On January 9, 2020, COVID-19 was identified as the causal agent behind a group of pneumonia cases initially reported on December 31, 2019, by the Wuhan Municipal Health Commission in China to the World Health Organization (World Health Organization, 2023). The COVID-19 pandemic has also activated emerging trends on social media platforms and their widespread use. Research data underscore the remarkable rise in online banking, social media engagement and content sharing. This surge is closely tied to the explosive popularity of digital phenomena like TikTok, Instagram, YouTube, AI tools like ChatGPT and the world of online gaming, all of which have now become mainstream trends. Moreover, the COVID-19 pandemic has sped up the adoption of digital technologies, resulting in a surge in online commerce and digital education.

Businesses and educational institutions have rapidly adapted to cater to the needs of an increasingly digital society. For instance, Microsoft's data between 2019 and 2022 reveals a significant increase in Italian companies embracing flexible work practices, rising from 15% to 77% (Microsoft, 2022). According to ISTAT's findings, nearly half the population has engaged in online shopping, marking a 6.5% increase from 2020 to 2022 (ISTAT, 2023) (Mignolli et al., 2022). Similar findings from ISTAT's June 2023 study reveal that 90% of large companies and 73% of medium-sized firms adopted or expanded smart working during the crisis (ISTAT, 2023). Comparatively, small and micro-enterprises reported lower percentages. In early 2019, remote work accounted for just 1.2% of total employment, surging to 8.8% in March and April 2019 (WHO, 2020).

The COVID-19 pandemic increased the adoption of digital technology in the workplace, transforming how businesses and government institutions can operate. Local and state governments have used remote employment, while universities, colleges, and public and private institutions have employed distant learning models.

Everyone who had to stay at home was able to take advantage of a variety of training courses that allowed them to stay current with their personal and professional development. Schools and colleges have included sustainable e-learning, employing dedicated systems to conduct real-time group sessions.

Beyond its direct impact on health and the economy, COVID-19 has also influenced a new and more articulated 'media diet' (Wolton, 2001). According to a report by the Italian Communications Authority, (AGCOM, 2020), research data highlights the impressive growth of online banking, social media engagement, and content sharing. Analytical insights from the same report (AGCOM, 2020) also indicate that post-COVID-19, three out of four individuals are more inclined than the previous year to engage in streaming and online shopping. This trend holds true globally and is somewhat slower in the Italian country regarding the latter aspect (at 65% only). These behavioural changes are also observed among the older age groups, with estimations from the AGCOM report (2020) indicating that over the next few months, globally, two-thirds of individuals aged 55 to 65 will opt for online shopping, while about six out of ten will indulge in streaming content.

Ultimately, as highlighted in the AGCOM report (2020), COVID-19 has ushered a large audience into the realm of digital experiences, often for the first time, accelerating technological evolution and fostering enduring cultural shifts. The most questioning phenomenon in this extraordinary historical moment is the intergenerational adoption that

prompts contemplation on various fronts. It signals a profound paradigm shift that companies must inevitably grapple with. A prime illustration of this is e-commerce, soon to become an essential factor and non-negotiable for consumers when selecting products or services.

Brands confront the challenge of predicting the evolution of these behaviours beyond the immediate circumstances, capitalising on opportunities and aligning with the swift pace of consumer preferences. Others face the risk of permanent irrelevance due to an inability to meet these transformed needs. In essence, businesses' offerings must significantly adapt, available both in physical stores and online, to cater to a consumption pattern driven by convenience.

Another side to highlight in this concise report pertains to the months of COVID-19-induced health crisis. Numerous companies resorted to agile or smart working to sustain operations and safeguard employee health. Notably, this approach, which had not been extensively implemented in Italy barring the public sector, emerged not from premeditated strategies or stable corporate structures, but from the practical necessity of working remotely during lockdown—a need that diminished since July.

Consequently, returning to our analysis, the COVID-19 crisis has acted as a catalyst for intensified use of digital technology in the professional sphere, revolutionising the operational methods of companies and public institutions within a remarkably short span. Despite remote work clauses existing in many employment contracts, practical implementation remained marginal. The pandemic witnessed a massive adoption of remote work, particularly by state and local bodies. When closely monitored, remote work proved capable of meeting user and territorial needs.

Lastly, the COVID-19 emergency has significantly bolstered Distance Learning methods (known as DL). The obligation of quarantine compelled the adoption of virtual platforms across all educational levels. Universities, specialized institutions, and both public and private schools promptly adapted through online networks and Digital Learning (DL). Facilitated by technology and digital solidarity, DL enabled those confined at home to access training, ensuring continued personal and professional growth. Educational institutions, primarily schools and universities, effectively continued lessons using the e-learning approach, conducting real-time group sessions on dedicated platforms.

2. ChatGPT

More recently, the development of Open AI ChatGPT and GPT-4 has brought about significant advancements in the field of natural language processing, business, educational and research settings. ChatGPT can generate human-like text, making it one of the most remarkable AI tools in recent years. However, with this new change in digitalisation some ethical concerns need to be addressed.

The GPT chat, an abbreviation for Generative Pretrained Transformer, represents software designed to emulate human-like conversations, functioning as a chatbot. It was developed by OpenAI, a non-profit organization focused on Artificial Intelligence (AI) research. Leveraging advanced machine learning algorithms, ChatGPT generates responses like human speech. The primary objective of ChatGPT is to enhance the way we interact with

machines across diverse applications, ranging from customer service and language translation to creative writing.

OpenAI, the entity behind Chat GPT, provides a beta program, offering a pre-release version that has already undergone expert testing. This program enables developers and researchers to access and utilize the technology at no cost. By registering an account on their website and submitting a form, one can request access to the beta program. Notably, GPT chat is presently available free of charge.

Privacy is also a notable aspect of the chat. When questioned about the personal data collected by ChatGPT-3 and GPT-4, it responds by asserting that it neither collects nor processes personal data. The information users provide during conversations is used solely for delivering responses and isn't stored or shared with third parties. It is crucial to acknowledge that the chat service employed may collect certain information about the chat session, such as the user's IP address and device type.

However, it is worth noting that accessing the service entails submitting an email address and creating an account, and the service does retain the history of users' questions. This implies that some personal information is collected and retained. This becomes particularly significant as questions and related data can often fall into sensitive categories, revealing attributes like race, religion, political opinions, and even more delicate information like health and personal life details.

The consequences of the conversation data are huge, possibly revealing information about many people globally, including their thought processes, requests, concerns, and emotions. In addition, the stated privacy policy fails to sufficiently explain the activities conducted with personal data and ethical issues, particularly those regulated by European Regulation (EU), raising ethical and societal concerns.

As far as current knowledge goes, personal data or data gathered from chat conversations is used by OpenAI, the proprietors of ChatGPT, to train the algorithm. On 31 March 2023, the Italian Data Protection Authority or Garante Per La Protezione dei Dati Personali (GPDP) initiated a provisional limitation on the processing of data from Italian users by OpenAI, the US-based company responsible for ChatGPT (GPDP, 2023). This move was accompanied by a legal and ethical investigation.

The suspension of GPT Chat in Italy stems from a significant incident that transpired in early March. ChatGPT, a well-known relational AI software for simulating human-like conversations, encountered a data breach on 20th March 2023. This breach exposed user conversations and payment details of subscribers to the paid service. This event highlighted not only the absence of information for users and data subjects whose information is collected by OpenAI, but also the lack of a valid legal basis for the extensive collection and storage of personal data to train the platform's algorithms. The Italian Data Protection Authority noted inaccuracies in the information provided by ChatGPT, leading to flawed processing of personal data. Despite OpenAI's assertion that the service targets users over 13, the Italian Protection Authority highlighted the absence of age verification filters, exposing minors to responses unsuited to their level of development and self-awareness.

3. Critical Analysis Using AI Tools

When deliberating on the potential regulation, taxation, or prohibition of AI platforms like ChatGPT, it becomes imperative to engage in critical thinking. The core consideration lies in whether these AI platforms, as well as the major players in social media, align with human values and ethical principles. This evaluation enables us to discern actions and choices that resonate with our morality and sense of accountability. In this context, it's essential to acknowledge that AI platforms and social media giants should not possess decision-making abilities, and their actions or human-like interactions should be guided by our choices rather than their own autonomy. Consequently, their ethical implications are contingent upon our determinations of their goodness or badness, rightness or wrongness.

Hence, the decision to regulate or tax AI platforms such as ChatGPT and social media networks should hinge on their congruence with our ethical standards and their responsible usage that avoids harm to individuals and society at large. Ultimately, the responsibility lies with us, as human beings, to make judicious choices and assume accountability for our actions, even when involving AI technology and social media platforms. Drawing parallel, recent discussions in UK Higher Education Quality Assurance Agency webinars have likened AI technologies to "fast food vendors" or machines without emotional intelligence (QAA, 2023). This analogy underscores the potential pitfalls of AI tools in dehumanizing intellectual capacities and problem-solving skills, potentially undermining human connections as posited by Arendt (Arend 1998). Such depersonalisation could lead to a deficiency in empathy and understanding of people's requirements and perspectives (Chomsky, N., *et al.*, 2023.)

The analogy serves as a cautionary note, suggesting that the implementation of AI technologies and Social Media Platforms should be thoughtfully and critically evaluated. This is to prevent negative repercussions on the quality of creative expression, the introduction of biases, the capacity for critical analysis and the intellectual maturation of individuals.

4. A Marxist surplus value theory applied to AI and social media

Karl Marx said in his masterpiece *Theories of Surplus Value*, that the industrial worker, particularly in the case of AI technology, the worker does not know when they have stopped working for themselves and when they begin working for the master (Marx, 2020). This means that the worker may unknowingly contribute to the profits of the company without receiving fair compensation for their labour. Similarly, Marx's theory of surplus value argues that this type of exploitation is inherent in the New Current AI algorithm capitalist system.

The surplus value of an AI platform item is defined by excess labour, which is the extra unpaid effort a worker undertakes to generate it. This concept is important in understanding the power dynamics between workers and owners, as the owners of the AI platform can extract profit from the surplus value created by the workers. This exploitation can lead to unequal distribution of wealth and perpetuate systemic inequalities.

At the same time, we can see it in AI and social media platforms. The user is unaware that by using the platform, they are contributing to the platform income itself, and in the process, time provides information and personal data in both conscious and unconscious ways.

In their book, Goldsmith and Wu, (2008), entitled *Who Controls the Internet? Illusions of a Borderless*, they explain how governments can enforce obedience with their own legislation.

This has sparked debate about the balance between government control and individual freedom in the digital age. Many argue that government control over the internet is a violation of human rights and impedes freedom of speech. However, others believe that some level of regulation and taxation is necessary to protect citizens from harmful content and cyber threats and data protection.

Google continues to dominate the most visited websites in the world. YouTube comes in second and Facebook comes in third, with Twitter coming in third. Instagram, owned by Facebook, is the fourth most popular social media platform with over 1 billion active users. Snapchat and LinkedIn are also among the top 10 social media platforms with millions of active users worldwide. The rise in social media usage has led to a significant change in marketing strategies for businesses and organisations.

These platforms use user data to recommend articles and videos on topics of interest to users. Instead of compensating users, they steal data and financial gains. This is the basis of their massive surplus value. If Google and Twitter are free to use, the vast amount of information they have obtained about us represents shareholder revenue. This is why it is important for users to be aware of the value they bring to these platforms and demand greater transparency and control over their personal data. Additionally, governments must also regulate these companies to ensure that they are not exploiting user data for profit without proper consent or compensation.

5. Taxes on Social Media Platforms and AI Policy

The taxation of online giants has long been the object of public criticism due to the minimal taxes paid and the falsification of their level of competitiveness. This has led to debates among governments and international organizations on how to tax these companies (Tankersley, 2019). Some proposed solutions include a digital services tax or a global minimum tax rate for corporations. France has chosen to impose a tax on digital earnings derived from the use of relevant copyrights and royalties on multinational corporations, largely American, that dominate the Internet (Govindarajan et al., 2019). The implementation of a digital tax in France operates as follows:

The French law imposes a 3% levy on companies generating at least €750 million ($845 million) in global revenues (Kayali, 2022), along with digital sales of €25 million ($27 million) within the country's borders to customers residing there (Govindarajan et al., 2019). This regulation predominantly affects around 30 companies, primarily of American origin, but also including Chinese, German, British, and even French firms. The central objective is to refocus taxation on where online service users are located, rather than where companies establish their European headquarters or direct their earnings in relation to the exploitation of various copyrights.

In essence, the new tax rules, exemplified by the French model, seek to directly tax revenues before profits can be moved to low- or zero-tax jurisdictions, thereby evading taxation. Other countries have also introduced digital taxes. After France, Italy was the first country to implement a digital tax, followed by Austria, Belgium and Spain. Italy, for

example, adopted a tax like the French model, effective on 1 January 2020, with a clause that neutralises its impact should a new global taxation standard be established by the Organisation for Economic Co-operation and Development (OECD, 2021). Similarly, Turkey introduced a 7.5% digital tax (Akdogan, 2021), more substantial than the French counterpart. The United Kingdom's proposed legislation entails a lower 2% tax on search engines, social media platforms, and online sales, only applied when earnings directly stem from users residing or operating within the UK (gov.uk, 2020).

In response to the French tax, the United States contends that it discriminates against American companies, proposing tariffs of around €2.2 billion ($2.4 billion) on French goods and launching investigations into similar digital taxes in Austria, Italy, and Turkey. The US relies on Section 301 of the U.S. Trade Act of 1974, previously used to impose tariffs on Chinese goods due to alleged intellectual property theft.

Amid these developments, Europe has faced crucial decisions. The immigration crisis, environmental concerns, social transformations due to new technologies, and other factors challenge established powers and norms. Furthermore, COVID-19 has spotlighted the limitations of current development models and the risks to democracy and well-being that the globalist narrative had obscured.

Google and Facebook have argued that the levy unjustly targets American corporations, while opponents argue that it is vital to ensure equal opportunities for smaller European businesses. The United States has been unwilling to implement new taxes, and although the European Union has tried to negotiate with the White House, they were with limited success.

As previously discussed, Open AI with ChatGPT was prohibited by Italian data protection on 1 April 2023 due to ethical concerns regarding data protection. This temporary ban was a significant step towards ensuring the safety and privacy of users, particularly children and cultural minorities.

Italy, Canada, Japan, G7, Germany, France, Ireland, New Zealand, the UK Taskforce, the US Center for AI and Digital Policy (CAIDP), UNESCO's AI regulations, the EU's AI Act, and Pakistan, and the African Union have been all working to establish a data policy and ethical standards framework (CAIDP, 2023). Considering this, resources for transformation should originate primarily from AI platforms and multinational corporations in the chemical and pharmaceutical sectors. These resources must be employed with revolutionary necessity. Europe's focus should extend towards regions such as the Mediterranean basin, enabling balanced economic development and a stronger Europe.

Cornelli (2008) argues that a paradigm transition from market-oriented and Rhineland development models to a state model in which public authorities’ direct development is essential.When it comes to taxation measurement, platforms' nature suggests using the number of connections and connection time to calculate the tax base. Simplistically, this involves multiplying the number of connections by the average connection time. For example, if 1,000 European users connect to a platform for three hours, the "value" of connections can be calculated as 125. This approach acknowledges the growing influence and impact of digital platforms in today's economy. By shifting towards a state model, public authorities can effectively regulate and guide the development of these platforms, ensuring fair taxation and equitable distribution of resources (Gorwa, 2019).

Additionally, using the number of connections and connection time as a basis for taxation measurement considers the value generated by these platforms through user engagement and activity, providing a more accurate representation of their economic impact. To calculate tax for a specific country, the number of connections and connection time originating from that country must be determined. By comparing these values, the portion of contacts weighted for that country's influence can be ascertained. Subsequently, the basis for taxation can be calculated by multiplying the global turnover by the weighted value.

In conclusion, the digital tax concept introduced in France represents an effort to address the evolving economic landscape driven by digital services. This paradigm shift aims to align taxation with the digital presence of companies and their data utilisation, ensuring a fair distribution of tax revenues.

6. Conclusion

The emergence of COVID-19 on January 9, 2020, marked a turning point that extended beyond a health crisis, catalysing transformative changes across various sectors. The pandemic's rapid global spread following its initial identification underscored its potency in shaping behaviours and technological trends.

An integral outcome of the pandemic was its profound impact on digital engagement, especially on social media platforms. This trend has amplified by the popularity of platforms such as TikTok, Instagram, YouTube, and AI tools like ChatGPT and other AI, which transitioned from niche entertainment to mainstream phenomena.
Simultaneously, the pandemic has expedited the integration of digital technologies into multiple aspects of daily life, leading to a surge in online commerce and digital education. Notably, businesses and educational institutions swiftly have adapted to these circumstances. Universities and educational institutions have embraced remote learning models, ensuring educational continuity through digital platforms.

Moreover, the pandemic and post-pandemic have prompted a significant change in media consumption patterns. Online banking, social media interaction, and content sharing observed a notable uptick. The Italian Communications Authority's (AGCOM) reports have emphasised these shifts and the increasing inclination toward streaming and online shopping. This behavioural change has transcended generations, with older demographics also embracing digital trends.

Following evident developments caused by the pandemic, a deeper reflection has emerged—one that questions the ethical elements of technology's participation. The discussion has focused on the ethical issues, integrity and potential biases inherent in the use of AI technologies, as well as the widespread presence of social media platforms. This has raised an important question: How can we monitor and regulate the impact of AI and the broad implications of social media through extensive and up-to-date legislation combined with equal taxation?

At the core of these concepts is an ethical imperative: maintaining the authority of human decision-making, while preventing the wrong transfer of autonomy in decision-making to AI systems. All platforms ought to conform to universally accepted human values and be

used responsibly. Therefore, regulatory frameworks with effective taxation are indispensable.

Finally, COVID-19 and post-COVID-19 caused a digital transformation that extended beyond traditional frontiers, impacting business, education and the use of media. The following period of the pandemic serves as a reminder of the relationship between technology and human values, highlighting the significance of using technology to enhance human experiences and well-being. As we access these technological advancements, critical thinking is necessary to ensure that technology is ethically beneficial and provides a sustainable and responsible mission.

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Paper 2: Resettling the academic community unsettled by AI

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Abstract

AI-based services like ChatGPT have recently pushed higher education academics into a complex dilemma of whether to accept or reject it. The paradox of the current understanding of embedding AI and its application within learning and development within Higher Education needs further debate. There is a need to re-imagine what we teach and how we assess. As digitalisation and digitisation have changed how we work and learn, as academics, we have a moral obligation to prepare our students for future jobs that do not exist today. A potential solution is to systematically adapt and engage further with AI to support learning and development (AdvanceHE, 2023). Not getting fixated on deficit models and looking beyond malpractice cases could help discover case studies around AI's exciting and legitimate use in education. Whereas some UK universities are banning the use of AI, some universities are ready to embrace AI (Cotton et. Al, 2023). It is imperative to say new AI services will take primary, secondary and tertiary sectors by storm. The higher education sector will not be an exception. It is high time for Higher Education academics to explore quality assurance and institutional policies and develop a broader understanding of how AI could support employability and personal skill development, especially for the Widening Participation (WP) students. Growth within Higher Education over the last decade was technology-driven, enhancing student engagement and employment (Goh and Wen, 2021; Kim & Jeong, 2018). In this paper, we will explore how we can escape the current unsettling state and embrace the call of the time.

1. Introduction

Artificial intelligence (AI) has become an expanding and transformative force in modern society, permeating almost every aspect of human life. The fast growth of AI technology has disrupted many industries, prompting around 1,500 technology leaders to request a six-month development pause for AI (Rash, 2023). In the UK, AI caused concern and triggered scholarly debate on ensuring authentic assessment of student achievement; 8 out of 24 Russel Group universities formally prohibited AI tools in graded tasks (Herman, 2023). The decision ignited a broader conversation within the academic community. Academics, researchers, and students engaged in vigorous debates on the implications of AI's role in evaluating student achievement. While some argued for the potential benefits of AI tools in providing objective and efficient assessments, others raised concerns about potential biases and the loss of human judgment in the grading process. As the discussions unfolded, universities outside the Russel Group started to weigh in on the matter, carefully considering the balance between technological advancement and maintaining the integrity of traditional assessment methods.

The authors acknowledge the need to thoroughly examine the efficacy, challenges and ethical implications that AI tools present in any discussion concerning them.

The promise of AI in academia: AI offers unprecedented opportunities to enhance academic research and educational practice. Machine learning algorithms have demonstrated extraordinary capabilities in processing large amounts of data, identifying

patterns, and generating insights. Researchers are increasingly turning to AI to augment their work, simplify data analysis and push the boundaries of scientific discovery. In addition, AI-driven personalised learning systems have the potential to revolutionise education by adapting content to individual student's needs, preferences, and learning progress.

Displacement and job insecurity: As AI continues to evolve, academics are working to address concerns about workflow displacement and job insecurity. Automated systems can now perform tasks traditionally undertaken by academics, such as grading exams, generating lecture content, and even writing research papers. It raises concerns that certain academic roles may become obsolete, leaving many academics needing clarification on their future in the academic ecosystem. The Impact of AI on Intellectual Property and Academic Integrity: With the advent of AI-generated content, the concepts of authorship and intellectual property have been challenged. AI-powered tools can produce compelling papers, articles, and research papers that can lead to plagiarism and academic integrity issues. Determining the actual authorship of a work is becoming increasingly complex, and universities and academic journals must work to develop new guidelines to address this growing problem. Biases and ethical issues in AI algorithms and the impartiality of AI algorithms depend on the data they are trained on. In academia, where objectivity and fairness are paramount, bias in AI-generated research has become deeply troubling. Bias in AI systems reinforce existing social biases, perpetuate inequality and hinder the pursuit of knowledge. Addressing and mitigating bias in AI models poses significant challenges that require immediate attention from academia.

Ethical dilemmas for AI surveillance: The potential of AI in monitoring and data analysis raises ethical dilemmas, especially in academic settings. As educational institutions integrate AI-driven monitoring and surveillance tools to track student progress and behaviour, concerns about privacy violations, informed consent, and data security arise. Balancing the benefits of AI education monitoring with the protection of students' rights is a controversial issue that requires a wide range of ethical considerations.

The impact of AI on the teaching landscape is notable; the entry of AI into the classroom has the potential to change the traditional role of educators. While AI can provide valuable insights into an individual's learning needs, there are concerns that over-reliance on AI-driven teaching could diminish the role of human teachers and harm education's social and emotional aspects. The rise of AI has undoubtedly unnerved the academic community, challenged long-standing norms, and triggered critical reflection on ethics, responsibility, and the future of academia. Integrating AI into academic research and education requires a thoughtful and comprehensive approach as it continues to evolve. Collaboration between researchers, educators, policymakers, and ethicists is essential to maximise the potential benefits of AI while mitigating its adverse effects. Through transparent dialogue and ethical decision-making, academics can navigate this transformative technological landscape with integrity and purpose.

2. Methodology

Systematic Review of Literature

PRIMA released a statement in 2000 advising the new guidance on the process for identification, selection, appraisal and synthesize studies. This method uses an abstract checklist and flow- diagrams. Systematic reviews play a critical role in research; besides

knowledge synthesis, they help identify future research priorities and any issues with primary research. The critical feature of Systematic reviews is the generation and evaluation of theories that help with understanding of various phenomena.

Key word	Wiley Online	Elsevier	Grey Literature
Artificial Intelligence AI	7693	55456 (Scopus) 3403 (ScienceDirect)	32
AI Tools			
UK Higher Education			
AI & Teaching & Learning			
n=66584			

Table 1. Literature Synthesis using Keywords.

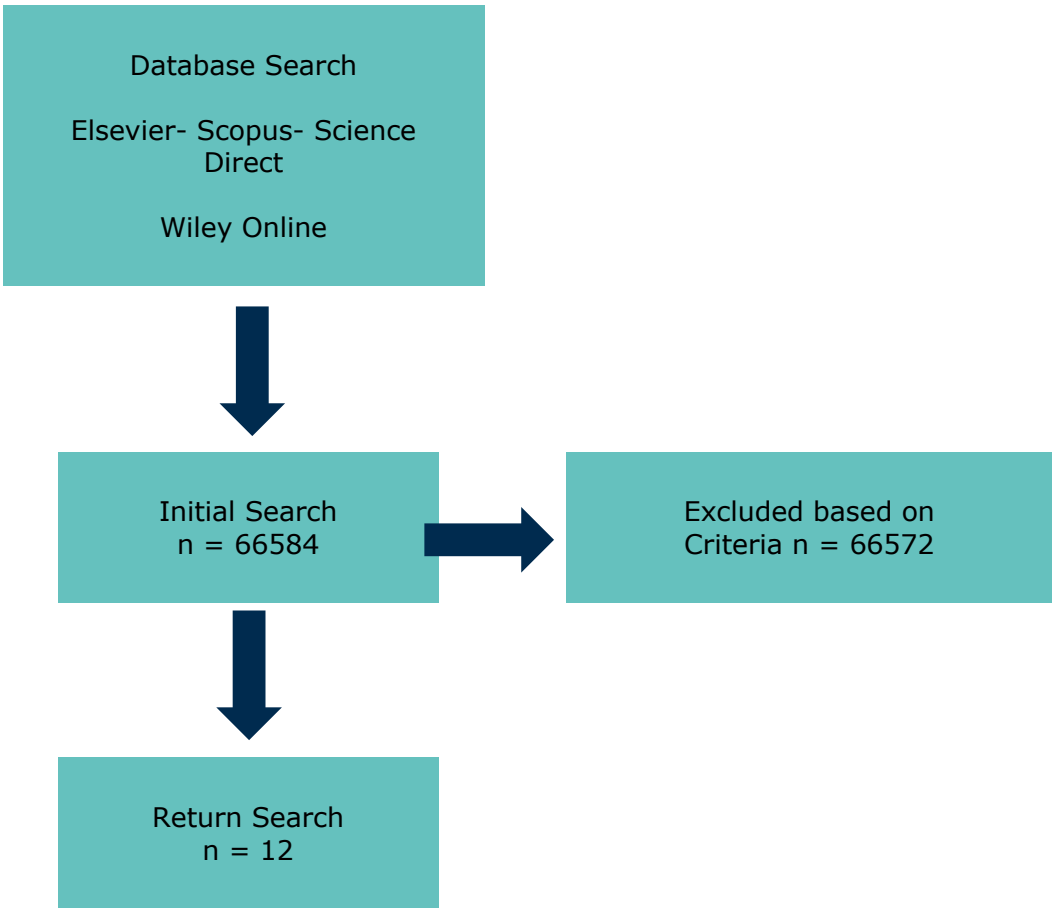

Figure 1. Systematic Review of Literature - Database Search

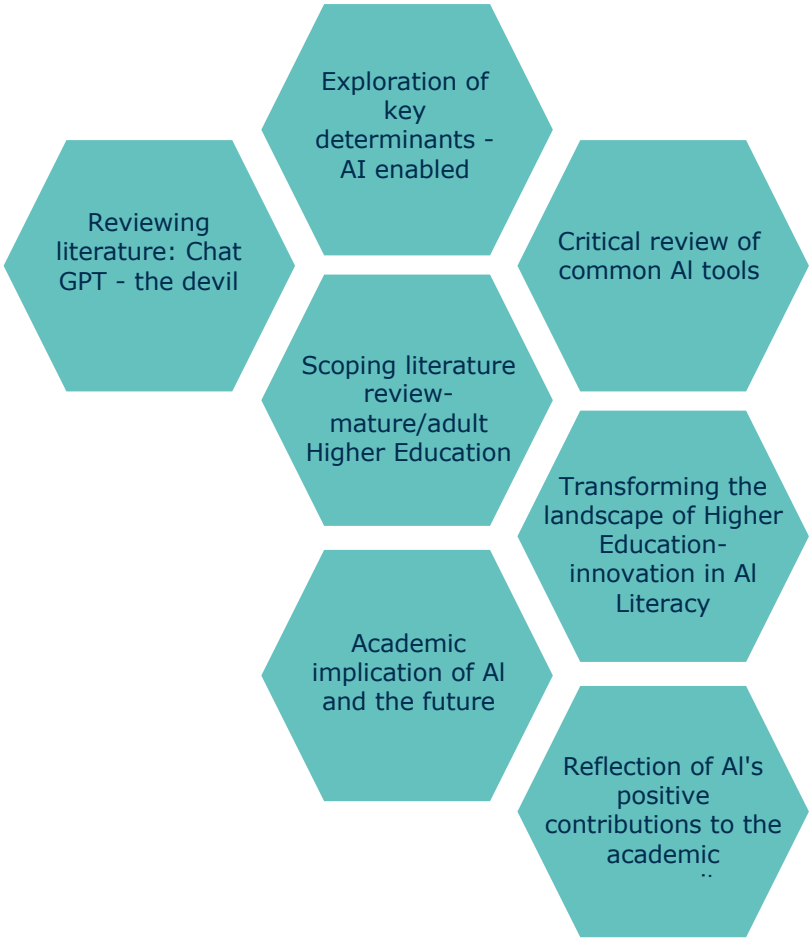

Figure 2. Scoping the literature

Artificial Intelligence (AI) tools like ChatGPT has the power to advance academia, which is exiting and anxiety-provoking (Lund & Wang, 2023). It is also claimed to impact the generation of scholarly knowledge due to the nature of the tool, presenting reviews, critical analysis, and evaluations etc. Thus, it is empirical to consider whether it could be used responsibly and ethically in higher education. ChatGPT can develop a research design to interpretation of results, and it demonstrates human intelligence.

3. Literature Review

In a recent article Sadeh (2020) argues that a number of case studies on AI use in academics suggest that the emergence and rapid advancement of artificial intelligence (AI) has caused significant disruption within the academic community. Murgia (2019), identified several advantages and suggested that AI has the potential to revolutionise academic research by improving data analysis, automating routine tasks, and unlocking new research questions. AI is also disrupting traditional academic practices and norms, particularly in the realm of citations and references (Johnson, 2020). One of the ways in which AI is unsettling the academic community is by challenging the traditional citation and reference practices that have been in place for decades. AI-powered algorithms can now generate references and citations with greater accuracy and speed than humans, raising questions about the value and necessity of traditional academic practices (Rokach, 2021).

Zhai (2022) argues that AI-powered citation tools can generate references in real-time, eliminating the need for researchers to search for and cite relevant sources manually. While this may increase the efficiency of the citation process, it also raises concerns about the accuracy and reliability of these automated references. Additionally, some researchers worry that AI-generated citations may not reflect the diversity of perspectives and sources that are traditionally valued in academic research.

According to Haque et. al (2022), AI is also challenging the way that academic plagiarism is detected and addressed. Some AI-powered plagiarism detection tools can now scan entire databases of academic articles and identify potential instances of plagiarism with greater accuracy than human reviewers. However, the use of these tools has also raised concerns about the potential for false positives and the impact of AI on academic integrity and trust. Janssen (2021) points out that although AI has the potential to greatly improve the efficiency and accuracy of academic research, it is also challenging long-standing academic practices and norms related to citations and plagiarism detection. As AI continues to evolve and become more integrated into academic research, it will be important for researchers to evaluate its impact on academic integrity critically and ensure that these new tools and practices align with traditional academic values (Noh and Lee, 2021).

In November 2022, OpenAI launched a chatbot named ChatGPT, which is an advanced conversational artificial intelligence interface that can interact realistically with users and create new content like poems and stories. Its development is a significant milestone in the evolution of AI and may even challenge the assessment strategies (Johnson, L, 2020). The use of Natural Language Processing and deep learning enables ChatGPT to generate human-like text and maintain a conversational style, making it an attractive tool for education. Despite its potential benefits, concerns about ChatGPT and chatbots in general have been raised. Studies have identified various reasons for chatbot failures, including lack of resources, inappropriate use cases, poor law regulations, data security, and liability concerns (Rudolph et. Al, 2023). There are also concerns about user expectations, bad conversation design, or poor content. While ChatGPT has not yet been fully investigated in the education sector, there are already examples of its use in cheating on assignments, leading some schools to ban its use. Therefore, it is crucial to examine the potential concerns of using advanced chatbots, like ChatGPT, in higher education space, to ensure their safe and effective use.

Labelling AI chatbots as "devils" in the academic community is inaccurate. While there are certainly concerns and challenges associated with their use, they also have the potential to offer significant benefits. AI chatbots are being used in academic settings to support student learning, provide personalised feedback, and assist with administrative tasks. For example, chatbots can be used to answer frequently asked questions from students or provide real-time feedback on writing assignments. However, there are also concerns about the use of AI chatbots in academic settings. Some critics argue that chatbots may promote a "one-size-fits-all" approach to learning and fail to provide the nuanced feedback that human instructors can offer. Additionally, there are concerns about the potential for bias and discrimination in chatbot interactions, particularly if the chatbots are trained on biased data.

There are concerns about the impact of AI chatbots on employment within the academic sector. If chatbots become increasingly prevalent in administrative and support roles, it

could lead to job loss for human workers. There are some conclusions around AI chatbots offer both potential benefits and challenges in the academic community. While they have the potential to improve efficiency and support student learning, there are also concerns about their impact on employment and the potential for bias in their interactions. Faizan Ali (2023) claimed that ChatGPT can be a successful tool in hospitality studies and gave a comparative analysis indicating a positive impact.

The article acknowledges the potential benefits of using ChatGPT in education, such as its ability to provide personalised learning experiences and improve student engagement. It also highlights the concerns that have been raised about using chatbots in education, such as issues related to data privacy and security, liability concerns, and the potential for perpetuating biases.

Several articles also raise important ethical concerns about the use of advanced AI technologies like ChatGPT in education, such as the potential for perpetuating social inequalities or perpetrating harm to vulnerable students (Zhai, 2022). The authors argue that it is important to approach the use of advanced chatbots like ChatGPT in education with caution and to consider the potential ethical implications carefully. One limitation of the article is that it primarily focuses on the potential concerns of using ChatGPT in education and needs to provide a thorough evaluation of its effectiveness and performance in real-world educational settings. Additionally, while the article acknowledges the potential benefits of using ChatGPT in education, it does not provide empirical evidence to support these claims. Overall, "What if the devil is my guardian angel: ChatGPT as a case study of Using Chatbots in education" is a thought-provoking article that highlights the potential benefits and concerns of using advanced chatbots in education. However, further research is needed to fully evaluate the effectiveness and potential ethical implications of using ChatGPT and other advanced chatbots in education.

4. Conclusion and Discussion

There are concerns about the impact of AI chatbots on employment within the academic sector. If chatbots become increasingly prevalent in administrative and support roles, it could lead to job loss for human workers. There are some conclusions around AI chatbots offer both potential benefits and challenges in the academic community. Although they have the potential to improve efficiency and support student learning, there are also concerns about their impact on employment and the potential for bias in their interactions.

The article acknowledges the potential benefits of using ChatGPT in education, such as its ability to provide personalised learning experiences and improve student engagement. It also highlights the concerns that have been raised about using chatbots in education, such as issues related to data privacy and security, liability concerns, and the potential for perpetuating biases. Several articles also raises important ethical concerns about the use of advanced AI technologies like ChatGPT in education, such as the potential for perpetuating social inequalities or perpetrating harm on vulnerable students (Zhai, 2022). Tlili et al. (2023) critically examined potential benefits and concerns of using advanced chatbots in education. However, we found in our study that further research is needed to fully evaluate the effectiveness and potential ethical implications of using ChatGPT and other advanced chatbots in education. While this paper acknowledges the potential benefits of using ChatGPT in education, it does not provide empirical evidence to support these claims.

While academics are hesitently delving into the profound transformations that artificial intelligence (AI) is bringing to academia, this paper indicates a path towards a more harmonious coexistence. As we embrace the benefits of AI, we're also mindful of the genuine concerns surrounding it, including job displacement, ethical dilemmas, and the need for strong frameworks for accountability and transparency.

The more we explore the potential of AI, it becomes increasingly clear that this technology is not our enemy, but rather a valuable asset to academia. AI has the potential to revolutionise learning experiences for educators and students, opening up new avenues for research and ensuring efficient use of resources. However, we must remain vigilant and uphold ethical principles to ensure that AI is used in a responsible and beneficial manner. As we embark on this new era, let us embrace the power of AI, which, when used wisely, can propel the academic community towards unprecedented levels of innovation, inclusivity, and excellence. With careful guidance, we can harness its capabilities to address the most pressing issues of our time and unlock the vast potential of knowledge dissemination. The integration of AI into academia represents not only an adaptation to change but also a renaissance of educational possibilities. It inspires us to embrace this transformative technology, refine its capabilities, and chart a course towards a brighter and more enlightened future for academia. By doing so, we ensure that AI is not a disruptor, but a catalyst for the continued advancement of scholarship, learning, and the pursuit of knowledge.

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Conference Theme 3
Equality, Diversity, Inclusion (EDI)

Equality, Diversity, and Inclusion (EDI) play a significant role in organisations and ultimately benefit business development. Enterprises, both big and small, are showing their commitment to EDI. However, various businesses still need strategic values to enforce these principles. EDI in traditional business processes helps to increase diversity in suppliers and reduce discrimination and harassment in workforce management. However, since the supply chain breakdown during the pandemic, sustainable development is being readdressed by how well all suppliers are engaged in the above activities.

Paper 1: A Game Model for Sustainable Medical Service Pricing based on the Diagnosis Related Groups

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Abstract
Currently there is a price setting issue exists in medical institutions in China. The existing price setting which based on Diagnosis Related Groups (DRGs) leads the existing payment standards in medical institutions cannot reasonably compensate the costs. It significantly impacts on sustainable development of medical service to the public**.** The main objective of this study is to prevent adverse selection problems in the operations of the DRGs system with the game pricing model for scientific and reasonable pricing. The study proposes an improved bargaining game model through three stages with the government and patients forming an alliance. The first stage assumes that the alliance is the price maker in the Stackelberg game to maximise social welfare. Medical institutions are a price taker and decide the level of quality of medical service to maximise their revenue. A Stackelberg equilibrium solution is obtained. The second stage assumes that medical institutions dominate the Stackelberg game and set an optimal service quality for maximising their revenues. The alliance as the price taker decides the price to maximise social welfare.

Another Stackelberg equilibrium solution is achieved. The final stage establishes a Rubinstein bargaining game model to combine the Stackelberg equilibrium solutions in the 1st and 2nd stages. A new equilibrium between the alliance and medical institutions is established. The result of this study shows that if the price elasticity of demand increases, the ratio of cost compensation on medical institutions will increase, and the equilibrium price will increase. The equilibrium price is associated with the coefficient of patients' quality preference. The absolute risk aversion coefficient of patients affects the government compensation and total social welfare.

This study contributes a sustainable DRGs system, considering that the demand elasticity and the quality preference of patients, sustainable medical service pricing can prevent the adverse selection problem.

Keywords: Bargaining model, Sustainable Pricing, Government compensation, Medical service, Patient; Quality

1. Introduction

The National Health Commission and the other relevant departments in China have started to test the Diagnosis Related Groups (DRGs) in 30 pilot locations since 2019. DRGs refer to a price standardization mechanism based on patients' classification. Patients can be classified based on their demographic and medical information, such as age, gender, length in hospital, types of diseases, the severity of diseases and comorbidity, complications, the necessity of surgery, etc. DRGs aim to categorize patients who have similar clinical features and medical resource consumption into the same groups, which can standardize prospective payment to hospitals or other medical institutions.

Currently, there are various issues that exist in the medical institutions around the world as a result of the price-setting in DRGs, which include medical institutions tending to choose patients, the payment standard for complex cases cannot reasonably compensate the cost, and medical service providers increase the number of outpatient services in order to reduce hospitalisation expenses. A high price setting in DRGs leads to the difficulties for the government in controlling medical expenses. While a low-price setting is not able to fairly compensate the costs in medical institutions, and even lead hospitals to refuse to accept patients in critical conditions. This conflict in price-setting can be understood as a problem of adverse selection. Therefore, it is imperative to explore an optimal pricing system that helps to resolve the problem of adverse selection.

Many scholars apply the game theory to the pricing of medical services, which solves the conflict of interests of the stakeholders in the pricing of medical services. Weingarten (2007) applies a generalised game theory model to study the price-setting strategy of competitive medical institutions. Westhoff et al. (2012) and Agee et al. (2013) apply game theory to study cooperation and competition in disease treatment payment and compensation. Nagurney et al. (2019) focus on the supply chain of blood products in an asymmetric information environment. Their study determines a generalised Nash equilibrium model by adopting sharing constraints. This model discusses the price-setting problem in the blood products supply chain, which finds participants closing to the termination of the supply chain will have better access to information and stronger bargain power.

However, most of these studies focus on the linkages between price makers and medical institutions' behaviour, which ignores the impact on patient's buying behaviour and preferences with regard to medical service quality.

The present study thus aims to address the above issues by answering the following research questions:

1. What is the impact of pricing strategy on patient's buying behaviour and preferences?
2. How can medical institutions innovate the current game-theoretical model assumptions and designs to achieve a sustainable medical service pricing strategy?

3. How can patient's bargaining power be enhanced to avoid the disruption in medical service supply?

The study introduces the quality of medical service as a variable in the medical service pricing game model. It also considers that medical institutions are monopolistic in the provision of medical services in China, and they are in a dominant position in the negotiation of price and quality; while patients as individuals, their bargaining power is scattered. Moreover, the lack of professional knowledge and complete information also weakens patients' bargaining power. In this regard, the medical service in China is not in a sustainable mode and disruptions are often happening.

2. Literature Review

Scholars in the early periods generally considered improving the competitiveness of medical service market and established a game pricing model. The Schleifer pricing mechanism is a type of yardstick regulation developed by Shleifer in 1985. They show that the specific Nash equilibrium is the point where medical institutions achieve optimal marginal cost. Allen et al. (1991) used game theory to study the influence of pricing setting strategy on patients' satisfaction with services. Weingarten (2007) applies a generalised game theory model to study the price-setting strategy of competitive medical institutions. Westhoff (2009) and Agee (2012) apply game theory to study cooperation and competition in disease treatment payment and compensation. Robinson et al. (2011) adopt a Stackelberg game theory model in discussing the relationship between cost transfer and payment methods for medical institutions. They reveal a direct connection between the cost-shifting and medical service payment policy, which shows paying by classification of diseases is better than paying by medical service items.

Some scholars developed game models on price-setting and negotiation by multiple participants in the medical services. Most of these studies are based on information asymmetry between participants. Yaesoubi et al. (2013) developed a game model that considers two types of constraints. The need constraint is the bargaining powers of medical service purchasers, and the soft constraint is the cost reimbursement for service providers. These two types of constraints help the model better determine the pricing in an information asymmetric environment. De (2014) adopts game theory to examine the impact of information transactions on the relationship between medical institutions and patients and finds that there is a Nash equilibrium when patients can restrict medical suppliers' induced demand.

In recent years, scholars have focused on the influence of various factors, such as government intervention, medical service quality and payment mode of medical services, on the results of sustainable pricing games.

Behzad et al. (2016) investigate the impact of government price intervention and duopoly competition on medical price setting. Their study applies the asymmetric Bertrand-Edgeworth model to study this impact within a duopoly market. A similar study by das Chagas Moura et al. (2017) applies queue theory to improve the Stackelberg game model, and focuses on the problems of medical service pricing and medical quality. Koenecke (2019) analyses the non-extreme equilibrium between two different payment methods in medical insurance and medical institutions by applying a Stackelberg game model. These two payment methods include a charge on a per-service basis and a per-patient basis.

Assuming medical insurance can offer non-linear bonuses; the analysis shows that charges on a per-patient basis can better contribute to sharing medical service information between medical institutions and patients.

3. The novel bargaining game model

3.1 Model assumptions

Assuming medical institutions have sufficient ability to fulfil patients' demands. The decision variable of the alliance is the treatment price of each disease, and the objective function is total social welfare. The decision variable of medical institutions is medical service quality, and the objective function is the profit of medical service If assuming the demand function of medical service is a linear function of the medical service price and quality, which is $Q = a - bp + cq$, where $a, b, c \geq 0,$ b is the price elasticity of demand (PED) for a single type of disease, c is the coefficient of patients' preference on quality, p and q are decision variables. Moreover, the cost function of medical service is a function of the medical service quality, which is $C = F + \frac{1}{2}\gamma q^2 Q$, where F is the fixed cost of medical service, $\frac{1}{2}\gamma q^2 Q$ is the marginal cost, and γ is the coefficient of quality cost.

The objective function of the alliance is the social total surplus, which refers to consumer surplus plus producer surplus.

$$\begin{aligned} WF &= \int_0^Q \frac{a + cq - Q}{b} dQ - pQ + pQ - F - \frac{1}{2}\gamma q^2 Q \\ &= \int_0^Q \frac{a + cq - Q}{b} dQ - F - \frac{1}{2}\gamma q^2 Q \end{aligned} \quad (1)$$

And the utility of patients is,

$$U_p = \int_0^Q \frac{a + cq - Q}{b} dQ - pQ \quad (2)$$

The profit of medical institutions is,

$$\pi = pQ - F - \frac{1}{2}\gamma q^2 Q \quad (3)$$

3.2 Model formation

The bargaining game on disease treatment pricing is developed between the alliance and the medical institutions. In the first stage, the alliance is a price marker and determine a pricing strategy for treatment based on social welfare maximisation. The medical institution is the price taker to determine a service quality strategy for responding to the price strategy from the alliance.

A Stackelberg equilibrium solution is achieved to balance the treatment price and service quality. In the second stage, medical institutions are the price makers and determine an optimal service quality strategy for maximising their profits. While the alliance as the price taker will determine another optimal treatment price strategy based on social welfare maximisation in response to the medical institutions' strategy. Another Stackelberg equilibrium solution is achieved in this stage to balance treatment price and service quality. These two equilibrium solutions are an initial solution for the bargaining model between the alliance and medical institutions in the final stage. The model is in the Stackelberg game based on the bargaining power of each player and it will achieve a final Stackelberg bargaining equilibrium solution.

3.2.1The first round Stackelberg game

By applying the reverse acquisition, firstly, when maximising the medical institutions' profit,

$$\frac{\partial \pi}{\partial q_1} = \frac{\partial (p_1 Q - F - \frac{1}{2}\gamma {q_1}^2 Q)}{\partial q_1} = 0 \tag{4}$$

And we obtain: achieve,

$$q_1 = \frac{rb_1 p_1 - ar + \sqrt{(rb_1 p_1 - ar)^2 + 6c^2 r p_1}}{3cr} \tag{5}$$

Plug (5) into (1), where the utility function maximization for the alliance will be:

$$\frac{\partial WF}{\partial p_1} = \frac{\partial (\int_0^Q \frac{a + cq_1 - Q}{b} dQ - F - \frac{1}{2}\gamma {q_1}^2 Q)}{\partial p_1} = 0 \tag{6}$$

We then have the following:

$$p_1 = \frac{\gamma^2 b^2}{9c^2} + \frac{\gamma b - 2a - 3}{3b} \tag{7}$$

Plug (7) into (5) and we get:

$$q_1 = \frac{b\gamma \sqrt{(a\gamma - b)^2 - 6c^2}}{3ac} \tag{8}$$

Lemma 1, if and only if $F \geq \frac{b(a+\gamma^2)}{ac-\gamma}$, there is an equilibrium solution exists for the pricing and quality Stackelberg game model between the alliance and medical institutions, and this equilibrium solution is $p_1 = \frac{\gamma^2 b^2}{9c^2} + \frac{\gamma b - 2a - 3}{3b}$, $q_1 = \frac{b\gamma \sqrt{(a\gamma - b)^2 - 6c^2}}{3ac}$

The ratio between the fixed cost and marginal cost in medical institutions are the minimum level of government compensation, and it is a positive relationship with PED. In other words, when the PED of a certain disease treatment increases, the ratio of cost compensation on medical institutions will increase, and the treatment price will increase. Whereas if the ratio of cost compensation on medical institutions decreases, the treatment price will decrease. This is the opposite of Ramsey pricing because of the welfare in medical service.

When a type of disease belongs to the basic medical service, PED decreases and the ratio of compensation on medical services will decrease. While if a type of disease is not listed in the basic medical services, such as rehabilitation, when PED increases, the ratio of compensation on medical services will increase.

3.2.2 The second round Stackelberg game

In this round of Stackelberg games, medical institutions are the first decision-makers, and the government and patients' alliance are the followers. Based on the objective of profit maximization, medical institutions will determine the decision variable q_2 for optimizing the service quality. The alliance then determines an optimal price p_2 for responding to the decision by the medical institutions. By applying the reverse acquisition, a price for the alliance can be obtained, which guarantees a maximized utility. Bases on $\partial WF / \partial p_2 = 0$, It can achieve,

$$p_2 = \frac{1}{2} c q_2^{\,2} + \frac{c q_2 + a - 1}{b} \tag{9}$$

Plug (9) into (3), bases on $\dfrac{\partial \pi}{\partial q_2} = 0$, it can achieve,

$$q_2 = \frac{bc\sqrt{a\gamma - b + 6\gamma^2}}{3a} \tag{10}$$

Plug (10) into (9), it can achieve,

$$p_2 = \frac{1}{2} b^2 c^3 \frac{a\gamma - b + 6\gamma^2}{9a^2} + c^2\sqrt{a\gamma - b + 6\gamma^2} + \frac{a-1}{b} \tag{11}$$

Lemma 2, if and only if $\sqrt{\dfrac{\gamma^2 - a\gamma}{4a}} < c < \sqrt{\dfrac{\gamma^2 + a\gamma}{4a}}$, there is an equilibrium solution exists in the Stackel game on the pricing and quality for the alliance and medical institutions. This solution is as follows.

$$p_2 = \frac{1}{2} b^2 c^3 \frac{a\gamma - b + 6\gamma^2}{9a^2} + c^2\sqrt{a\gamma - b + 6\gamma^2} + \frac{a-1}{b} \quad , \quad q_2 = \frac{bc\sqrt{a\gamma - b + 6\gamma^2}}{3a}$$

If the coefficient of patients' quality preference is in a certain range, the equilibrium price of disease treatment will increase with the increase of the coefficient of patients' quality preference. Because the larger the coefficient of patients' quality preference, the more competitive the medical service quality, and that is, if a medical institution slightly improves the quality of medical services, it will lead to a large increase in the demand for medical services. This will also lead to an increase in the market share, which brings more profits to medical institutions. In this regard, medical institutions normally set their treatment price high. However, if the coefficient of patients' quality preference is beyond a certain range, especially at a very high level, the treatment price will no longer be the priority in patients' consideration. Achieving an effective treatment without waiting in a queue is the first to be considered by the patients. In this situation, the treatment price will lose the ability to balance market supply and demand. Conversely, if the coefficient of patients' quality preference is low, the service quality competition among medical institutions is ineffective. Patients are not sensitive to the quality of medical services. If they feel that the quality of medical services is the same, they are sensitive to the price. The market share of which medical institutions are cheap will be large. Therefore, medical institutions will adopt a low-price strategy.

The alliance as the price maker in the Stackelberg game determines a medical pricing strategy, medical institutions as the price takers must respond to the strategy and make an optimal service quality strategy. The alliance has the first-mover advantage. When medical institutions as the price makers, the alliance as the price taker has to respond by determining an optimal medical pricing strategy. In this regard, medical institutions have the first-mover advantage.

To satisfy the needs of the initial solution for the bargaining model, the price level of unit quality for the equilibrium solutions (p_1, q_1) and (p_2, q_2) are standardized as $p_1^* = p_1 / q_1$ and $p_2^* = p_2 / q_2$.

3.2.3 The bargaining game for co-payment medical expense

A bargaining range (p_1^*, p_2^*) made by the medical institutions and the alliance is in a game. By applying the Rubinstein bargaining model, an equilibrium solution is achieved,

$$\bar{p} = p_1^* + \frac{1-\theta_2}{1-\theta_1\theta_2} p_2^*$$

Where θ_1, θ_2 are the discount factors for the alliance and medical institutions, respectively. θ_1 often depends on the patience level of the alliance in negotiation, the opportunity cost of medical treatment, and the severity of the diseases. θ_2 depends on the patience level of medical institutions in negotiation, the difficulty of patient referral, and the difficulty and risk of treatment.

Through the bargaining game between the alliance and medical institutions, the medical service is priced for the alliance as $\bar{p}$. In this second game, the government and patients

will get in the game of sharing medical payments based on the price $\overline{p}$. The government and patients share the payment for the medical service through a third-party payment mechanism, i.e, health insurance. Paying through health insurance can easily put patients into a moral hazard, because patients may be insensitive to medical prices and overspend on treatment. The early studies by Arrow (1963) and Zeckhauser (1970) find that health insurance should not fully cover all medical costs. The effective payment method is to set a reasonable co-payment ratio, which diversifies the risks of patients, balances risks of patients' moral hazard and the profits of the insurance business. Ellis (2007) and Eeckhoudt (2012) state that the marginal profit achieved from the risk diversification by insurants equals their marginal cost in moral hazard, the health insurance co-payment ratio is the optima. Blomqvist (1997) discusses the optimal design of the health insurance co-payment ratio in a nonlinear model and finds the optimal health insurance co-payment ratio depends on patients' health level.

The medical pricing bargaining model was developed in the first stage by the alliance and medical institutions, which aims to prevent moral hazards caused by patients' excessive consumption of medical care. The medical treatment co-payment ratio game model developed in the second stage aims to prevent the overtreatment risk caused by the third-party payment system.

Based on the result in the first stage, by adding the co-payment ratio λ, the demand of medical function is $D = a - b\lambda p$, which refers to a linear function of patients' medical demand, where $a \geq 0, b \geq 0$ and $0 \leq \lambda \leq 1$.

Patients' moral hazard in health insurance can cause waste in social welfare. Therefore, this study considers that the optimal co-payment rate is if and only if the social welfare loss caused by medical insurance is minimized. Three parts of health insurance may cause a loss in social welfare. The first part is the deadweight loss caused by patients' moral hazard. Based on Arrow's study, the deadweight loss caused by patients' moral hazard is $(1-\lambda)^2 b \big/ 2$. The second part is the government's expectation of opportunity cost on its medical support. This can be presented as $\delta[(1-\lambda)(a-b\lambda)]\overline{p}$. The third part is the cost of risk prevention, which is presented as $R\lambda^2\sigma^2 \big/ 2$, where δ is the incidence of diseases, R is the coefficient of patients' absolute risk aversion. σ^2 is the variance of the medical treatment price.

Therefore, the government's utility function is the total loss of social welfare.

$$\min WL = \frac{1}{2}(1-\lambda)^2 b + \delta[(1-\lambda)(a-b\lambda)]\overline{p} + \frac{1}{2}R\lambda^2\sigma^2 \tag{12}$$

$$\frac{\partial WL}{\partial \lambda} = -(1-\lambda)b - b\delta\overline{p}(1-\lambda) - \delta\overline{p}(a-b\lambda) + R\lambda\sigma^2 = 0 \tag{13}$$

Solve (13) and achieve,

$$\lambda^* = \frac{b + \delta\overline{p}(a+b)}{b + 2b\delta\overline{p} + R\sigma^2} \tag{14}$$

Lemma 3 if and only if $R \geq \frac{\sigma^2 b + \frac{1}{2} a\delta}{\delta^2 a}$, the loss of total social welfare decreases, then increases with the increase of social health insurance co-payment ratio. If $R < \frac{\sigma^2 b + \frac{1}{2} a\delta}{\delta^2 a}$, the loss of total social welfare decreases with the increase of social health insurance co-payment ratio.

The coefficient of patients' absolute risk aversion stands for the ability of patients to predict the incidence and loss caused by diseases. If the coefficient is lower than a certain threshold value, an increase in the social medical insurance co-payment ratio will bring about a reduction in the total social welfare loss, which is an increase in the total social welfare. In contrast, if the coefficient is higher than the certain threshold value, the increase of social health insurance co-payment ratio will reduce the loss of total social welfare first and then increase, which means that the total social welfare first increases and then decreases.

4. Results and Discussion

The above section presents the bargaining game model on pricing and government compensation between the government, patients, and medical institutions. In the first stage, the alliance formed by the government and patients leads the price as the price marker. The alliance will determine a pricing strategy based on social welfare maximisation. Medical institutions as price takers will make a service quality strategy in response to the pricing strategy from the alliance. This will form a Stackelberg equilibrium solution between prices of disease treatment and medical service quality.

In the second stage, medical institutions are the price marker. Based on profit maximisation, medical institutions will create an optimal service strategy for providing the highest level of medical quality. While based on the social welfare maximisation, the alliance is the price taker, to make an optimal disease treatment price in response to the optimal service strategy made by the medical institutions. This will create another Stackelberg equilibrium solution between prices of disease treatment and medical service quality.

Take these two equilibrium solutions as the initial solution for the bargaining game between the alliance and medical institutions, and based on the bargaining power of the alliance and medical institutions, which can achieve an equilibrium price of Rubenstein's bargaining game through developing Rubenstein's game. In the final stage, based on the minimisation of deadweight social loss, the government and patients will share the payment of medical costs. To analyse PED on diseases, the coefficient of patients' preferences on service quality, the coefficient of patients' absolute risk aversion, and the relationship between disease pricing and government compensation, this study provides several specific values to simulate a series of impacts on the equilibrium price. Firstly, the study analyses the PED on the equilibrium price. It assumes that the coefficient of the demand function $a = 0.3$, the coefficient of disease treatment quality cost $\gamma = 10$, and the coefficient of patients' preferences on treatment quality $c = 0.6$. Figure 1 shows the relationship between the equilibrium price and disease PED.

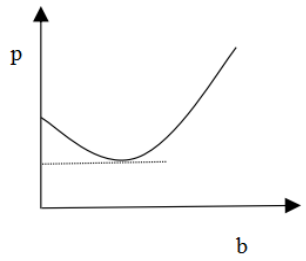

Figure 1. Price and PED

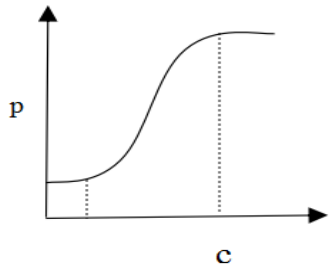

Figure 2. Price and preference

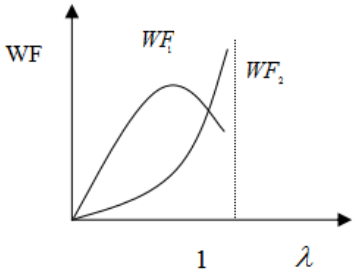

Figure 3. Welfare and co-payment ratio

The relationship presented in Figure 1 is in a scenario that the optimal pricing strategy made by the alliance as a price maker will call for medical institutions to respond by their service quality strategy. It is a positive correlation between the treatment equilibrium price and disease treatment PED, i.e., the higher the PED in the treatment of the disease, the higher the price of the treatment. This is the opposite of Ramsey pricing. Medical services can be categorised as basic medical services and special medical services. The PED of basic medical service is low, and it is largely for non-profit-making purposes. In this regard, the pricing for this type of medication is low. While special medical service has more significant commodity attributes and its high PED value leads the pricing to be higher than that of basic medical service.

To analyze the relationship between the treatment pricing and the coefficient of patients' service quality preference, it is necessary to set the elasticity of treatment demand $b = 0.3$, the parameter of the demand function $a = 0.3$, and the coefficient of treatment quality cost $\gamma = 10$.

Figure 2 shows a scenario that reflects the relationship between the equilibrium price of diseases and the coefficient of patients' quality preferences. In this scenario, medical institutions act as price makers. Based on the objective of maximizing profit, their priority is to optimize disease quality control decisions. Furthermore, the alliance of government and patients as the price taker will make the optimal price decision according to the goal of maximizing social welfare. In this model, when the coefficient of patients' quality preferences can be controlled in a certain range, the relationship between disease equilibrium price and patients' quality preference can be positive, i.e., the higher coefficient of patients' quality preference, the more increase in disease equilibrium price, and vice versa.

The curve WF_1 in Figure 3 presents the total social welfare increases first and then decreases with the increase of social medical insurance co-payment ratio, which the

patients' absolute risk aversion coefficient is $R \geq \frac{\sigma^2 b + \frac{1}{2} a\delta}{\delta^2 a}$. The curve WF_2 presents another scenario in which the patients' absolute risk aversion coefficient is $R < \frac{\sigma^2 b + \frac{1}{2} a\delta}{\delta^2 a}$ and the total social welfare increases with the increase of the social insurance co-payment ratio.

5. Conclusion

In the process of DRGs operation in many countries, especially in developing countries, such as India and China, unreasonable pricing and government compensation of medical services will lead to two major problems: firstly, under-pricing will lead to medical institutions shirking the responsibility patients and decomposing the DRGs category; Secondly, overpricing will lead to a sharp increase or even out of control of medical expense. Both cause unsustainable and disruptions in medical service supply.

Our study balances the interests of the government, patients and medical institutions. Their interests and behaviours have been studied through the improved bargaining game model, which presents a suggestion on price negotiation and setting to the government and medical institutes, and the conducted result can guide medical institutes with a better price-setting strategy. The model also classifies price settings according to the price elasticity of demand for medical services. To be more realistic, the study has considered the price settings under the impact of patients' preferences for medical service quality.

The result finds that the absolute risk aversion coefficient of patients affects the relationship between the co-payment rate of medical expenses and total social welfare. In addition, with more investment in public health education, the government can control the moral risk of over-treatment of patients during the operation of DRGs by influencing the absolute risk aversion coefficient of patients and limiting the absolute risk aversion coefficient of patients in a certain range. The future of this study is to generalise these models to DRGs pricing systems with the effects of competition of medical institutions, including considering differences in the compensation of DRGs systems between infirmaries and hospitals, in order to promote the goal of hierarchical diagnosis and treatment.

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Conference Theme 4
Entrepreneurship and SMEs

SMEs, which make up more than 90% of all businesses worldwide, face a critical challenge in their sustainable innovation, creative leadership, and digital transformation in the post-pandemic period. It requires SMEs to act, scale up their impact, and become part of the solution for sustainable development. It is urgent to discuss how SMEs integrate their business planning with the goals of unlocking new opportunities in terms of sustainability, promoting higher levels of productivity, and contributing to economic growth.

Paper 1: Remote Work for SMEs: Perspectives from SMEs in the United Kingdom (UK) after the COVID-19 pandemic

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Abstract

Remote working has become more popular in recent years but certainly is not a new concept. In response to the recent COVID-19 pandemic, small and medium-sized enterprises (SMEs) were forced to implement hybrid and remote working schedules very quickly. In this paper, the key barriers hindering the implementation of remote working practices in SMEs in the United Kingdom (UK) will be examined, in addition to potential solutions.

The data analysis used an interpretive qualitative approach and 10 semi-structured interviews with SME owners, employees and consultants. The data analysis identified a number of important challenges, including financial constraints, a higher perceived risk of cyberattacks, a lack of understanding and interest, communication issues, high employee turnover rates and problems locating reliable employees to implement remote working procedures.

The research findings also identified a number of factors and opportunities that should be taken into account, including empowering and training your workforce, preventing a negative impact on productivity, fostering communication, collaboration, and engagement, persuading people of the benefits of remote working, IT training, offering remote (online) college courses, and implementing remote working practices in SMEs. This is not only in response to the COVID-19 pandemic but also to reap long-term benefits. Governments can support economic flexibility and resilience by making investments in infrastructure for remote employment and digital literacy.

This study has highlighted many advantages relating to the performance of SMEs, as well as employee benefits, such as weight loss, improved cooking habits, enhanced mental health, better sleep, economic resilience and flexibility.

Keywords: Post-pandemic, Qualitative study, Revolution, Economic resilience, Small and medium-sized enterprises (SMEs).

1. Introduction

Sane (2020) asserts that there is no common definition of an SME. However, the World Bank defines the term as a company that has between 5 and 199 employees. Meanwhile, the European Commission (EC) defines such enterprises as companies that have less than 500 employees (as cited in Zutshi et al., 2021). In recent years, smaller enterprises have suffered to a greater extent than large companies due to issues such as supply chain interruptions, raw material shortages, low demand and transportation delays. Businesses operating in the hotelier, restaurant, hospitality, food retail and property management industries have all suffered significant losses as a result of business closures (Albonico, Mladenov, and Sharma, 2020). However, the economy must continue to function, and thus the COVID-19 outbreak cannot stop commercial operations permanently (Islam et al., 2021). It would be perplexing for companies of any size to close their doors permanently during a pandemic. Therefore, even if remote working was once innovative, SMEs were compelled to create hybrid or remote working arrangements in record time in response to the pandemic outbreak. In order to increase their resilience and long-term viability, SMEs were forced to adapt to the challenges posed by the COVID-19 pandemic.

The COVID-19 pandemic generated new opportunities to study SMEs, such as the importance of agility in improving company performance (Zutshi et al., 2021; Akpan et al., 2022) and productivity (Martnez-Campillo and Fernández-Santos, 2020), as well as mitigating financial difficulties. Early research revealed that SMEs must be dynamic to overcome the COVID-19 challenges. However, it was unclear how they could do this. Emerging research pertaining to SMEs and the COVID-19 pandemic suggests that proactive measures are required to increase the chances of SME survival. For example, Musa and Aifuma (2020) discovered that social media can help SMEs with cash flow problems, budgeting, and commercial transactions. These solutions can help impacted SMEs to become more resilient in many financial areas, including account monitoring, product and service promotion, and cash flow maintenance. However, the extent to which these solutions have helped remains unclear. Thus, the paper will address the following research questions:

1. How is COVID-19 impacting SMEs during the post-pandemic period?

2. What measures have SMEs taken to overcome the challenges caused by the pandemic, particularly with regard to remote working and the adoption of digital tools, and what are the key success factors associated with these approaches?

3. How have social media and other digital interventions enhanced the resilience and competitive edge of SMEs during and after the COVID-19 pandemic?

This study serves as a valuable contribution to the existing body of knowledge regarding SMEs. Firstly, it improves our knowledge of various opportunities and viable solutions for SMEs. The popularity of remote work and digital tools has surged after the end of the pandemic. Secondly, SMEs that can quickly adjust and implement online

business models and e-commerce platforms typically perform better than those who cannot do so.

2. Theoretical context

2.1 Remote Working Practices

Due to the effects of the pandemic, England was placed into lockdown between March and June 2020, which required people to work from home unless it was impossible to do so (Raikes, 2021). As well as enabling workers to complete tasks from home, remote working has also been found to improve employees' work-life balance (Hafermalz and Riemer, 2021). Additionally, remote working can also enhance company productivity, employee engagement, and staff retention (Chapman, 2020). Remote working was a healthy and sustainable practice during the COVID-19 pandemic and has the potential to be implemented in post-pandemic workplaces (Bao et al., 2022), even if some employees found it difficult to adjust to working in new environments (i.e., at home). Working remotely can increase organisational resilience and protect businesses against unforeseeable crises such as COVID-19 (Raikes, 2021; Bao et al., 2022). In light of this, remote working has increasingly become the norm for many businesses and employees, particularly in industrialised countries where it has persisted through the COVID-19 pandemic (Zhang et al., 2021; Hosseini-Motlagh et., 2021).

Due to financial and human resource limitations, implementing remote work practises in SMEs in the UK or other developed countries may be challenging (Sane, 2020). Managing remote workers is a further barrier to remote working, as demonstrated by Hafermalz and Riemer (2021). The researchers added that the absence of logistics among remote employees is also a barrier that must be considered. Other barriers include family opposition to remote work (Albonico et al., 2020) and convincing employees to work remotely when it could adversely impact their career prospects (Zhang et al., 2021). Furthermore, Munga et al., (2012) point out that many businesses find it difficult to uphold ethical standards while using remote working. When it comes to defining and evaluating remote work, Munga et al. (2012) and Baine et al., (2018) differ significantly.

Remote work has been defined by Munga et al. (2012) as working through information and communication technologies. Employees that work remotely do so as a flexible work option away from the company's offices. Moreover, Zhang et al. (2021) explain that remote working enables employees to work from home or other locations, which benefits companies around the world as economies and working processes change. According to Zhang et al. (2021), while remote working practices differ between companies, they have been successful in bringing together internal and external stakeholders to complete projects. Sane (2020), also points out that remote working can reduce employee office costs and cut down commuter-related CO2 emissions.

Elshaiekh et al. (2018) explain that remote working has differing impacts on employee performance. However, although job satisfaction, happiness, performance and revenue intent increase when working, it can lead to increase stress, poor time management and feelings of loneliness and isolation. Although remote work increases flexibility, it can have negative effects on companies and their employees (Musa and Aifuwa., 2020). Users are now becoming more accepting of remote working thanks to video conferencing tools such as MySQL for databases and Zoom, Skype, Microsoft Teams, and WebEx for online

video conferences and meetings (Sane, 2020). As remote work is typically carried out from home using technology, Hafermalz and Riemer (2021) use the terms homeworking and teleworking to define the concept. Moreover, it enables employees to work from home or elsewhere and offers flexibility. Thus, some researchers believe that all businesses should adopt remote working. However, even though the prevalence of remote work is increasing, there are several obstacles that need to be overcome in order to reap its benefits.

2.2 Obstacles Hindering the Implementation of Remote Working Practices for SMEs

Deutrom et al. (2022) assert that SMEs are at a higher risk of experiencing cyberattacks. In line with this, remote working also increases cybersecurity risks as employees use their own personal devices and rely on risky home internet connections. Additionally, differences in employee behaviours can also increase the risk of remote working (Holmes et al., 2022). According to Chapman (2020), cybersecurity problems may be brought on by inadequate training and low employee adherence to information security requirements due to poor organisational support. Deutrom et al. (2022) state that providing assistance and training in cyber awareness specifically geared towards remote employment can help control risk. Lack of awareness and interest, as well as high staff turnover, were highlighted by Heiden et al. (2021) as key obstacles to remote working. Moreover, Holmes et al. (2022) claim that some managers and employees may be averse to remote work because they are unaware of or misinterpret its advantages. This resistance, according to Chapman (2020), might hinder adoption and productivity. This issue can be resolved by establishing effective communication and providing education about the advantages of remote work (i.e., flexibility and work-life balance).

When hiring remote workers, employers must have confidence in their skills and ability to be dedicated and productive (Ergün and Doruk, 2020; Chapman, 2020; Heiden et al., 2021). Nonetheless, it can be difficult to find such trustworthy, disciplined employees remotely. To identify reliable remote workers, Bao et al. (2022) recommends carrying out thorough screening, evaluating remote working experience, and providing a trial term. Each of these issues, according to the researchers, emphasises the need for careful preparation, sound guidelines, and effective implementation methods to handle the intricacy of remote working. These issues can be resolved by implementing technological solutions, establishing clear communication, setting up training programmes, and making changes to a corporate culture that embraces remote work's advantages and minimises barriers.

2.3 Potential Solutions and Opportunities for SMEs

Furthermore, Contreras et al. (2020) recommend training and educating employees on remote working, including the processes and equipment involved, in order to maximise their interest and productivity. There are various forms of training that can help employees learn to use digital tools and software from home in order to complete their work. Moreover, Contreras et al. (2020) add that productivity can be increased through extensive remote work training. Meanwhile, Hafermalz and Riemer (2021) highlight miscommunication between managers and employees with regard to adopting remote working practices as being a significant concern. Nonetheless, organisations could employ video conferencing, project management platforms and messaging apps to enable real-time communication, collaboration, and engagement. Moreover, this can help them to

increase work flexibility and minimize the stress associated with commuting. Similarly, Larson et al. (2020) recommend that companies hold regular team meetings, provide frequent status updates, and host virtual brainstorming sessions in order to maintain connectivity. Logistical help with technology and procedures, as well as frequent monitoring, can also promote remote working, according to Büyüközkan and Göçer (2018).

Remote working has a number of long-term benefits that can be obtained by providing employees with PCs, mobile phones, software, WiFi for high-bandwidth internet, and financial compensation. Additionally, remote workers require regular technical support and instruction to help them with device setup and maintenance. Hope (2020) provides ongoing IT support to help remote workers with their technical issues.
This study claims that businesses can develop productive remote work environments that are advantageous to both employees and the organisation by implementing these solutions and seizing opportunities.

3. Research Methodology

Understanding human experience involves establishing a close connection with an individual, and this is the key objective of interpretivist epistemology. Based on the subjective realities that underlie human activity, this paper investigates actions and changes (Burrell and Morgan, 2017). The primary goal of this study is to understand the importance that employers and organisations place on flexibility and remote work in SME workplaces. A qualitative research approach was considered to be most appropriate for the current study given its exploratory nature. This is because qualitative approaches are subjective and enable researchers to delve deeper into the phenomenon in order to produce rich insights. Furthermore, qualitative research allows researchers to comprehend the fundamental causes and motivations of events, which is in line with interpretivism and subjectivism (Easterby-Smith et al., 2021). For this reason, it was thought that a qualitative research methodology would be suitable for examining flexibility and remote work in SME workplaces. Thus, semi-structured interviews were held with 10 SME owners, consultants, and employees in the UK. The details can be seen below in Table 1.

Table 1. Participating demographics

No	Gender	Age Group	Occupation
Participant 1	Male	25-34	Checkout.com worker
Participant 2	Female	45-54	Saloon owner
Participant 3	Male	35-44	Taxi driver
Participant 4	Male	25-34	Pet services worker
Participant 5	Male	45-54	Ice cream shop worker
Participant 6	Female	35-44	Bed and Breakfast owner
Participant 7	Female	25-34	Cakes/pastry shop owner
Participant 8	Male	35-44	Bakery owner
Participant 9	Female	25-34	Cleaning owner
Participant 10	Male	Above 55	Checkout.com consultant

In contrast to quantitative research that includes hundreds of participants, this study only employed a small sample (Burrell and Morgan, 2017). Braun and Clarke (2021) explain that qualitative research involves gathering data using qualitative methods such as semi-structured interviews, diaries, stories, narratives and participatory observations. To acquire and analyse the data from SME owners', consultants', and employees' experiences, a thematic analysis was carried out (Guest et al., 2020).

Despite being criticised for being a weak analytical technique, thematic analysis is frequently employed in interpretive and qualitative studies (Braun and Clarke, 2021). Thematic analysis is viewed as a highly adaptable method that can be tailored to meet the objectives of each researcher given the theoretical freedom that it provides (Guest et al., 2020). It is a practical technique that uses in-depth data analysis to get insightful results. Thematic analysis can be utilised as a separate and independent strategy. Thus, the researcher does not need to have in-depth knowledge of other qualitative analytical approaches in these situations (Easterby-Smith et al., 2021). Consequently, the researchers employed purposive sampling to investigate participants' experiences and expectations.

This resulted in the production of insightful information about SMEs' perspectives on remote work. The data analysis process was performed manually using a conventional inductive qualitative approach rather than using qualitative data management software tools to help with data coding (e.g., Nvivo, ATLAS.ti) (Braun and Clarke, 2021). Furthermore, the small sample size used in the semi-structured interviews is a further limitation.

4. Data Analysis and Findings

The thematic analysis focuses on identifying and defining implicit and explicit ideas expressed in the data (Guest et al., 2020). Moreover, Guest et al. (2020) also stated that it has progressed beyond counting explicit words or phrases. In order to portray participants' thoughts or words within the framework of the study, the empirical data were grouped into four main themes (presented in Table 2) and synthesised implicitly and explicitly. The explicit themes in this case were classified as thoughts and words provided by respondents, while implicit themes were found and developed from respondents' remarks. Please take note that quotes are verbatim but have been proofread for accuracy.

Table 2. Categorised themes

Major Themes	Description	Key Words
Financial constraints	Challenges related to limited financial resources or budgetary restrictions that impact the organisation's operations, growth, and decision-making.	Budget limitations, financial constraints, resource scarcity, funding issues, cost-cutting.
Risk of cyberattacks,	Concerns about potential cyber threats and the vulnerability of the organisation's digital assets and sensitive information.	Cybersecurity, data breaches, hacking, malware, phishing, digital threats.
Communication problems	Difficulties in effective communication within the organisation, with customers, or with external partners, leading to misunderstandings or hindrances in achieving goals.	Communication barriers, miscommunication, lack of clarity, collaboration issues, information sharing.
Difficulty in finding trustworthy employees	Challenges in recruiting and retaining employees who can be relied upon to perform their roles with integrity and professionalism.	Employee trustworthiness, hiring challenges, employee reliability, ethical concerns, staff retention.

The emerging themes**: Financial constraints, perceived increase in the risk of cyberattacks, communication problem, difficulty in finding trustworthy employees.**

Financial Constraints

For businesses that require external finance for their intangible or fixed capital investments (or research and development [R&D] investments) in order to achieve their growth or profit goals, the issue of 'financing constraints' is deemed to be a key barrier (Ergün and Doruk, 2020). Business executives must deal with macroeconomic challenges, according to existing literature (Hafermalz and Riemer, 2021).

Due to the ongoing economic uncertainty brought on by the pandemic, which has decreased consumer spending and affected supply chains, a number of participants identified financial constraints as the biggest issues facing SMEs in the UK throughout the interviews.

'I am worried about my inability to pay bills this year and am now looking for avenues to help reduce the amount of energy I use.' [Participant 6].

'To combat the cost-of-living impact, my business has increased the prices of its products and services, while other businesses are reducing the size of their workforces'. [Participant 7].

These quotations demonstrate that many SMEs in the UK are at risk of going out of business as customers feel the brunt of the cost-of-living crisis. Consequently, many SME leaders are experiencing serious problems and reporting significant losses.

Moreover, there is a shortage of credit and lending services provided by official financial institutions, meaning that entrepreneurs who want to set up their own businesses are largely dependent on their own personal resources. One participant stated in the interviews that a lack of credit and loan options was a significant barrier preventing companies from implementing remote working during the post-pandemic phase.

Many UK SMEs have had financial constraints since they were launched with owner capital. Loans from banks and the government are difficult. Thus, SMEs lack the economic capacity to purchase remote working equipment. [Participant 2].

Cyberattack Risk

Holmes et al. (2022) define a cyberattack as any aggressive action against computer information systems, infrastructure, computer networks, or personal computer devices. Research has shown that, in the post-pandemic phase, cybersecurity is a major cause of concern for remote workers (Chapman, 2020; Reuschke, and Felstead, 2020). The participant quotes included below offer some unique perspectives.

'For me, I transfer data between work and personal computers while working from home, which is a concerning practice, but it does save time, weight loss, and improved meal habits'. [Participant 1].

'When I work from home, I frequently participate in teleconferences and video calls that require me to use my webcam, which is worrying, but it does offer some benefits such as enhanced mental health and longer nights of sleep' [Participant 4].

Nonetheless, it is important to note that there are several challenges associated with remote working. This includes missing out on interactions with co-workers and being distracted by partners and family members, as well as issues with technical infrastructure and insufficient cyber and data protection. The participants in this study reported the risks of using personal gadgets for work and webcam hacking, although they also mentioned the advantages of losing weight, developing better cooking techniques, improving mental health, and getting more sleep.

Communication Problems

The most significant communication problems associated with remote working include grammar mistakes in emails, information overload, misconceptions, insufficient feedback, or feelings of loneliness and mistrust. These factors were all reported by two participants in the following responses:

'Suppose I let an employee work from home. Whether he or she is working or not is unknown, and you don't know what's interrupting them. Sometimes they don't answer the phone with numerous excuses. Thus, urgent information is difficult to provide. [Participant 8].

A Checkout.com expert said that occasionally employees switch off their phones and internet at home and report a network issue. Smoother communication becomes tougher.

This may not be accurate, as many employees do it purposely. Therefore, I don't favour letting staff work from home. [Participant 10].

It is evident that remote work is here to stay. However, this means that the most common communication challenges will also remain. Thus, SMEs must be able to identify communication issues at an early stage so that they do not adversely impact employee productivity, engagement and team spirit.

Difficulty in Finding Trustworthy Employees

Some of the interviewees reported that it is hard for SMEs to locate and recruit reliable remote workers.

For instance, it was reported by Participant 8 that: *It is hard to find an employee that works outside the office honestly and with great engagement. In my fashion brands shop back office, I have to watch staff to make sure they're working since they occasionally play the game instead of keeping sales and other records. Having people work remotely is tough. I can let around 2 of my team members work from home because it will not matter much, but I can't trust them.*

Similarly, participant 10 (a consultant) stated: *SME owners and directors value employee trust due to unexpected performance issues when working remotely. Thus, despite the COVID-19 pandemic, companies don't like remote working because of a scarcity of reputable and trustworthy individuals.*

5. A Reflection on the Emerging Themes, Opportunities and Considerations

When asked to express their opinions regarding potential solutions to the barriers hindering the implementation of remote working practices in their companies three SME workers (participants 2, 3, and 5) unexpectedly expressed opposition to remote working practices. Only seven participants have identified opportunities and challenges associated with remote working in this regard. Participants also provided justifications in support of the recommended solutions.

Financial Rewards: Participants proposed that financial incentives could motivate employees to embrace remote working practices now and after the COVID-19 pandemic.

For instance, participant 10 reported that: *'the government expedite the disbursement of loans and other financial incentives to SMEs so that they can purchase the necessary technologies and train their employees to implement remote working practises not only during the COVID-19 pandemic but also for an extended period of time. A new pandemic may occur in the world, thus remote working practices are unavoidable today and in future. '*

Training and Empowering the Workforce: Participants highlighted the need to train employees and employers regarding remote working practices in SMEs. Thus, the British government could implement mass training opportunities for companies and managers in this regard.

For example, it was reported by Participant 7 that: *'training is always vital, especially when something new is to be implemented. Because remote working practices are new to many firms, training may teach them how to use them, safeguard their privacy, and make the greatest use of them. Therefore, training is critical in establishing remote working practises*.'

Information Technology (IT) Workshops: To improve students' knowledge and attitudes concerning remote working overtime, a participant in this study proposed starting frequent remote or online classes for all students, regardless of faculties or fields of study. For example, participant 4 stated that:

'Every college student is a prospective entrepreneur or employee, therefore if we can teach them about remote working before graduation, they will use it thereafter. Therefore, obligatory IT training and remote or online lessons during and after the epidemic may be useful'.

6. Discussion and Conclusion

This study examined the most significant opportunities and barriers associated with remote working in SMEs, not just in the wake of the COVID-19 outbreak but also for their long-term advantages. Since they provide innovative insights into the challenges of remote working practices in UK SMEs, our findings have important theoretical ramifications. For instance, SME owners and managers may wish to consider how SMEs perform as well as staff benefits like cost savings, weight loss, better cooking habits, enhanced mental health, and longer sleep cycles. Existing studies into the challenges associated with implementing remote working practices have also been significantly influenced by high turnover and a lack of trust between employers and employees. This study also highlighted a number of other limitations, such as financial constraints and communication problems, which is in line with past studies (Bao et al., 2022). The findings of our study add to our knowledge and the body of literature on how to implement remote working practices in SMEs by highlighting a number of significant issues that have not previously been highlighted. In order to solve the issues associated with implementing remote working practises, it has not been previously researched how to persuade employers and employees of the advantages of remote working practises, IT training, and remote (online) classes at colleges. Our results thus confirm the value of IT workshops and online courses to improve digital skills and preparation for remote work.

However, previous studies conducted by Hope (2020) and Zerssa et al. (2021) revealed that training was an effective way of implementing successful remote working practices. Moreover, this study found that financial rewards could also help motivate employees to adopt remote work, which is in line with the results of Bao et al.'s (2022) study. Therefore, financial incentives and government support appear to play critical roles in helping SMEs to make the necessary investments in technologies and training for remote work. The results of this study have implications for society as a whole and the future of labour. Governments may support economic flexibility and resilience by making investments in infrastructure for remote employment and digital literacy. Our analysis outlines workable solutions that can help SMEs, their employees, and society as a whole, even though there are still challenges to be faced, such as budgetary limitations and cybersecurity threats. The study's findings can aid SMEs' owners in better understanding the challenges and

solutions associated with implementing remote working practices to ensure that their business operations do not fail due to the pandemic.

7. Limitations and Recommendations for Future Research

It is important to note that this research had a number of limitations, despite being credited with the benefits of using qualitative research methodology. The use of small sample sizes, the occurrence of data saturation, and a propensity for geographic concentration are some of the drawbacks associated with qualitative approaches. In turn, this adversely impacts the generalisability of the findings. Additionally, the research was particularly aimed at SMEs, making it impossible to generalize the results to large businesses. Despite these limitations, the current study creates a key framework for future research using quantitative research techniques. Conducting a thorough poll among a larger group of SME owners, consultants, and staff may be required for this study. The goal of this survey is to gather quantitative information about the many challenges, opportunities, and outcomes related to the adoption of remote working practices. Moreover, future researchers may wish to perform a comparative analysis of SMEs in different countries or different industries as this is likely to generate a more comprehensive understanding of the barriers and solutions associated with remote working.

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Paper 2 (*Work in Progress*): A Case Study on SMEs' survival model in Circular Economy – Investigating speciality coffee shops in Northeast Region of the UK

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Abstract:
The paper aims to explore the implementation of a new non-linear, restorative and regenerative economic system, the Circular Economy (CE), in the context of waste management in Small- and Medium-sized Enterprise (SMEs) in the hospitality industry. It proposes the adoption of a "Reduce-Reuse-Recycle" (3R) waste management model. The objective of the study is to expand the domain of Speciality Coffee Shop (SCS) waste management practices by challenging and transiting from the traditional linear to a circular approach to supply chain management. The paper adopts a critical realism philosophical stance and an abductive research approach. The paper opted to apply the case study and experiment research strategies to explore the case in its natural environment. Data collection methods include field experiments, observations and semi-structured interviews to enable triangulation of evidence. The paper provides empirical insights into how

transitioning from the linear to the more sustainable CE waste management systems can be achieved using the 3R model, which prioritises the reduction, re-use and recycling of SCS waste materials. While the chosen research strategy of a case study limits the generalisability to a speciality restaurant population, analytical generalisation and case to case transferability is possible. Further replication of the research is recommended. The paper proposes the development of a robust non-linear, cost-effective and sustainable waste management system that delivers benefits for society, the environment and SME shareholders. The study fulfils a gap in research on how the CE principles can be applied to develop effective waste management systems for SCSs to deliver on the triple bottom line agenda.

Keywords: Circular economics, SMEs, Northeast of the UK, Hospitality sector

1. Introduction

The coffee culture in the UK has undergone a profound transformation over the years. As of 2023, there are slightly over 7,700 established coffee shops in the UK, representing a 0.2% increase over 2022 (IBISWorld, 2023). The increasing number of coffee shops means significant levels of waste are generated and disposed into the public physical environment (Agrawal, et al., 2019). The nature of waste can encompass various forms such as single use packaging, food wastes, extra energy usage, etc.

The waste generated by coffee shops have created impacts on the environment and pose a threat to the sustainable development of the coffee industry. Prabawanti (2020) reports that pollution caused by large quantities of single used cups, lids, straws and other packaging materials has become a challenge for the industry maintaining its promise of sustainable development. Moreover, the consumption of energy and water contributes to the society's overall carbon footprint. The energy and resources required to produce, transport, and dispose of coffee products no doubt results in carbon emissions. de Figueiredo Tavares and Mourad (2020) explain that coffee shops create certain levels of impacts on a region's environmental and sustainable development, while a coffee supply chain can contribute wide positive impacts on sustainable development due to its global reach and interconnected stages. From cultivation to consumption, various elements within the supply chain influence economic, social, and environmental dimensions of sustainability.

In this regard, the concept of circular economy (CE) is introduced to the industry. Circular economy (CE) refers to an economic system which is designed to be restorative and regenerative. As a new concept in sustainable development, it contrasts with the traditional linear economy where wastes are normally created from end-users (Santibanez Gonzalez et al., 2019). This new concept requires a 'Take-Make-Dispose' (TMD) model and keeps resources in use by prioritising the reduction, reuse, and recycling of materials. The fundamental principle of CE is to minimise waste and make the most of resources by promoting continuous cycles of reuse, repair, refurbishment, and recycling through a closed loop chain (Mayson and Williams, 2021). Starbucks, as a multinational chain of coffee houses, has adopted the CE system into their operations, from the simplest solution such as reusable cup programmes and coffee grounds recycling, to the complex innovations on waste management, energy efficiency and green building development. Starbucks has been taking these steps towards a CE to enhance sustainability across its

supply chain. However, CE is still an emerging complex and challenging concept in business practices, especially for small and medium sized enterprises (SMEs).

This concept requires an extensive and efficient infrastructure support, which can handle the recycling and repurposing of waste products to some new markets. Meanwhile, CE challenges the traditional principle of supply chain by transiting the entire flows from linear to circular; this not only increases the complexity in supply chains, but also requires more coordination and collaboration across all relevant stakeholders (González-Sánchez et al. 2020; Knošková 2020; Howard et al. 2022; Zhu et al. 2022). Moreover, consistency of operating CE principle is hard to guarantee, specifically in SMEs. Finally, customer behaviour, which is also another reason of keeping SMEs away from CE implementation, as consumers may not be willing to change their consumption patterns or pay more for sustainable products.

Comparing with large sized organisations, SMEs are facing limited capital and abilities to adopt CE in their practice, especially the increasing financial pressure and continuing shrinking market size since the Covid-19 pandemic. van Keulen and Kirchherr (2021) reveals that small and medium sized coffee businesses are facing several barriers when adopting CE practices including:

1. Financial constraints.
2. Limited access to resources.
3. Underdeveloped infrastructure.
4. Resistance to change.
5. Shortage of education and awareness.

Small coffee shops are not only struggling with the above-mentioned barriers; furthermore, they are lacking local support and resources, and leveraging capability of their community connections. Ferreira and Ferreira (2019) posit that collaboration with not only their suppliers, but also other businesses and stakeholders is a necessity for small and medium coffee businesses in adopting and applying the circular economy principles. Exploring partnerships can effectively assist SME coffee businesses to gain a wider understanding of waste management and obtain better capabilities and synergy in managing their wastes, educating their employees and customers on the need to manage waste and recycle to attain positive environmental impacts (Idowu, et al., 2023).

In the context of the increasing consciousness of the need for adopting CE principles in small and medium sized coffee businesses, the research aims to address the above-mentioned research gaps. This study aims to address the following research questions:

1. What are the key principles and components of a CE business model in the context of an independent SME coffee shop business?
2. How can a coffee shop implement strategies to minimise waste generation and maximise resource efficiency and profitability through a non-linear CE approach?
3. How can a coffee shop effectively collaborate with suppliers, customers, and other stakeholders to close the loop and create a circular value chain that delivers benefits for the business, society and environment?
4. What are the challenges and barriers faced by coffee shops in implementing a CE business model, and how can these challenges be overcome?

To answer the above research questions, this study is structured to review the key concepts of CE and its adoption in current business operations initially. The reviewing of the current literature also aims to develop insights of the application of existing CE models in supply chain management. The methodology part will present a design of field experiments within a real-world SME business environment. As a work in progress paper, the sections on data analysis and discussion, and conclusion and implications are still evolving. However, this section on data analysis and discussion will focus on the results which will be obtained from the field experiments, to generate detailed insights into how a nonlinear CE model can be innovated in a small and medium coffee business environment. This will be premised on adding stakeholder value through stakeholder engagement, collaboration, performance improvement and sustainable development. The conclusion will highlight the significance of the innovated CE model in real business operations and help resolve the research questions and propose future research directions.

2. Literature Review

Circular Business Models in Supply Chain

Geissdoerfer et al. (2018) define Circular Business Models (CBMs) as business models that aim to achieve sustainable development with economic, environmental and social benefits through long-term, proactive management of multiple stakeholders. These business models also emphasise on SMEs balancing revenue generation and cost compensation when outlining their value propositions while eco-design and design for disassembly are some of their common features. Popular CBMs include closing loops through recycling activities, narrowing loops through efficiency improvement, slowing loop through the extension of use phase, dematerialising loops through the substitution of product utility with service and software solutions (Geissdoerfer et al., 2018).

Among these CBMs, Knošková (2020) advocates for "slowing down loops" which involves manufacturing long-lasting products that reduce the rate at which products become waste, and "closing down loops" which entails recycling and reusing materials cyclically. These models can either dissipative losses in a "biological cycle" or completely recycle materials in a "technological cycle (Knošková 2020). Moreover, the core benefits of CBMs reside within the creation of circular value, a broad term ranging from simple product maintenance and repair activities to extending product life, purchasing recycled waste streams, re-using resources and materials (Brendzel-Skowera, 2021; van Renswoude et al., 2015). The ReSOLVE approach proposed by the Ellen MacArthur Foundation offers a comprehensive strategy featuring regeneration, sharing, optimisation, looping, virtualisation, and exchange to foster a sustainable circular economy (Ellen MacArthur Foundation, 2015). Moreno et al. (2016) also propose "extending product value" through the extension of the lifespan of product and "sharing platforms" that encourage shared use and ownership.

van Loon and van Wassenhove (2020) underscore the vulnerability of companies to external conditions, such as legislation, competition, and consumer behaviour, while finding it hard to identify a circular business model as profitable as the conventional linear make-use-dispose models in today's business climate. Four main challenges are identified: understanding the market for recirculated products, maintaining low additional costs, securing access to high-quality products for recirculation, and keeping up with the speed of technological progress (van Loon and van Wassenhove, 2020).

Internally, Brendzel-Skowera (2021) contemplates the key success factors for circular business models: for a value proposition that reflects the equilibrium of economic, ecological, and social needs; a supply chain that engages suppliers into sustainable supply chain management; a customer interface that motivates customers to take responsibility for their consumption; and a financial model reflecting an appropriate distribution of economic costs and benefits among business model participants. These challenges underscore the complexity of navigating and implementing circular business models in SMEs.

Although the topics of sustainability and CE have been raised in coffee industry, especially in the field of energy renewal and innovation; in current studies, there are still some clear research gaps that have not been fulfilled, including:

1. Limited understanding of guidelines for small and medium coffee businesses in adopting circular economy.
2. Insufficient empirical studies on SME coffee shops.
3. Limited Knowledge transfer and capacity building – Business model and value chain innovation.
4. Unclear Performance measurement and Evaluation – No clear indictors for CE performance management.
5. Limited discussion on collaboration and networking with stakeholders.

3. Methodology

The study commits to critical realism as the philosophical guiding paradigm. Critical realism has been selected to inform the paper's methodology because it supports research beyond the default quantitative and incorporates qualitative data collection methods (Guba and Lincoln, 1994), which is desirable in the current research. Second, critical realism supports research that aims to discover both observable and non-observable mechanism and structures that underlie circular economy (CE) experiences and activities (Saunders et al., 2019; Tsoukas, 1989), which is appropriate for the current explanatory study.

In the context of critical realism, the study adopts an abductive research approach that mixes both inductive and deductive approaches to generate, modify and test the theoretical concepts relating to Circular Economy (Saunders et al., 2019). In terms of methodological choice, the paper adopts a mixed-method research design that combines quantitative and qualitative research methods in the same study (Saunders et al., 2019). In this context, the Circular Economy theory provides both the research focus and boundaries of its scope ((Tashakkori and Teddlie 2010). The paper applies a sequential mixed method research design involving multiple data collections phases.

The paper adopts case study and field experiments as the preferred research strategies. The case study strategy is deemed appropriate because the concept of CE is contemporary and pre-paradigmatic (Boing, 1994). Thus, research on CE would benefit from an inductive theory building approach because a deductive approach faces challenges where accepted principles and constructs are still emerging, inadequate and disputed as is the case with CE. Thus, allowing the researcher to mix both deductive and inductive research approaches as desired. The case study strategy is preferred because it permits an inquiry into dynamic contemporary phenomena and their emerging bodies of knowledge within the phenomena's real-life context (SCSs), where the boundaries between the phenomena and

their context is blurred (Bonoma, 1985; Chetty, 1996; Eisenhardt, 1989; Stake, 2005; Yin, 2018).

In addition, a case study strategy is particularly useful when attempts to explain causal links are too complex for experimental methods (Eisenhardt, 1989; McGuire, 1997). Hence, a case study strategy supports the use of multiple data collection methods using multiple sources of data to better understand the phenomenon under study (Bonoma, 1985; Creswell, 2009; Robson, 1993). Furthermore, the deployment of multiple research methods strengthens the robustness of the research and findings through triangulation and cross validation (Creswell, 2009; Saunders et al., 2019; Yin, 2018), where the different sources of data converge and are deemed congruent.

The field experiments are desirable in this research because they permit the researcher some level of control required in testing the theory and developing an appropriate CE model for SCSs. In terms of time horizon, the paper adopts a cross-section study approach that suits the current time-constrained research (Saunders et al., 2019).

As stated above, the study adopts multiple data collection methods including structured observations, semi-structured interviews, reports and content analysis to collect data from different sources and facilitate triangulation (Saunders et al., 2019). To help with the data collection the researchers have developed a detailed experiment procedure to guide the quantitative data collection and a case study protocol to guide the qualitative data collection phase incorporating Stake's (1995) and Yin's (2018) recommendations.

The paper adopts a purposive sampling technique because the study seeks to understand contextual meaning within a bounded system (case study) within its real-life context. Thus, there is no wish to generalise the results to a population, but to facilitate the desired theoretical (analytic) generalisation and case to case transferability. As Yin (2018) advises, the research questions were presented and reviewed by colleagues to avoid confusion concerning the definition of cases. This process yielded a singular representative pilot SCS case study briefly reported in the preliminary results section below. In terms of data analysis strategy, the study will employ a multi-level analysis approach including within-case analysis, cross-case-analysis, group analysis and analytical generalisation.

4. Potential Contributions

The researchers have completed a pilot study in one selected coffee businesses. Briefly, the business has achieved a better financial performance directly attributed to better waste reduction; meanwhile, its new profit generation comes from the new value adding products, which is produced through the collaboration with local science institutes (Shown in the Figure 1).

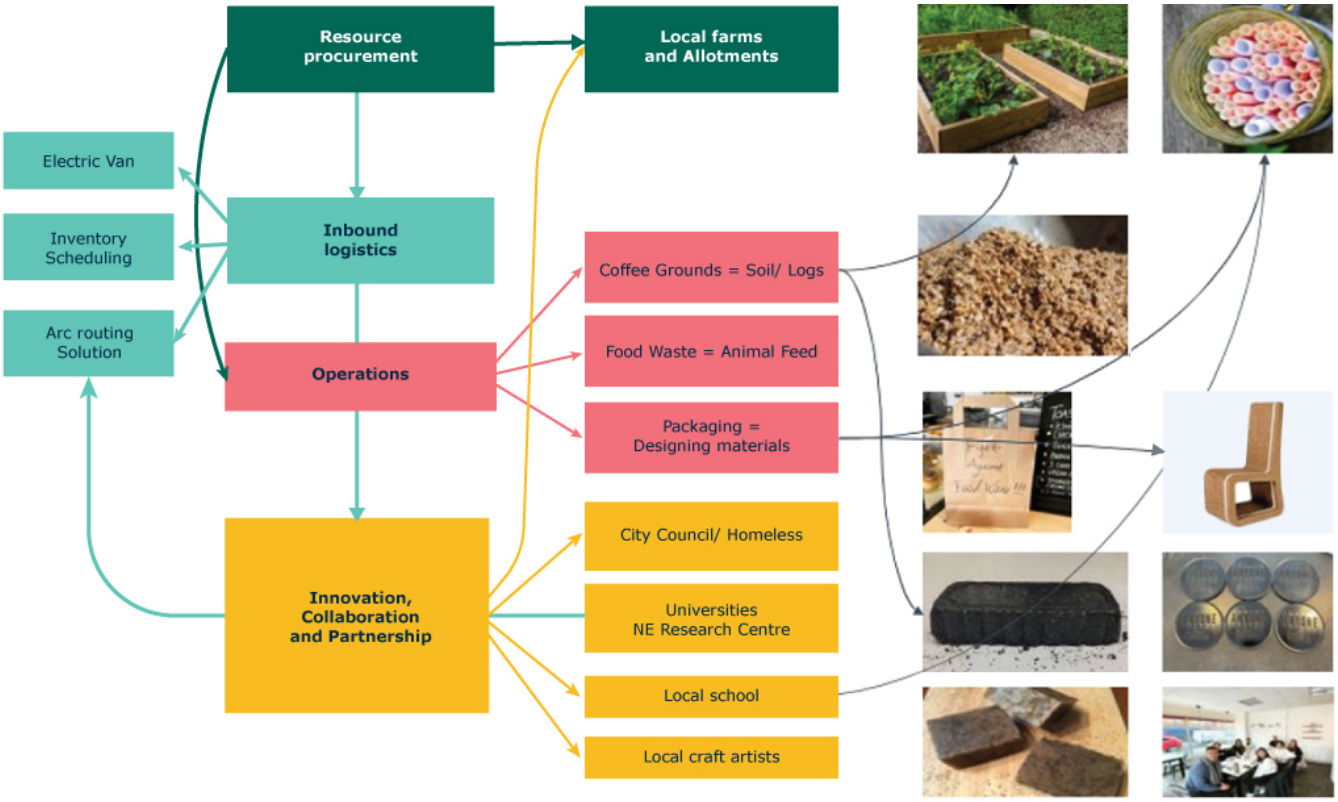

Figure 1. Value adding products from new partnerships

Moreover, the concept of CE is determined from the perspective of small and medium coffee businesses' sustainable development. This concept is presented in Figure 2, which is a model that will be explained in the future as the research unfolds. Furthermore, from the perspectives of customers and other stakeholders in this coffee business supply chain, extra values have been generated with the waste recycling and regenerations. A brief value adding explanation is presented in Figure 3, more details will be presented in the future as the study is completed.

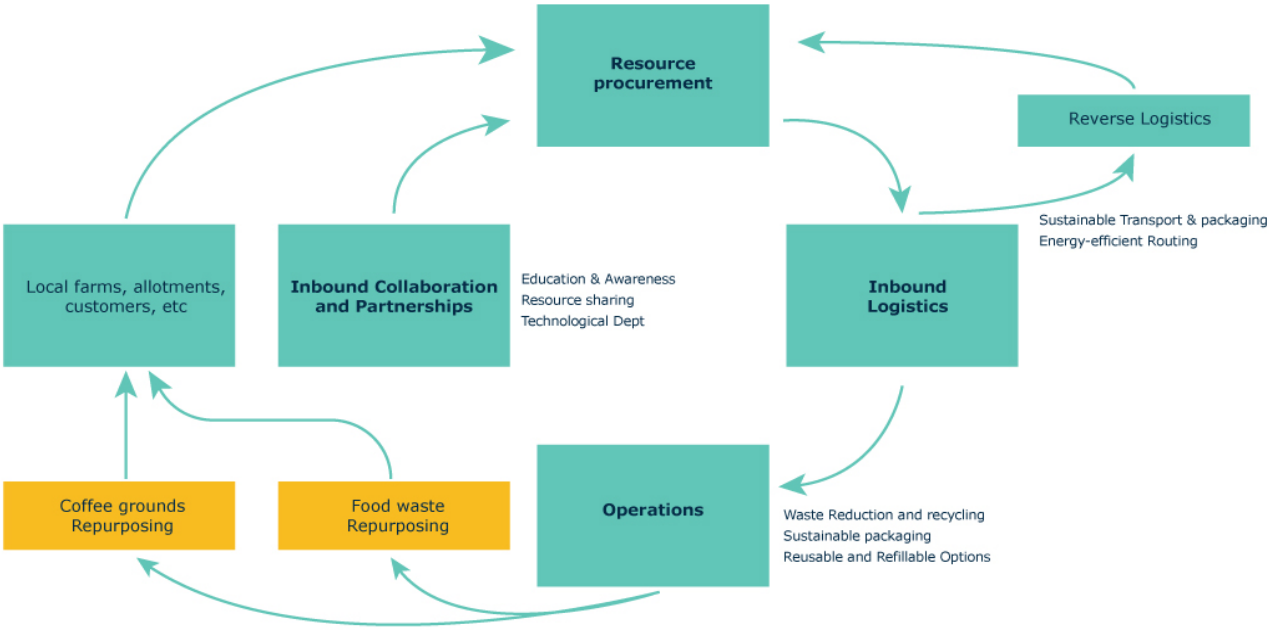

Figure 2. The concept of CE in small and medium coffee businesses

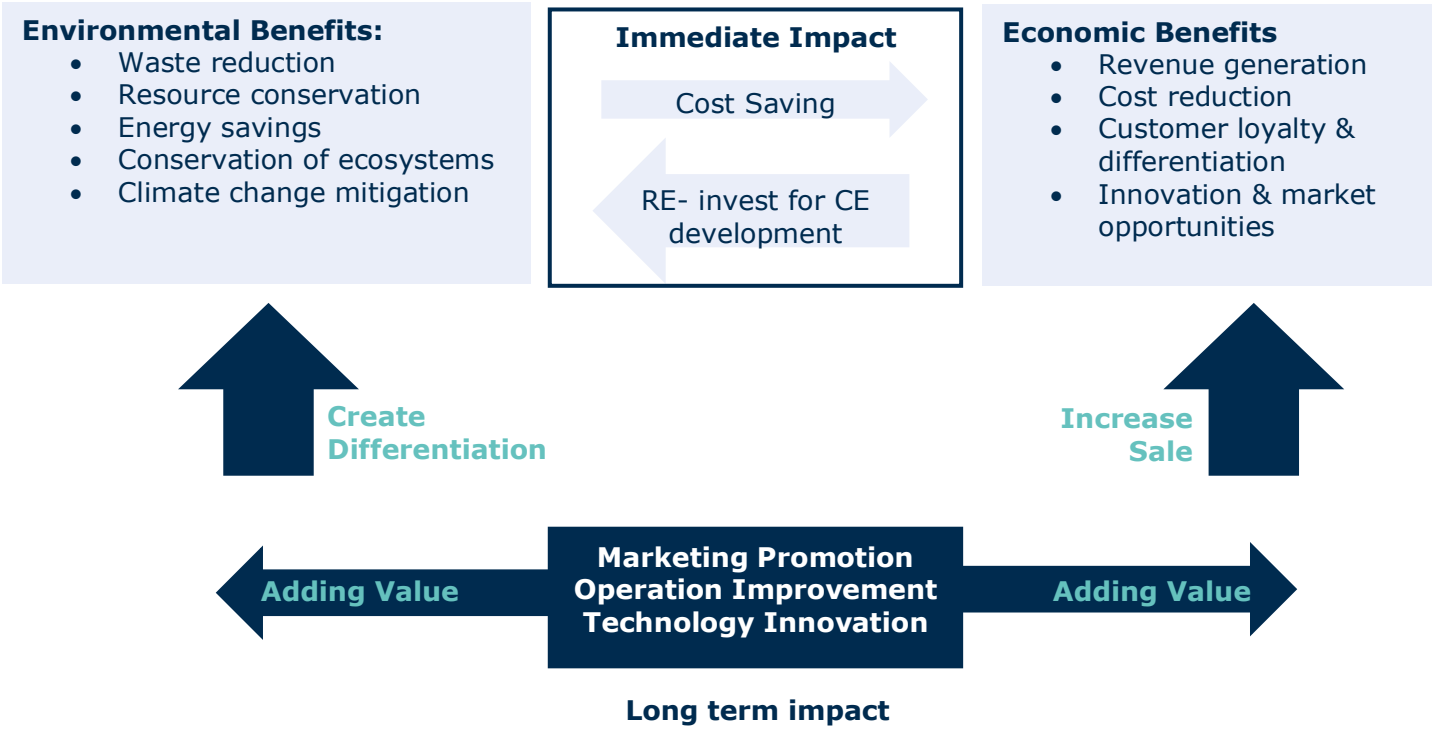

Figure 3. New value adding in the selected small and medium coffee businesses

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Paper 3: Exploring the Impact of Frugal Innovation (FIs) and Digital Transformation (DT) on the Sustainability of Small and Medium Enterprises (SMEs)

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Abstract

This research aims to explore how frugal innovations (FIs) and digital transformation (DT) emerge at the grassroots level of downturn economic conditions and how SMEs employ them to contribute to a sustainable economy. An abductive approach with a multiple case study method was used in this study because this is effective for theory development or extension and is commonly adopted in entrepreneurship and small business (SMEs) and information systems research. This approach is a form of logical inference that starts with observations and proceeds to develop a reasonable conclusion. It yields the most likely conclusion from the data, so this reasoning infers the best explanation for a situation. The study assesses three case studies to investigate how SMEs with limited funds, and resources can bring affordable products to market using outside-the-box thinking to meet the needs of developed countries' underserved customers. Past research studies focused mainly on developing countries' underserved consumers synergised by FIs and ignored developed countries' downturn economies, underserved consumers, and sustainable SMEs with digital transformation. Therefore, this research will provide valuable insights into the impact of FIs and DT on the sustainability of SMEs in the UK's economic context. Also, the study will analyse how both FI and DT approaches will contribute to the development of best practices for implementation in SMEs and the mediating impact of sustainable financial performance. The result of the research will be positively correlated with practitioners, policymakers, and academic researchers in the fields of entrepreneurship, innovation, and sustainable development.

Keywords: Frugal Innovation; Digital Transformation; SMEs; Economy; Financial resilience, sustainable development; Resource-based view, Mixed methods.

1. Introduction

As per ONS (Office of National Statistics, UK) 1st quarter report (May 2023), the UK's GDP rose by 0.9% which was primarily driven by price pressures for household consumption (1.2%). On the other hand, the Chief Economist for KMPG, UK stated that the chance of a recession has fallen in the UK (Selfin, 2023). The report indicates that UK GDP growth will remain weak in 2024 at 0.6% as well due to the impact of interest rate increases, structural issues as well a drop in the number of more than 250,000 SMEs during the covid 19 pandemic. Other contributing factors include skills shortages, slowing workforce participation, aging population that pose longer-term risks to the UK economic and business community. Additionally, a thread of new technologies is taking over human jobs accounting for a 4.6% increase in national unemployment in the UK.

According to OECD, (2019), new innovation and digital transformation have emerged as promising approaches for SMEs to increase their competitiveness and sustainability. Therefore, this research is privileged to investigate the impact of the integration of frugal

innovations, and digital transformation in SME businesses for UK businesses and Economic sustainability.

Frugal Innovation (FI) may be defined as developing quality products and service solutions in a resource-constrained environment that are affordable to lower-income consumers. Thus, it is a strategy for dealing with resource limitations to produce affordable, and acceptable goods as a novel way to serve low-income consumers who cannot afford conventional equivalents. Frugal innovation also has other distinctive underlying characteristics, particularly with respect to contextual factors and environmental complexities (Pisoni, Michelini, & Martignoni, 2018). **Digital Transformation (DT)** of businesses is fundamentally reshaping the role of digital technologies, combining information, computing, communication, and connectivity technologies (Bharadwaj et al., 2013).

Small and Medium-sized Enterprises (SMEs) play a vital role in the economic growth and development of countries. Although SMEs often face challenges in terms of competition, limited resources, and changing customer needs, FIs and Digital transformation have emerged as promising approaches for SMEs to increase their competitiveness and sustainability (OECD, 2019). The integral approaches of FI and DT in SMEs do not only refer to sustainable development of economics but also broadly refer to accommodating various social, environmental, and economic concerns. This study investigates business models and describes how FIs develop in developed countries and how businesses propose, create, and capture value. The study also investigates the challenges and opportunities associated with integrating FIs and DT in SME business that impact the UK's sustainable development. In addition, the study explores how to create a conceptual business model with FIs and DT in SMEs for the downturn economic fund circulation.

Business models that integrate sustainability can provide value to customers and the wider society with far-reaching goals (Abdelkafi and Auscher, 2016, p.74). FIs vary extensively from common innovation in terms of business models and products (Child and Tsai, 2005), prior research indicates that they show promise for improved economic circulation and sustainable development (Lev et al., 2016, p.4). Additionally, the Digital Transformation (DT) of societies and their economies has brought the ongoing co-evolution of business and technology into stark relief, as firms respond to the emerging opportunities and challenges presented by the strategic digitalisation of their activities (Peter et al., 2020).

Digital transformation creates and captures value with novel propositions that reach customers around the world (Winterhalter et al., 2017). The authors use three cases to identify the business models for FIs and DT for sustainable economic fund circulation in developed countries, and the grassroots challenges that SME innovators in Developed Countries face to innovate FIs and implement DT in their business.

In particular, the research objective is to understand FIs and their underlying business models in developed countries with a focus on digital transformation in SMEs for sustainable economic fund circulation. To identify best practices and challenges associated with the implementation of FIs and DT in developed countries' SMEs. The achieve the research objectives the authors investigate the research questions below.

1. How do FIs develop with DT in developed countries with novel business models?
2. What are the challenges and opportunities associated with integrating FIs and DT in SME business for the UK's sustainable economic development?

2. **Literature**

FI is especially promising in resource-scarce environments because of its emphasis on affordable, quality products (Annala, Sarin, and Green, 2018). A key challenge here is to develop novel offerings with limited resources (Pisoni, Michelini, and Martignoni., 2018), and some enterprises compete without the benefits of resources, core technologies, or market power. This phenomenon is viewed from a composition-based view that emphasises how ordinary firms with limited resources can generate tremendous results (Luo and Child., 2015). Hence, specifically understanding local phenomena and generating theoretical knowledge across national boundaries is crucial (Van de Ven and Jing., 2012). FIs embrace context-sensitive approaches to serve low-income customers, and innovations that emerge at the grassroots level of developing countries often serve these customers' needs (Nair et al., 2015).

Due to product quality standards, Western firms sometimes regard home-based product development as a viable approach to meeting the needs of low-income customers (Altman and Engberg, 2016). Along with established firms, many innovators at the grassroots level, often with limited low-price resources and a shortage of technological knowledge staff, lack of transferable knowledge to develop innovations using outside-the-box thinking (Shepherd, Parida, and Wincent, 2020), and knowledge transfer at this level may take place informally (Hossain, 2018). These innovators, therefore, deliver sustainable solutions using local materials and reusing discarded materials. The FIs that originate at the grassroots level in emerging economies can have a significant impact on society because they serve underserved customers and promote sustainability in the economy (Sarker, 2018). Like any other type of innovation, however, an appropriate business model is essential for commercial success.

Additionally, the context of the COVID-19 pandemic has seized the entire society, and, therefore, a major domestic and global economic recession is to be expected [OECD, 2022]. In this context, the sustainability of SMEs is a focus area that gains more attention. Worldwide organisations, such as the United Nations, acknowledged that SMEs are facing some of the greatest economic difficulties due to the COVID-19 pandemic (UNCTAD, 2021), According to ONS (2022), more than 250,000 closed shops during the lockdown in the UK. All these challenges constitute the general framework in which micro-enterprises and SMEs are carrying out their activities and which will mark them in the near future. Various scholars agree that there is still a general gap in understanding the effects of COVID-19 on enterprises and their digital transformation journeys during a disruptive business environment.

Developing countries' innovations are usually developed in developed countries and shifted to emerging countries (George et al., 2012, p.664). However, in recent decades frugal innovation registered tremendous growth in emerging economies mainly because FIs require resource-constrained environments, consumers have significantly lower purchasing abilities, and emerging countries limit it for multinational companies (Mutlu et al., 2015). Although, developed countries' multinational companies often collaborate with their subsidiaries in emerging countries to develop products to reach emerging markets'

underserved customers. This collaboration allows them to blend knowledge and resource-constrained materials on how to create appropriate solutions (Immelt et al., 2009, p.58).

Frugal innovation for the developed countries' underserved customers has an opportunity to create new markets and startup ideas with an SME business model. Digital transformation could support these SMEs to sell their products around the world instead of collaborating with emerging countries' firms. However, limited research is available now for developed countries' frugal innovation due to the feature of being resource-constrained and quality affordable products' price. The solution may reuse recycling products and local market materials (Lim and Fujimoto, 2019). Small changes in economic growth for frugal innovation in developed countries' SMEs result in large differences in incomes over time. Innovation is recognised in the UK as a key enabler for economic growth. In recent years emerging countries' SMEs are increasingly experiencing new innovations for their underserved customers that deliver great value at affordable prices (Govinfatajan and Ramamurti, 2011).

Although, these are firms are subsidiaries of global firms. If the developed countries' multinational companies have subsidiaries with local SMEs that will improve local economies' fund circulation. Additionally, the advantages of developed countries are already well set in innovation knowledge, technology, institutional support, regulation, policy, and quality standard infrastructure developed at the grassroots level. Despite these advantages, FI challenges in developed countries are a shortage of staff and raw materials which can be minimised by SMEs' digital transformation like AI involvement during product development and reuse of local recycling materials.

A sustainable business model creates business value (Hart et al., 2016). Past research indicates that developed countries' business models are unsuitable for FIs. Therefore, this research investigates the sustainable business model for FIs in developed countries where sustainable business models need to consider affordability to satisfy low-earning customers. So, understanding sustainable business models in the context of developed countries like the UK and FIs for low-earning customers presents an interesting research avenue.

The knowledge of how innovation, digital transformation, and sustainable business models, are integrated with developed countries' downturn economies is a current potentially rich source of new research knowledge as well. There is many of literature on FIs connected to issues of sustainability, although the examination of that connection may differ (Albert, 2019). Other hands, many authors argued that FIs can contribute to a more sustainable world (Basu et al., 2013) and sustainable development (Rao, 2014).

Critics opposed that FIs do not create sustainable impact (Rosca et al., 2017). Other authors argued that FIs don't necessarily involve sustainability (Weyrauch and Hersatatt, 2017), and are not initially eco-friendly. Sharma and Lyer (2012). Bhatti et al., (2018) and Prahalad and Mashelkar (2015) suggested that FIs involve redefining business models, reconfiguring value chains, redesigning products to target those with low purchasing power, creating a new market and using a scalable and sustainable approach. Weyrauch and Herstatt (2017) suggested that sustainability was not necessary for FIs and defined it as consisting of "…three attributes: substantial cost reduction, concentration on core functionalities and optimised performance level.

3. **Methodology**

An abductive approach with a multiple case study strategy was used in this study because this is effective for theory development or extension (Dubois and Gadde, 2002) and is commonly adopted in entrepreneurship and small business (SME) (Chetty, 1996; Perren and Ram, 2004) and information systems (Benbasat et al., 1987) research. This approach is a form of logical inference that starts with observations and proceeds to develop a reasonable conclusion. It yields the most likely conclusion from the data, so this reasoning infers the best explanation for a situation (Behfar and Okhuysen, 2018). A case study, meanwhile, is a suitable research strategy for gaining in-depth insights into underexplored phenomena (Yin, 2017). While the multiple case study approaches have been criticised for providing mere descriptions (Dubois and Gadde, 2002), it is a widely used research strategy for qualitative studies (Eisenhardt. 1989) and analysis of SME digital transformation draws on the strengths of this design to generate new insights (Gibbert et al., 2008). Three case studies will focus on adapting the design to incrementally develop digital transformation in SMEs that successfully adopt FIs and assess the impact on the local economy.

3.1 Data collection and analysis

This research study is using a qualitative case study approach (Eisenhardt, 1989, Yin, 2003). We collected data information mainly focusing on the SMART products of Siemens their proven success, Multination business model for frugal innovation, Mitticool frugal innovation based in emerging market in India and its business model as well as Japan's SMEs and technology contribution for economic development case study based on Toyota, Nissan and Furukawa (Hirasawa et al., 2018). This data was collected through interview and information materials provide by Siemens, Toyota, Nissan and Furukawa, Prof. Anil Gupta of the Indian Institute of Management, Ahmedabad, India about Mitticool. So, data sources from secondary data. The authors performed desk research to collect secondary data, such as from enterprise websites, different case studies, articles, reports, etc.

This secondary data allowed the authors to understand the cases better and develop conceptual theory of business models. Case studies provide unique means of developing theory by ultilising in depth insights of empirical phenomena and their contexts. Textbooks on research methodology fail to take account of the opportunities offered by a twisted research process enabled by case research.

They tend to describe case studies as a linear process (Dubois and Gadde, 2002), similar to other research methods, which have been developed for other purposes and for studies in other contexts to understand of the characteristics and consequences of case studies based on abduction this requires and integrated approach, because the main difficulty of case studies is handling the interrelatedness of the various elements in the research work.

The research focuses on the question of how developed countries SMEs are organising their frugal innovation and digital transformation for sustainable economic development. The authors choose Multinational companies, Sole trader, small and medium business because such companies are typically these are the businesses presence in globally Zeschky et al., 2011) and perfectly fits the requirement for our research investigation. The authors choose Siemens, Toyota, Nissan and Furukawa to focus on a company having frugal innovation initiative as an example of changing strategies of big MNCs, Mitticool an example of changing for small business strategies and Japan's SMEs and Technology for

their economic sustainable development strategies. The authors capture the frugal innovation which also use in develop countries as a integral process which is new solutions themselves. Our case studies in the research study based on analysis and evaluation of secondary data and case analysis.

3.2 Case selection

To assess the contribution to developed countries' economic sustainability, three cases of FI, and DT in SMEs at the grassroots level were considered a purposive sampling technique. The case studies select from existing secondary case studies and publicly available. The cases share many aspects in origin and efforts were selected because they were appropriate for exploring suitable business models for frugal innovation for developed countries' SMEs' sustainability and sustainable economic vision. The three cases were selected from different countries to understand a wide range of business feasibility for sustainable development.

3.3 Case description

3.3.1 Multinational company: Siemens (in Germany) Frugal Innovation strategy

Siemens initiated and launched a new product SMART (S=simple, M= Maintenance friendly, A= affordable, R=reliable, and T= timely to market) in developing markets, which covered the frugal innovation criteria. Siemens is a multinational corporate company (MNC). MNCs emphasise end-to-end location and core value to identify both these factors. Bruche's (2009) research found that learning and innovation are highly localised interactive processes of innovation. However, Frugal innovation requires know-how of the local market and tacit knowledge transfer which is complex and requires face-to-face interactions. A complete and successful frugal innovation development also requires the entire value chain from conceptualisation of the product to design to commercialisation worldwide.

Since 2005 Siemens's employees increased from 46,000 to 85,000 in emerging markets and production facilities increased from 64 to 117. To launch these products one significant requirement is the R&D team must be local. Therefore, during the period from 2005 to 2010, Siemens' R&D employees and engineers grew in numbers from 8600 to 15500.

However, along with the localisation, Siemens understands the different core values of emerging market end users and developed countries' consumers which is significant for frugal product development. A clear orientation towards the developing markets, where they already have 27% of their sales employees for further control. An affirmed example of HMI panels of Siemens has been a success in the market, value identification and localisation were key factors. Focus on reverse innovation along with frugal innovation products are not only successful in emerging markets but also have potential for developed countries as developed countries become more cost and resource restrained. Based on the findings, Siemens also works on reverse innovation and plans products in order to be successful not only for developing markets but in the global arena.

Siemens SMART products are based on reverse innovation and lead successfully in the global market's Healthcare sector such as Multix select DR. Siemens also reported that the same products are demanded in developed countries too, such as imaging products like Magneto Resonance [MR] and Computed Tomography [CT] that are sold in developed countries and China's hospitals and used backed systems in the United States (US) for simpler applications. In the USA, primary products are top-end and expensive machines

that are backed up by cheaper machines for better throughput and higher efficiency. So, Siemens SMART products can be positioned in the developed world with different end-user customer applications.

3.3.2 Emerging Market (in India) Frugal Innovation

Mansukhbhai Prajapati of Gujarat, India came from a family of traditional pottery makers. He dropped out of school to support his family and work in different professions, including working as a pottery helper, tea seller, and tile manufacturing worker. As a pottery helper, he learned the pottery-making process, while as a tile manufacturing worker, he learned how tile-making machines work. He became intrigued by applying the mechanism of the tile-making machine to making traditional clay pottery. His initial capital was $500 US dollars, borrowed a loan of $10000 US dollars with 18% interest, and in his business, growth stages he secured 1% interest from Gujarat state banks. He could make 700 quality earthen pans after numerous attempts and sell them to the local market.

Currently, the firm manufactures over 100 types of pottery including its flagship clay fridge, Miticool, which brought them international fame. The fridge can preserve perishable foods and vegetables through a natural cooling process that requires no power. It is also widely used to store medicines and drugs at a cool temperature in areas where there is no electricity supply. The fridge is therefore especially useful for people who lack access to electricity or cannot afford a traditional fridge. The price of this fridge is around US$80. Its top chamber stores cold water, while the bottom chamber is used to preserve perishable items. Water drips down from the top chamber through the sidewalls and then evaporates, thus cooling the bottom chamber. An integrated tap in the top chamber allows it to dispense drinking water. Mansukhbhai has been recognised by different local, national, and international organizations for his achievements.

3.3.3 SMEs and Technology in Japan for economic development: (Toyota, Nissan and Furukawa)

The industrial production capacity of Japan was severely diminished during World War II. In 1943, the output of crude steel from Japan peaked at 8.63 million 1943 but plummeted to 560,000 tons in 1946 after the country's surrender (Hirasawa et al,, 2018). The post-war decade saw the resurgence of the Japanese fuelled by such factors affordable labour, government development and export promotion policies, recording an average annual growth of 7% during the period (Okazaki 2017). By 1956, crude steel production rebounded to 9.4 million tons (Tetsu-to-Hagané Overseas, 1961). From then onwards until the early 1970s, Japan's economy continued its rapid ascent with over 10% annual growth and saw its Gross National Product expanded more than fourfold (Yoshioka & Kawasaki, 2016).

Many reasons contributed to the phenomenal growth including, the massive volume of economic assistance and capital investment provided by the United States, alongside with the democratization of the society, industrial and land ownership that encouraged free competitions and innovations (Hirasawa et al., 2018). One of the supporting factors contributing to Japanese economic revival was the keiretsu system, where a usually dominant manufacturer/buyer fostered exclusive, long-term contractual relationships with its suppliers, often hundreds of small-and-medium sized specialised in supplying specific components in large volumes on a just-in-time manner (Aoki and Lennerfors, 2013). Keiretsu helped giant carmakers, such as Toyota and Nissan, and other industrial groups gain competitive advantage with reliable quality, quick prototyping, economies of scale

and process innovations through mutual trust, cooperation and commitment in the buyer-supplier relationship (Hamamatsu, 2016). Nissan, for instance, provided subcontractors with assistance on their research and development capabilities and evaluation on their product quality, while those failing to meet Nissan's standards would face exclusion from the supplier network (Hirasawa et al., 2018). Meeting the quality standards would come with guaranteed business volumes for these subcontractors, thereby motivating them to excel in product quality, material procurement, quality assurance. The co-dependency between buyers and suppliers encouraged process innovations at the grassroot level with fragmented yet coordinated industry players in a close-knit network.

4. **Results**

The findings of this research will provide valuable insight into the present UK's economic context, the impact of FIs, and digital transformation on the sustainability of SMEs. These will contribute to the development of best practices for their implementation and the mediating role and impact of financial performance. The result of the research will be positively correlated with practitioners, policymakers, and academic researchers in the fields of entrepreneurship, innovation, and sustainable business development.

5. **Discussion**

Based on the findings we developed a framework for developed countries' frugal innovation business model for frugal innovation. However, MitiCool's clay fridges are appealing to emerging market consumers as it offers affordable prices and do not require any electricity. It will be attractive to developed countries who either care about the environment or want to reduce electricity costs. Moreover, Siemens' frugal products are already used in developed countries' healthcare sector as a backup system. Affordable products are a key proposition of frugal products. Additionally, frugal products can also serve niche markets that are often ignored by mainstream companies.

The frugal products' niche market facilitated people and small NGOs to start social enterprises and provide employment as well as affordable prices for low-earning people. Social enterprises often have brand names of their own and these social enterprises with the opportunity to offer promising value propositions to their target consumers with alternative supply chains. On the other hand, a case study based on Japanese technology and SMEs helped Japan to become a developed country within 8 years' time. According to Nomura (1981, p. 126), the "high growth of post-war Japanese capitalism has not been achieved only by giant companies. On the contrary, without small businesses, especially their roles as subcontractors, it would have been impossible to achieve such high growth, which has drawn attention internationally". Toyota, Nissan, and Furukawa used subcontractors' strategies with SMEs and digital technology for sustainable supply chains which shows us SME businesses' significance in a country. All these three case studies have significant elements of a sustainable business model and footprint of sustainable environment, social enterprise, and economic growth.

6. **Implementation and recommendation**

This study has several implications for practitioners. It demonstrates how to solve social problems with innovation, technology, and a novel business model in order to meet society's needs affordably. The researchers will extend the current business model and FIs market literature and complement previous studies on inclusive development (Hossain, 2018), sustainability (Lev et al., 2016, p.4), and the FI process (Hossain, 2020). Developing a frugal mindset, culture, and attitude in scholars, managers, and

policymakers is essential for sustainable development and improving the downturn economy. Frugal inventors at the grassroots level have in-depth knowledge about low-income customers when in dire need.

Affordable solutions present a precious value proposition for developed countries' customers who cannot afford the existing products. FIs at the grassroots level also often do not compete with existing products because they solve problems that mainstream companies have ignored. Success usually comes after a long struggle, and the need to overcome barriers that significantly differ from those of developing countries' start-ups. Additionally, the digital transformation of SMEs is a complex and multifaceted phenomenon that requires further research into the relationship between operational work and the digital tools available to SMEs to realise the successful digital transformation of these critical actors in national economies.

To develop FIs at the grassroots level, individuals therefore need long-term dedication and technological support, which is not readily available in emerging countries. However, developed countries' start-ups, in contrast, have access to hi-tech science and technology, innovation hubs, and venture capital but sustainability is becoming increasingly important for business and society. Although FIs are an effective means for achieving sustainable development, they create new types of employment and customer segments, and they empower local people and serve niche markets. FI at the grassroots level therefore represents a bottom-up approach that is effective for sustainable development. FIs also employ business models with multi-dimensional value propositions. FIs can also bring underprivileged people into mainstream society, so managers and policymakers may need to rethink their assessment of FIs, and digital transformation in SMEs.

The recommendation for managers, training institutions, and policymakers should encourage SME training and upskilling (through apprenticeship programmes, associations networks, online platforms, etc.) for FIs and SMEs' digital transformation by reducing training costs. Employers can promote workplace training by combining training investment and strengthening management skills in SMEs. Moreover, encourage them to build a data culture and digital security profile to manage and protect their information, financial support, or technical assistance. Additionally, FI encourages business innovation and the supply of new digital solutions through a range of research and innovation policies (such as public procurement, research grants, tax incentives, demand side regulation, competencies centres, public-private partnerships, SMEs innovation research programmes, University transfer office, the co-creation platform for FIs, and digital innovation hub, etc.). However, there is a need to leverage fintech and alternative sources of finance for SMEs by promoting new technologies such as blockchain and AI to lower transaction costs, use of mobile banking, credit risk assessment, and efficiency.

7. **Conclusion**

This study has several limitations, thus providing opportunities for future research. It explored three FI cases, but exploring a larger number of cases could provide deeper insights into Frugal Innovation, Digital Transformations, sustainable business models, and their interrelationship with SMEs and the developmental paths of advanced economies. The differences between business models in developed and developing countries, and those between FIs and mainstream innovations are limitedly explored in the extant literature. Additionally, the decision-making process of frugal entrepreneurs also differs from those of other entrepreneurs in the psychological aspects of frugal entrepreneurs.

So, future research would be on developing sustainable distribution channels for FIs, how effectual entrepreneurs start small and grow their endeavours by expanding their networks of relationships over iterative cycles, and how FIs can be protected from unscrupulous copying.

The scientific contribution presented by FIs, digital transformation is a top priority for UK's SMEs, to gain sustainable advantages during a downturn economy. Given the results, the study provides a solid foundation for conducting other research in the field, bringing value primarily to academia, as new research opportunities can also be identified in the fields of entrepreneurship and digital transformation through Frugal innovation. A further research direction may be a follow-up of the study to ensure the involvement of target participants. Subsequently, it can be improved by introducing several other questions in the questionnaire, which aims to analyse business models and entrepreneurs toward digital transformation, following their target audience's reactions to FIs initiatives and change through the SMEs' digital transformation. Finally, this marks the start of new extensive research aimed at studying what leverages are needed for an enterprise to start organisational capability building and induce SMEs to increase competitiveness and sustainability.

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As a distinguished professor and visiting lecturer at numerous prestigious institutions across the globe, he has honed his expertise in shaping the next generation of business leaders. Tosin's passion for research and data induced decision making has led to the publication of numerous books and research articles, positioning him as a thought leader in his field. In addition to his academic achievements, he has also made a significant impact in the business world as a consultant, helping organizations develop data governance policies, improve productivity, and foster entrepreneurship for economic development. He is also an IBM Certified Data Scientist and hold numerous other professional certifications, making him a highly sought-after expert in the fields of data governance, organization development, entrepreneurship, and strategic management.

Theme 2: Digital first (AU strategic vision)

Ria Gurpreet Sidhu
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Ria Sidhu is a Senior Lecturer & Programme Team Leader (UG) for the School of Leadership and Management at Arden University, she can delivery most modules that fall under the leadership and management umbrella. She is a strategic leader with a deep understanding of teaching and leading individuals to excel for over 13 years. Her other major roles include works as a quality assurer and Pearson (EE) External Examiner (Higher Nationals) for BTEC - HN 4-7 Management. Her experience provides her with the skills, qualities and competencies needed to successfully manage liaisons with various partnerships through effective ongoing communication channels to ensure the successful running of an organisation with respect to all the relevant programmes. She is an engineer, holds an MBA and currently pursuing her PhD, her research interests include higher education, mature students, AI, globalisation – education but not limited to.

Dr Syed Ali Tarek
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Syed is an outstanding multi-disciplinary academic with over a decade of UK HEI involvement in teaching and managing UG and PG programmes. Syed is currently a member of the QAA Advisory Group for the Business and Management Subject Benchmark Statement. He is also a Primary Reviewer of the AdvanceHE National Teaching Fellowship Scheme (NTFS). In recent years, Syed had advocated strongly in favour of including 'Sustainability', 'UN SDGs' in UK UG and PG Business and Management curriculum.

Prof Enea Franza
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Prof Enea Franza graduated in Economics and Commerce from the Sapienza University of Rome and completed his studies in law and economics of the European Union, first at the Sapienza University and then at the University of Nice and worked at the Ministry of Economy and Finance. He was a member of the board of statutory auditors of agricultural consortia representing the MEF. After being appointed by the Ministry of Public Function, he became a member of the board of statutory auditors of Formez SpA and Formez Italia SpA. Franza is currently Executive Director at the "Commissione Nazionale per le Società e la Borsa" (CONSOB). He is also responsible for two CONSOB Departments: the Consumer Protection Office and the Chamber of Conciliation and Arbitration Office.
In addition, he is a chartered accountant and a statutory auditor. He teaches Economics at several public and private universities in Italy and abroad. He is the Vice President and Director of the Department of Political Science at the International University for Peace (UPEACE) in Rome, and a member of numerous scientific committees.

Dr Marzia A. Coltri
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Dr. Coltri holds a PhD in Philosophy and Religion from the University of Birmingham in the United Kingdom. She has shown expertise in the Higher Education industry and is a Lecturer in the Institute of Foundation Studies at Arden University, Birmingham UK. She has taught at a number of universities in the UK and internationally. She has published several peer-reviewed papers in the Humanities. She chaired and co-organized the UN-UPEACE online Conference "The Role of the Humanities in Higher Education" - International University for Peace (UPEACE), Rome.

Theme 3: Equality, Diversity, Inclusion (EDI)

Dr Feng Jiao
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Feng is designated as a lecturer and exerts primarily as module leader for MBA International Programme at Arden University. After completing his PhD in Operations Management from Newcastle University, U.K, he has served with numerous academic institutions in the U.K. and engaged in research. Feng is currently working on various projects to aid medical service suppliers and other private healthcare organisations in the UK and China.

Theme 4: Entrepreneurship and SMEs

Dr Samuel Ayertey
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Samuel is currently an Associate Business Lecturer and Dissertation Supervisor at Arden University, UK. He has a Ph.D. in Marketing from the University of Plymouth, UK, and an MBA from the University of Wales, UK. Samuel has worked in a number of marketing companies as digital marketing executive across UK and Africa. He has presented several conference papers in the field of digital marketing, particularly on the impact of emerging technologies on service failure and recovery strategies.

Dr Emmanuel Murasiranwa
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Emmanuel is a senior lecturer at Arden University. He is a Senior Fellow of the Higher Education Academy, a Certified Management and Business Educator and a member of the Institute of Hospitality (MIH). His research interests include service quality, business performance and blended learning. He is an active reviewer for Emerald and Elsevier. His most recent scholarly activities include establishing a school research group, launching the inaugural research Café webinar series and school conference. He holds a PhD in Organisation and Management, an MA in Social Science Research Methods and an MSc in Hospitality and Tourism Management all from Sheffield Hallam University.

Mr Keith Wong
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Keith is the programme leader of Executive MBA (foreign languages). He works as a relationship builder and business content expert with substantial experience in creating learning content, conducting institutional research and strategic planning, and building partner relationships with multinational enterprises, start-ups, and nongovernmental organizations across Asia-Pacific.

Dr Rehana Khanam
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Rehana is an Enthusiastic Lecturer and Researcher with over 15 years of experience as a lecturer, Assessor, Moderator/Internal Verifier (IV), Module Leader, dissertation supervisor, and Mentor. She is a fellow member of HEA, BERA, BAFA, LIBF. She also worked as a Corporate Banker, Director of Finance, and Accountant in different cooperate organisations. Apart from being involved in academia, she is also working as a Business and Finance lecturer in different HE institutions. Her current research areas are quantitative research financial resilience, financial literacy, and financial well-being.

Leadership and Management Research Group

The 1st Holistic and Sustainable Transformation Conference was organised by Leadership and Management Research Group (LMRG), which is a school level research group at Arden University. LMRG is a research group organised by the University academics who are highly engaged themselves in public funded or self-funded research activities. The objectives of the research group are:

1. To provide a platform to promote collaboration among faculty, peer engagement and sharing of good practice.
2. To build collaborative staff/student engagement and build a community of learning.
3. To provide a platform for debate on contemporary leadership and management topics of interest to faculty and students.

The research group has developed 3 main goals for encouraging academics, practitioners and HE students to be contributors in the research community. These 3 main goals are:

The 1st Holistic and Sustainable Transformation Conference is a part of the research activities for the achievement of the above goals. It succeeded in engaging academics and practitioners to contribute innovative ideas and provide insights into current educational and industrial practices.

To engage and understand the current actions and future plans of LMRG in research activities, **please contact: lmrg@arden.ac.uk**