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Content Details:

Mohamed Naseem Ashik Ahamed (Author) *Circle of Success Academy* **Ayshathul Afra Ishaq (Co-Author)** *Circle of Success Academy*	**Recommending Organizational decisions based on comparisons of financial ratios and proposing managerial recommendations based on financial analysis of two reputed international companies UNILEVER & RECKITT BENCKISER**

1.1 Abstract

This report aims to assess the potential for ratio analysis of two organizations and its present, potential, and future impact. Whilst critically evaluating the ratio analysis of & its ability in delivering the vision and mission is a key focus of this research. In this case, as a junior analyst, the author selected two major companies from the London Stock Exchange such as Unilever and Reckitt Benckiser (Choate, 1974).

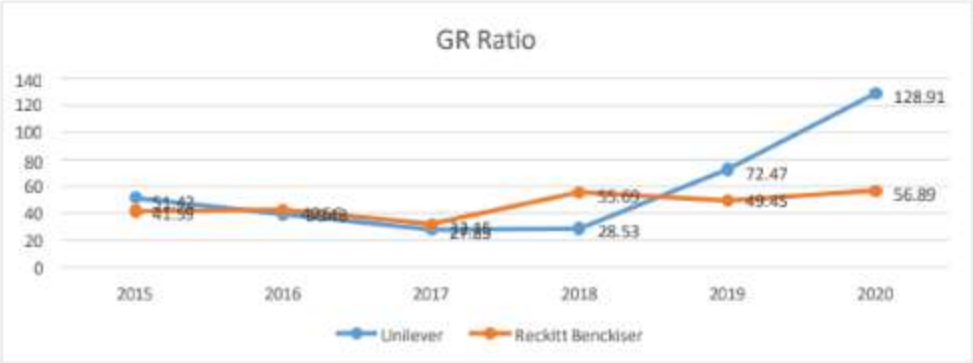
The industry in which both companies operate is considered to be subjected to external risk & strategic uncertainties both domestically & internationally, which are outside of the control of both companies. One, or a combination, of these identified uncertainties, could materially and adversely impact Unilever and Reckitt Benckiser's financial strategy implementation, ability to achieve the strategic goals, and its strategic intent (Fadel Alkadmani & Nobanee, 2020).

Keywords: Growth, Net Profit, Efficiency, Performance,Investments, financial strategies

1.2 Financial Statement analysis

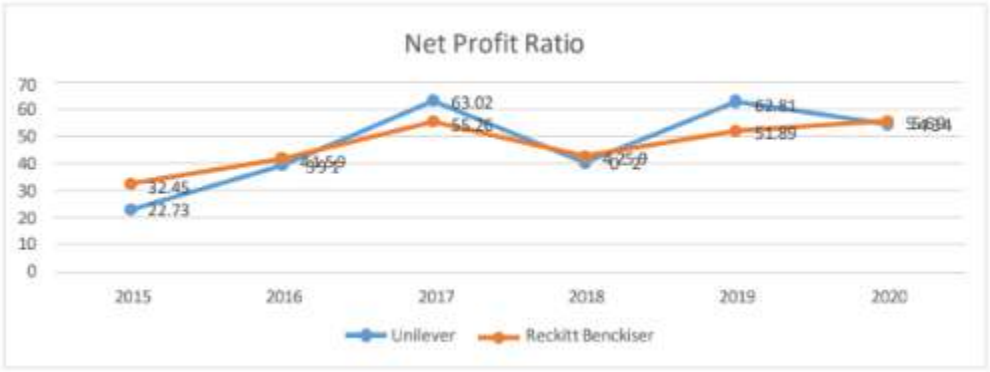
1.2.1 Gross Profit (GP) Margin Ratio

The GP ratio analysis in assessing Unilever and Reckitt Benckiser's identified and discussed below are considered important in determining the type of uncertainty likely to impact and impede Unilever and Reckitt Benckiser's growth. However, Unilever shows a strong performance when compared to Reckitt Benckiser (Hasan et al., 2020).Evaluating the GP ratio analysis via the proposed tools facilitates Unilever and Reckitt Benckiser in market sensing and scenario planning the significance and potentials of the uncertainties that could materially impact the organization positively (Prawirodipoero, 2019).



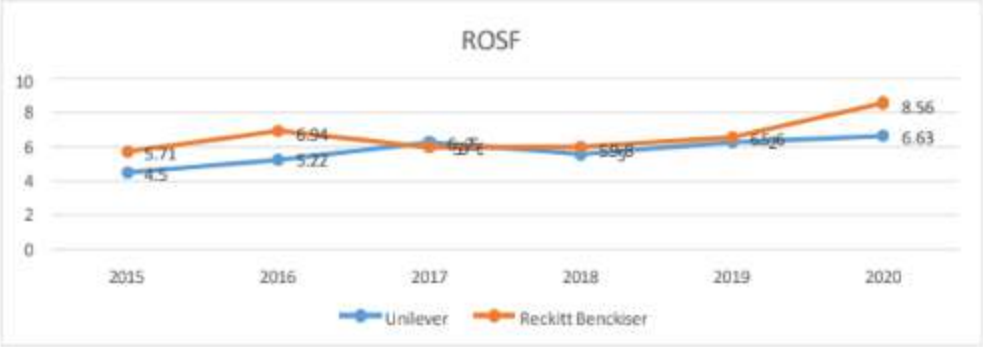
1.2.2 Net Profit Margin Ratio

Net Profit ratio plays a pivotal role in facilitating Unilever and Reckitt Benckiser in considering the critical issues, associated with key financial decisions while keeping strategic issues in their senses, in developing high ratio analysis in preparing Unilever and Reckitt Benckiser for success. Again, Unilever shows a strong performance when compared to Reckitt Benckiser (Babajee et al., 2021).



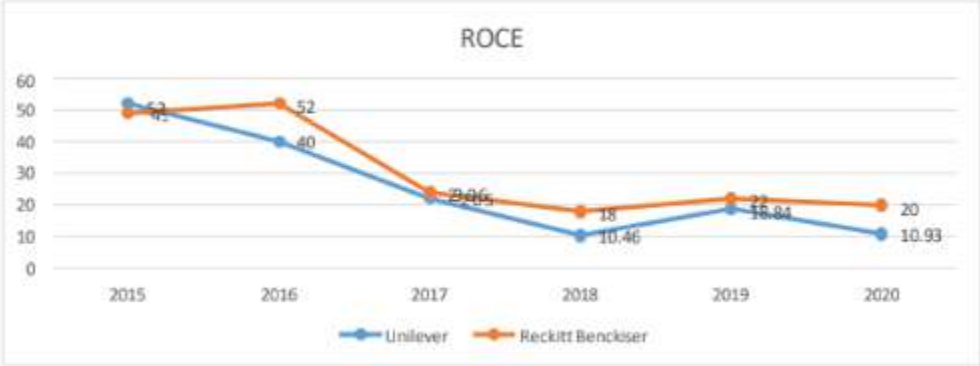
1.2.3 Return on ordinary shareholder'sfund (ROSF)

ROSF analysis impacts Unilever and Reckitt Benckiser positively helps in growth makes it capable of exploiting market opportunities and is likely to impact its concept of practices positively (Kabir et al., 2019). Again, Unilever shows a strong performance when compared to Reckitt Benckiser.



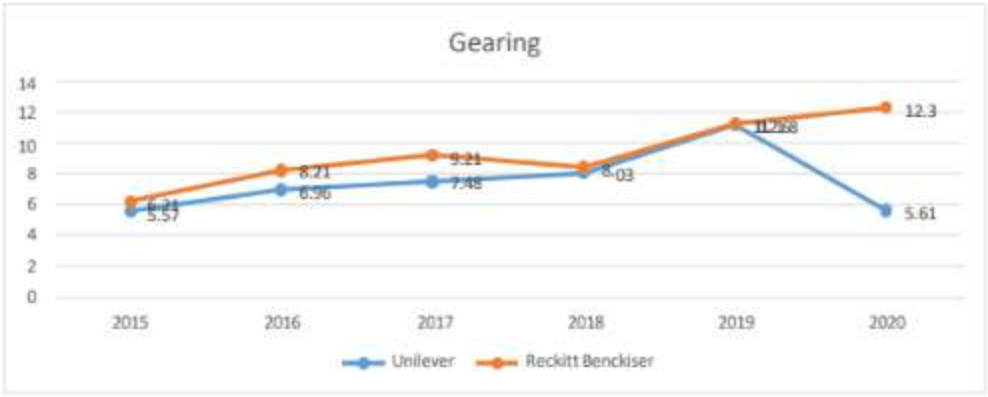
1.2.4 Return on Capital Employed (ROCE)

Unilever and Reckitt Benckiser's ROCE are coercive in terms of profitability & survivability in passing the increased cost to the end customer, which may materially and adversely impact the density of customers ("Efficiency of Financial Ratios Analysis for Evaluating Companies' Liquidity," 2018). Further, this can materially and adversely impact Unilever and Reckitt Benckiser's growth & positioning.Unilever shows a strong performance compared to Reckitt Benckiser.



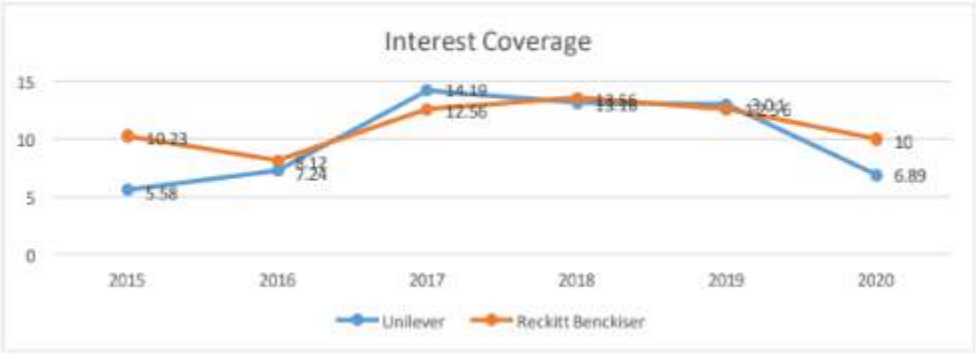
1.2.5 Gearing Ratio

The gearing ratio analysis abilities also negatively impact Unilever and Reckitt Benckiser's ability in capitalizing forecasted growth and profitability across emerging markets and stagnant markets. This is because ratio analysis is considered an important factor in an organization and it can influence the financial decisions (Ali et al., 2020).Unilever shows a strong performance compared to Reckitt Benckiser.



1.2.6 Interest Cover Ratio

Interest cover ratio analysis practices, impact the demand for its products and services in the new normal, as of the changing customer behaviour, expectations & increasing consciousness, which in turn could materially & adversely impact its profitability, cost, worsen the already deteriorating financial performance and impedes its ability in capitalizing forecasted growth rates (Abdi et al., 2021). Unilever shows a strong performance when compared to Reckitt Benckiser.

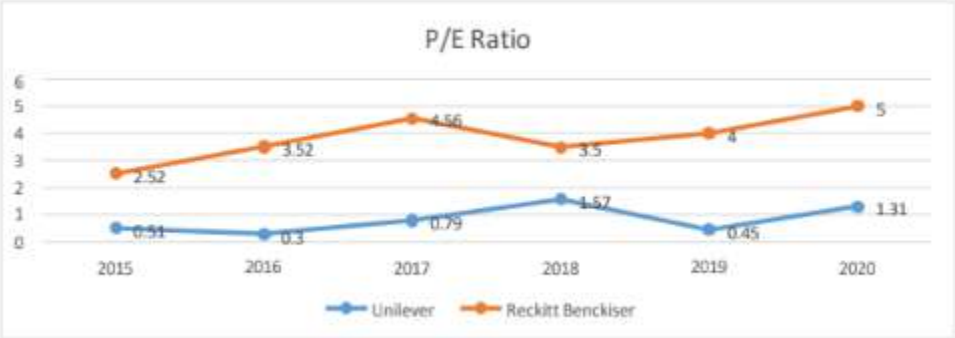


1.2.7 Earnings per Share (EPS)

It could be argued that the outcome of EPS, Unilever, and Reckitt Benckiser can organize and capture value from its infrastructure facilitates and its extensive reach makes it rare and extremely inimitable for its direct competitors to offer the right ratio analysis strategies (GÜLEÇ & BEKTAŞ, 2019).Unilever shows a strong performance when compared to Reckitt Benckiser .

1.2.8 P/E Ratio

P/E ratio analysis strategies will have efficiencies within their operations, efficiencies in internal linkages, efficiencies in external interconnectedness, efficiencies in casual ambiguity, and efficiencies in complex social interconnectedness (Patil & Divekar, 2014). Unilever shows a strong performance when compared to Reckitt Benckiser.



1.3 Managerial Recommendations

In this case, the author recommends Unilever to Penco for their future investments. This will have a positive impact on Unilever's reputation. Future this will help to increase the demand for its products and services. Further, this also result in materially impacting Unilever's ability in leveraging the effective integration among its subsidies, suppliers and distribution hubs. Poor integration of management accounting systems and management accounting reporting could create inefficiencies within its operations and increase transportation costs, this could also impact Unilever's reach & network affect, which can adversely impact Unilever's ethos (Worokinasih & Zaini, 2020). Which in turn could materially and adversely impact the deteriorating financial performance, market growth given to the inability to sustain/acquiring market share, competitiveness, density of customers, and demand for assortments. The continuing impact of the pandemic has resulted in creating an extremely volatile and unpredictable environment for any organization in the world. Therefore, Integration of financial management reporting of Unilever concealed its ability in understanding the evolving customer preferences and trends that they seek

in the new normal. Further, poor integration of financial reporting Unilever will directly be led in materially increasing the overall cost of operations holistically across its market (Rivera & Alarcón, 2020).

1.4 Financial Appraisal Methods

1.4.1 Payback Period

1.4.1.1 Project A – Fourth Year

Project A						
	Inflow	Outflow	Net Cash Flow	COC 12%	NPV	
Year 1	250,000.00	100,000.00	150,000.00	0.89	133,935.00	133,935.00
Year 2	475,000.00	175,000.00	300,000.00	0.80	239,160.00	373,095.00
Year 3	770,000.00	200,000.00	570,000.00	0.71	405,726.00	778,821.00
Year 4	900,000.00	300,000.00	600,000.00	0.64	381,300.00	1,160,121.00
Year 5	1,000,000.00	350,000.00	650,000.00	0.57	368,810.00	
Total	3,395,000.00	1,125,000.00	2,270,000.00		1,528,931.00	

1.4.1.2 Project B – Fifth Years

Project B						
	Inflow	Outflow	Net Cash Flow	COC 12%	NPV	
Year 1	150,000.00	100,000.00	50,000.00	0.89	44,645.00	44,645.00
Year 2	275,000.00	150,000.00	125,000.00	0.80	99,650.00	144,295.00

Year 3	500,000.00	225,000.00	275,000.00	0.71	195,745.00	340,040.00
Year 4	850,000.00	350,000.00	500,000.00	0.64	317,750.00	657,790.00
Year 5	1,100,000.00	420,000.00	680,000.00	0.57	385,832.00	1,043,622.00
	2,875,000.00	1,245,000.00	1,630,000.00		1,043,622.00	

1.4.2 NPV

1.4.2.1 Project A

	Inflow	Outflow	Net Cash Flow	COC 12%	NPV
Year 0	1,000,000.00				(1,000,000.00)
Year 1	250,000.00	100,000.00	150,000.00	0.89	133,935.00
Year 2	475,000.00	175,000.00	300,000.00	0.80	239,160.00
Year 3	770,000.00	200,000.00	570,000.00	0.71	405,726.00
Year 4	900,000.00	300,000.00	600,000.00	0.64	381,300.00
Year 5	1,000,000.00	350,000.00	650,000.00	0.57	368,810.00
Positive NPV					528,931.00

1.4.2.2 Project B

	Inflow	Outflow	Net Cash Flow	COC 12%	NPV
Year 0					(1,000,000.00)
Year 1	150,000.00	100,000.00	50,000.00	0.89	44,645.00
Year 2	275,000.00	150,000.00	125,000.00	0.80	99,650.00
Year 3	500,000.00	225,000.00	275,000.00	0.71	195,745.00
Year 4	850,000.00	350,000.00	500,000.00	0.64	317,750.00
Year 5	1,100,000.00	420,000.00	680,000.00	0.57	385,832.00
Positive NPV					43,622.00

1.4.3 ARR

1.4.3.1 Project A

Total Net Profit/Number of Year/Initial Cost*100

2,270,000.00/5/1,000,000.00 = 45.4

1.4.3.2 Project B

Total Net Profit/Number of Year/Initial Cost*100

1,630,000.00 /5/1,000,000.00*100 = 32.6

1.4.4 IRR

1.4.4.1 Project A

	Inflow	Outflow	Net Cash Flow	COC 12%	NPV
Year 0	1,000,000.00				(1,000,000.00)
Year 1	250,000.00	100,000.00	150,000.00	0.89	133,935.00
Year 2	475,000.00	175,000.00	300,000.00	0.80	239,160.00
Year 3	770,000.00	200,000.00	570,000.00	0.71	405,726.00
Year 4	900,000.00	300,000.00	600,000.00	0.64	381,300.00
Year 5	1,000,000.00	350,000.00	650,000.00	0.57	368,810.00
					528,931.00
					5.28%

1.4.4.2 Project B

		Project B			
	Inflow	Outflow	Net Cash Flow	COC 12%	NPV
Year 0					(1,000,000.00)
Year 1	150,000.00	100,000.00	50,000.00	0.89	44,645.00
Year 2	275,000.00	150,000.00	125,000.00	0.80	99,650.00

Year 3	500,000.00	225,000.00	275,000.00	0.71	195,745.00
Year 4	850,000.00	350,000.00	500,000.00	0.64	317,750.00
Year 5	1,100,000.00	420,000.00	680,000.00	0.57	385,832.00
					43,622.00
					4.36%

1.5 Strategic investment decision

In this case, the author recommends project A, because it has a high NPV and low payback period. Investment appraisal Project A and P Project Bstrive to work beyond the required expectation towards a shared vision and purpose globally in achieving the long-term goals of Project A and Project B as this increases intrinsic motivators. This focuses on extinct motivators for the performance of certain tasks. Project A and Project B striking a balance between the proposed leadership styles can assist them in reaching their optimal potential in implementing the proposed financial strategies.

1.6 Critically analysesstrategic investment decisions

Project A profit reflects an extremely ridged, centralized, bureaucratic, and hierarchical corporate structure and reporting line, which will impede Project A and Project B's ability to react swiftly to the extremely volatile, changing landscape and dynamic environment which it operates (Rivera & Alarcón, 2020). Furthermore, this could result in creating communicational gaps/miscommunication which can make the organization extremely vulnerable to external environment threats and uncertainties which may hinder Project A and Project B's ability to execute the proposed MKD strategies in achieving growth-oriented objectives.

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Intelligent Agronomic Advisory Model for Predicting Best Crop Yields.

Abstract

Nigeria's net worth derives up to 40% of its income from agriculture. Most of the agricultural activities that make this possible are done by smallholder farmers, who make up about 80% of the farming population and produce up to 98% of the total food consumed in the country. At present, farm process planning and management activities by most smallholder farmers are done using manual or crude approaches. Because of this, smallholder farmers' farm process planning and management operations lack standardization, precision, decision support, and guidance, which leads to low crop yields and creates a crisis between farmers and some important stakeholders. This presents a significant risk to the country's food security. The aim of the study is to develop an intelligent agronomic advisory model for predicting the best crop yields. A cross - section of 341 smallholder farmers was given an online questionnaire to gauge the effectiveness of the crop yield prediction systems currently in use. Colored Petri Nets (CPN) tool set (Petri .NETS Simulator 2.0) was used to model farm planning and management workflows. The multilayered perceptron feedforward Artificial Neural Networks (ANN) algorithms were used to present an intelligent agronomic model for the prediction of crop yields. The agile software development methodologies PyCharm 2023.1, Python 3.9, and MariaDB 10.6.5 were used to develop an intelligent agronomic system for prediction of crop yields. Performance evaluation metrics of mean weights of smallholder farmers, accuracy in predicting crop yield, the start and stop time, cost implications of the new system, crop yield, soil pH and texture, and system performance were compared between the new and old systems

Keywords: Crop yield, colored petri nets, artificial neural networks, food security, agronomic

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Artificial Intelligence, Internet of Things, and Hydrogen Fuel Cells- Based Uninterrupted Hybrid Renewable Energy for Real-Time Implementation in the Remote/Desert Houses

Abstract

This research presents an innovative approach to address the critical need for reliable and sustainable energy solutions in remote and desert regions of Ethiopia. By exploring the combinations of advanced technologies including Artificial Intelligence (AI), Internet of Things (IoT), and an array of renewable energy sources solar, wind, hydrogen fuel cells, a bicycle-based electric generator, and a hand-driven generator an uninterrupted hybrid renewable energy system has developed. This system is designed to provide a stable and sustainable green energy to remote (desert houses where limited) no access to conventional energy sources. The installed energy system uniquely integrates renewable sources of Solar Energy, Wind Energy, and latest Hydrogen Fuel Cells Energy with novel human- powered generators to ensure uninterrupted energy availability. The bicycle-based generator and hand-driven generator are not only innovative solutions to energy generation but also promote physical activity and self-sufficiency among residents. These sources are especially critical during periods when solar, wind, and hydrogen fuel cells cannot meet the energy demand, thus ensuring a 24/7 power supply. In this work AI algorithms predicts energy availability and demand, enabling the system to dynamically select the most efficient energy source in real-time. The IoT framework facilitates seamless communication between system components, allowing for real time monitoring, control, and optimization of energy production, storage and distribution. The implementation of this hybrid renewable energy system aims to demonstrate a scalable and replicable model for energy independence in desert areas, reducing dependence on non-renewable energy sources and minimizing environmental impact. Moreover, the system is designed with a view towards scalability, ensuring that it can be adapted for broader applications beyond Ethiopian desert areas, potentially transforming energy access in remote communities worldwide thereby showcasing the model as the best in order to generate and use Uninterrupted Green Energy. The project realized the development of 5 KW installed capacity prototypes with integration of existing renewable energy technologies along with Hydrogen Fuel Cells (Green Hydrogen), bicycle-based and hand-driven generators. Through rigorous testing and optimization, this innovation validated the feasibility, efficiency, and impact of utilized system, showing the way for wider implementation across Ethiopian desert areas. This work represents a significant step forward in achieving energy security, stimulating local innovation, environmental sustainability, and economic development in desert areas and beyond.

Keywords: Artificial Intelligence, Internet of Things, uninterrupted

1.Introduction

Desert regions characterized by sparse populations and challenging geographic conditions, face significant hurdles in accessing reliable and sustainable energy. This research introduces an innovative solution to surmount these obstacles by harnessing a combination of cutting-edge technologies and renewable energy sources. Integrating Artificial Intelligence (AI), the Internet of Things (IoT), solar, wind, hydrogen fuel cells, and human-powered generators, the initiative has developed an uninterrupted hybrid renewable energy system for a 5 KW installed capacity and delivers stable and green energy to areas with limited or no access to conventional power grids, setting a precedent for energy independence, sustainability and similar environments globally. AI and IoT have been utilized for the intelligent management and optimization of the various energy sources to make the entire process automatic and without more involvement of human interference. Use of natural resources to ensure a sustainable and uninterrupted power supply for communities living in remote and desert areas.

1.1 Renewable Energy Technologies and Hybrid Systems

Renewable energy technologies have witnessed significant advancements, promising to address the challenges of energy access and sustainability. The development and optimization of photovoltaic cells, including novel materials like perovskites, have enhanced solar energy efficiency and reduced costs (Zhu et al., similarly, wind energy has seen innovations in turbine design, making it more adaptable to low-wind conditions (Singh et al., 2022). These advancements underscore the potential of hybrid renewable energy systems (HRES) in providing reliable and continuous power supply, as demonstrated by Mishra et al. (2020), who also highlight the role of IoT in optimizing these systems' efficiency and operational performance.

1.2 Distributed Generation and Energy Storage

The paradigm shift towards distributed generation (DG) underscores a move from centralized to localized energy production, reducing transmission losses and enhancing grid resilience (Almas et al., 2018). Energy storage plays a pivotal role in addressing renewable sources' intermittency. Recent breakthroughs in battery technology and the exploration of green hydrogen as an energy carrier underscore the evolving landscape of energy storage solutions, offering higher energy densities and safety profiles (Kumar et al., 2022; Zhao et al., 2023).

1.3 Artificial Intelligence and IoT in Smart Energy Management

AI and IoT are revolutionizing energy management, providing tools for precise forecasting, decision-making, and system control. The application of machine learning algorithms for intelligent control of renewable energy sources is shown to optimize energy generation and

consumption (Ding et al., 2016; Barrero et al., 2018). These technologies facilitate the creation of self-adaptive systems, crucial for managing the complexities of HRES.

1.4 Human-Powered Energy Generation

Innovative approaches to energy generation, such as human-powered generators, offer sustainable solutions that complement traditional renewable sources. Incorporating bicycle-based and hand-driven generators not only diversifies the energy mix but also fosters community involvement and promotes physical health (Gupta et al., 2019).

1.5 Smart Villages: A Model for Sustainable Development

The smart village concept, leveraging renewable energy, IoT, and AI, presents a comprehensive model for enhancing living standards and economic opportunities in rural settings (Khadem et al., 2020).

2. Statement of the Problem

Remote and desert households are predominantly relying on non-renewable energy sources, which are both environmentally detrimental and economically unsustainable. The challenges of energy insecurity are exacerbated by the intermittent nature of renewable energy and the high costs and maintenance requirements of traditional power infrastructures. Furthermore, desert areas unique climatic conditions characterized by prolonged periods of sunlight and significant wind potential present untapped opportunities for renewable energy generation, yet have not been fully leveraged due to existing technological and logistical limitations. The absence of a reliable and continuous energy supply in these regions poses critical challenges to local development, hindering socio-economic progress and efforts towards environmental conservation. There is a pressing need for an innovative and multifaceted energy solution that transcends conventional limitations, optimizing the use of natural resources to ensure a sustainable and uninterrupted power supply for communities living in remote and desert areas.

3. Objectives

The objectives of a research focusing on implementing a hybrid renewable energy system in remote and desert regions, incorporating advanced technologies like Artificial Intelligence (AI), the Internet of Things (IoT), and human-powered generation mechanisms, would be meticulously designed to address the specific challenges and goals of the research. Here are the objectives, articulated in a structured manner:

3.1 To Design and Implement a Hybrid Renewable Energy System

Develop a scalable and efficient hybrid renewable energy system that combines solar, wind, hydrogen fuel cells, and innovative human-powered generators.

3.2 To Integrate Advanced AI and IoT

Technologies for Energy Management Utilize AI algorithms for predictive analytics, optimization, and intelligent control of the energy system. Incorporate IoT devices for real-time monitoring, control, and maintenance of the energy infrastructure, ensuring optimal performance and energy distribution.

3.3 To Enhance Energy Storage and Distribution

Implement cutting-edge energy storage solutions, including advanced battery technologies and green hydrogen, to ensure energy availability during periods of low generation. Develop a distributed generation model that reduces transmission losses and enhances the resilience of the energy supply.

3.4 To Promote Sustainable Development and Energy Independence

Facilitate socio-economic development in remote and desert communities through access to clean and affordable energy. Aim to reduce dependence on non-renewable energy sources and minimize environmental impact, contributing sustainability goals and energy security.

3.5 To Foster Innovation and Community Engagement

Encourage local innovation and entrepreneurship in renewable energy technologies. Involve communities in the energy generation process, particularly through human- powered energy solutions, to promote awareness, participation, and sustainable practices.

3.6 To Conduct a Comprehensive Feasibility and Impact Assessment

Evaluate the technical, economic, and environmental feasibility of the proposed hybrid renewable energy system. Assess the project's impact on improving energy access, reducing carbon emissions, and enhancing the quality of life for residents in targeted areas.

4 . Research Methodology

The implementation of a hybrid renewable energy system in remote and desert regions, employing Artificial Intelligence (AI), the Internet of Things (IoT), and human-powered generators, a detailed research methodology and implementation ways are crucial.

Preliminary Research and Feasibility Study:

- Conducting a comprehensive literature review to gather insights on the latest technologies in hybrid renewable energy systems, AI, IoT, and human- powered energy generation.
- Performing a feasibility study to assess the technical, economic, and environmental viability of implementing such a system.

System Design and Technology Selection:

- Designing the hybrid renewable energy system architecture, integrating solar, wind, hydrogen fuel cells, and human-powered generators.
- Selecting appropriate AI algorithms for energy management and IoT devices for system monitoring and control.

Development and Testing of AI and IoT Framework:

- Developing AI-based predictive analytics and optimization algorithms tailored to the hybrid system.
- Implementing the IoT framework for real-time data collection, monitoring, and remote control of the energy system.
- Conducting laboratory tests to validate the AI algorithms and IoT integration, ensuring system compatibility and efficiency.

Evaluation and Optimization:

- Collecting and analyzing data on energy generation, consumption, storage, and distribution metrics.
- Evaluating the system's impact on energy access, reliability, and sustainability in the target community.
- Optimizing the system based on performance data, refining the AI algorithms and adjusting the IoT settings to enhance efficiency and reliability.

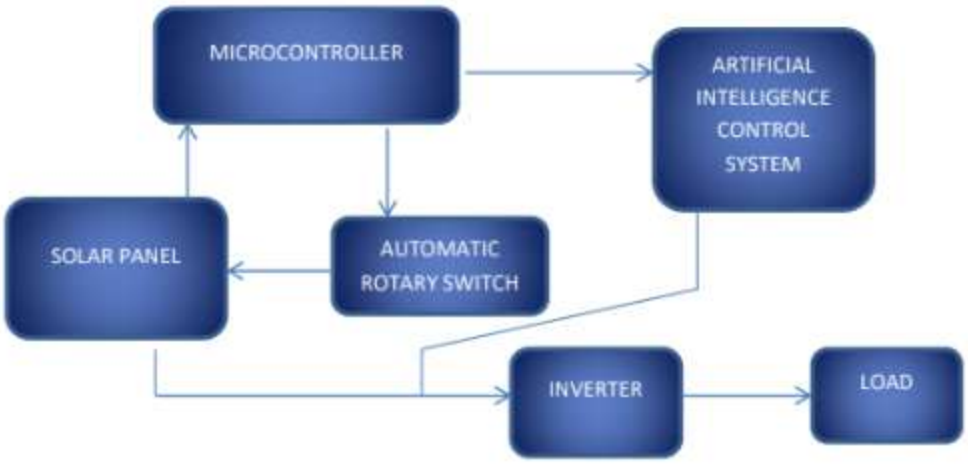


Figure 1. Conceptual Block diagram of intelligent solar power

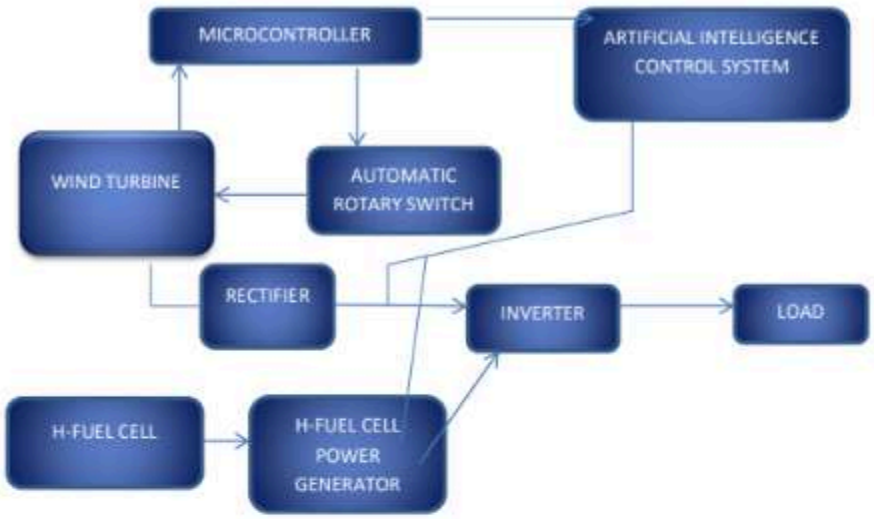


Figure 2. Conceptual Block diagram of intelligent Wind and H-fuel energy system

Figure 3. conceptual diagram of IoT and data processing control

Developments of the system Artificial intelligence, IoT based uninterrupted green energy generation developed consisting of solar panel, wind, hydrogen fuel cell. All of these three energy sources together we call a hybrid renewable energy. The real time implementation of these is the latest model with respect to the hydrogen fuel cell charge controller directing to the inverter. All these things are controlled by Artificial IoT mobile. To verify theoretical analysis mentioned in last sections, all systems which are connected to a boost dc-dc converter are simulated by using MATLAB/SIMULINK. The data generated from the Neural network will be generated in order to control the boost converter of wind and solar PV energy system conversion All data parameters, solar panels, fuel cell, how much power is coming all these details is given to the artificial neural network program. NN processes online data from IoT by random programming, every time to time update data processed automatically by Artificial intelligence NN. The other point is that in order to stimulate whenever the battery becomes low automatically it takes power from others. The overall system is stimulated on MATLAB/SIMULINK successfully and also the prototype demonstration has successfully developed, Figure 7.

Major Components used for prototype implantation.

Table 1. some components used during prototypes

Item	Specifications and Reference	Quantity
PV Solar Panel with inverter and charger circuit	2KW, Power output: AC and DC	2
Wind Turbine Generator	2KW, 48V, 3m/s to 10 m/s	2
Hydrogen fuel cell	Power output: 1kW , Voltage range: 30-50 volts , Current range: 40-70 amps, Efficiency: 50-60%, Operating temperature:70-90°C, Fuel type: Hydrogen gas (H2), Fuel consumption rate: 0.5-1.0 kg/h, Stack size: 5-10 cells, Weight: 20-30 kg	1
Bicycle Generator		
Hand driven Generator		
Battery		
DC/AC Inverter	12 kW, Input voltage:48 V/78V, Input Current: 35- 50 A Output voltage: 220 V AC pure sine, output current: 36-55 A,	1
Arduino Mega micro controller	MEGA 2560 R3 Board ATmega2560-16AU CH340G + USB Cable for Arduino	2
Intelligent Charger Module	12V , Starting Voltage: 10.5V-11.5V, .Blocking Voltage: 14.4V-14.8V	10

Result Discussion and Implementation

The power generated from the hybrid components, and Artificial neural network are simulated and discussed in the section below.

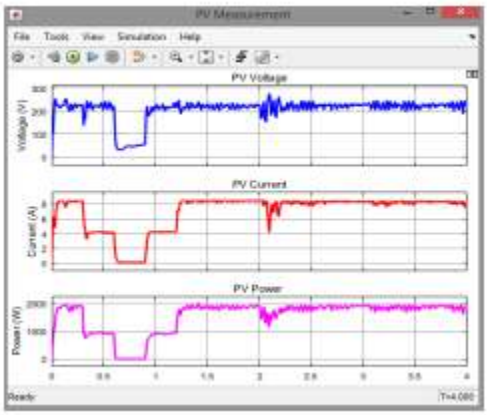


Figure 4. V-I and P-V characteristics curve of solar generated power based A/Neural nework

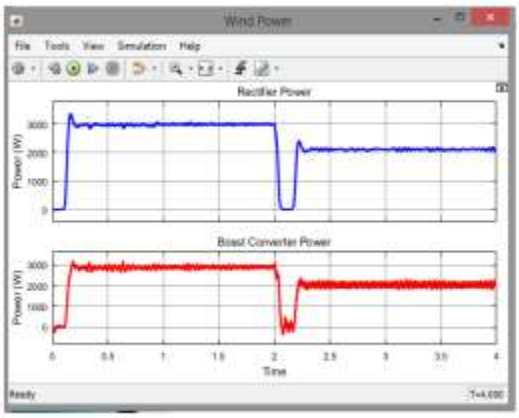
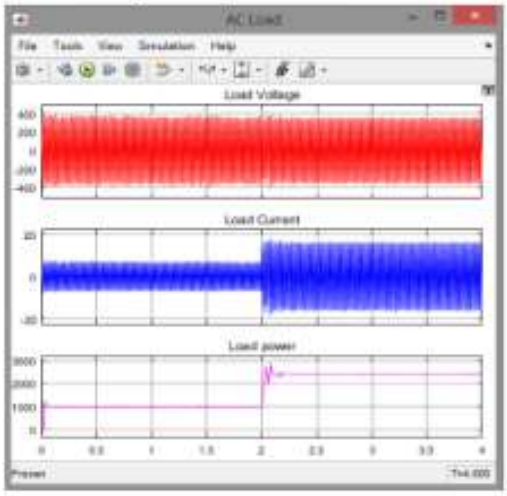


Figure 5. Wind turbine power output based Neural Network



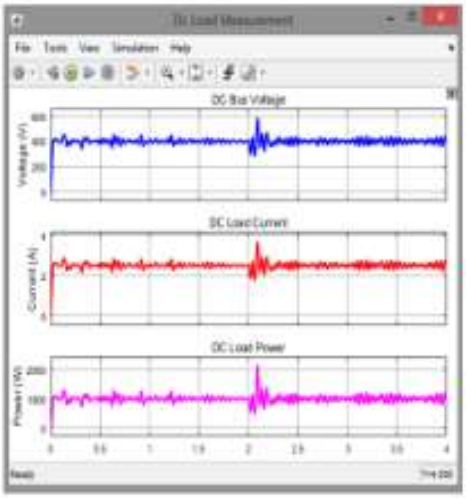


Figure 6. AC and DC load measurements Based Artificial Neural Network.

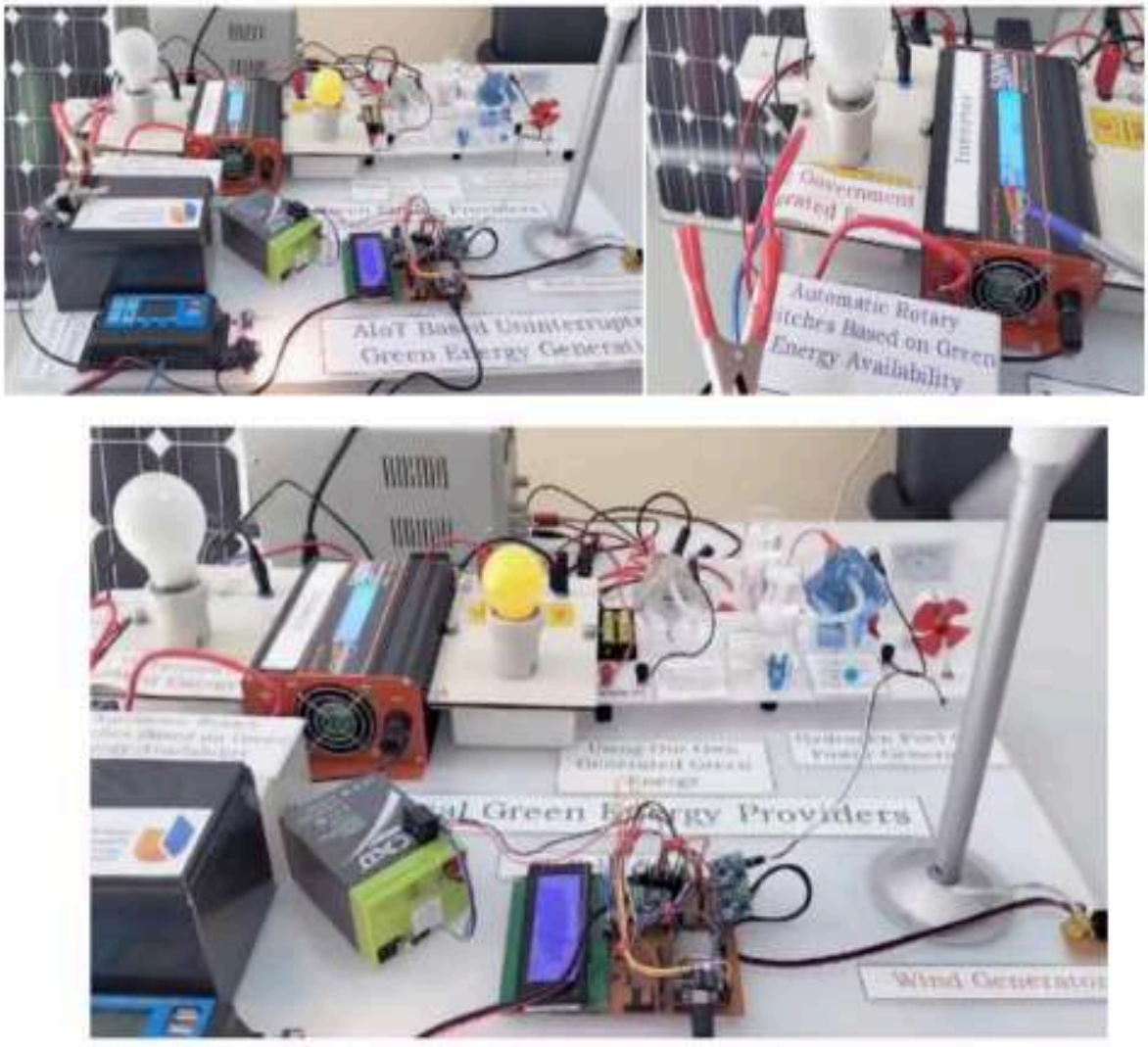


Figure 7. Implementation of the Artificial Intelligence, Internet of Things, and Hydrogen Fuel Cells- Based Uninterrupted Hybrid Renewable Energy for Real-Time

Conclusion

Generally AI and IoT has been utilized for the intelligent management and optimization of the various energy systems installing solar panels, wind, hydrogen fuel cells, and human- powered generators to make the entire process automatic and without more involvement of human interference. The viability and innovative potential of implementing a hybrid renewable energy system in remote areas and desert regions has profound academic, scientific, and innovation significance. It advances knowledge in renewable energy technologies, promotes interdisciplinary skills. By capitalizing on advancements in renewable technologies, distributed generation, energy storage, and smart energy management, the research aims to deliver a scalable, sustainable, and efficient solution to energy challenges. This endeavor contributes significantly to global efforts toward energy security, environmental sustainability, and socio-economic development in underserved communities, marking a step forward in the quest for universal access to clean energy. The work provided a reliable and continuous power supply to remote and desert houses, addressing the inherent intermittency issues of renewable energy sources, leveraging technology and innovation to achieve sustainable energy solutions, economic development, and environmental preservation. The successful execution of this research could serve as a blueprint for similar initiatives globally, contributing to the advancement of renewable energy and sustainable development. For the future this research may lead to the development of new software algorithms, hardware configurations, and operational models that can be patented and commercialized.

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Navigating ESG Reporting Under European CSRD:
Insights and Challenges from a Consultancy Start-up Perspective.

Abstract

This paper provides a comprehensive analysis of Envitrail's experience with ESG reporting under the Corpo- rate Sustainability Reporting Directive (CSRD) from the perspective of a consultancy start-up. Envitrail, based in Prague, Czech Republic, has been advising companies on sustainability for three years, navigating the com- plexities of EU regulations. The paper highlights key challenges encountered with the European Sustainability Reporting Standards (ESRS), particularly in relation to administrative burden, ambiguous guidelines, and the role of the Double Materiality Assessment. Furthermore, the paper explores issues of compatibility with exist- ing GHG reporting standards, such as the GHG Protocol and ISO 14064-1, and discusses the indirect impact of the CSRD on small and medium-sized enterprises (SMEs) that supply larger firms. The conclusions empha- size the need for clearer guidelines, alignment of standards, and a focus on tangible sustainability projects over extensive reporting requirements

Keywords: Sustainability reporting; CSRD; ESRS; Consultancy start-up; GHG footprint

1 Introduction

Envitrail is a consultancy start-up based in Prague, Czech Republic, specializing in sustainability reporting and advisory services. With three years of experience operating in the European Union market, we have gained valuable insights into the challenges and opportunities that arise from compliance with evolving sustainability frameworks. A core aspect of our services involves the use of certified, third-party software to assist clients in accurately calculating their carbon footprints, ensuring reliability and transparency in the reporting process. However, despite the progress made in ESG (Environmental, Social, and Governance) reporting, we frequently encounter significant challenges stemming from the current state of EU legislation, particularly with the Corporate Sustainability Reporting Directive (CSRD)(European Parliament and Council, 2022). While the directive aims to standardize sustainability reporting, many of its legal and technical components remain unclear, leading to difficulties in interpretation and compliance. State officials, tasked with enforcing the regulations, often lack the necessary understanding of the technical standards, adding another layer of complexity for companies like ours. As a consultancy start-up, we have also observed that "smaller" large companies – e.g. those with 500 to 1,000 employees – face unique obstacles when it comes to ESG reporting. For many of these companies, producing a full-fledged ESG report remains a costly and resource-intensive endeavor. Our approach is to seek out minimum- effort solutions that still meet regulatory

requirements while balancing cost and efficiency for these businesses. This paper summarizes our experiences navigating these challenges and offers insights into practical solutions for streamlined ESG reporting under the CSRD framework.

2 Corporate Sustainability Reporting Directive (CSRD)

The Corporate Sustainability Reporting Directive (European Parliament and Council, 2022), adopted in December 2022, is a mandatory EU standard for non-financial reporting. It will require companies and institutions to disclose information on their environmental, social (e.g. care of employees) and corporate governance.The aim is to make non-financial reporting an integral part of mandatory reporting in general. In other words, the disclosure of such information will gradually be put on a par with the disclosure of economic results. In this way, the reports will provide a truly comprehensive view of the functioning of a given company or institution. There are a number of reasons why the EU has adopted CSRD, but the main one is the desire to tackle climate change and other negative impacts on the environment and society itself. This effort is not new; for example, in the financial world it is increasingly common to take into account a company's approach to sustainability, i.e. the ESG (environmental, social, governance) aspect and the ESG score of the company. It takes into account, among other things, the company's impact on the environment and society in general or its overall transparency. How well a company has incorporated ESG principles into its strategy and day-to-day operations tends to be a key metric for some investors, which is why many companies already routinely report their ESG performance, even though it is not yet universally mandatory and there is no clear European standard.The emerging CSRD will help investors to direct their investments towards greener companies. But it will also be important for companies seeking credit. Banks will require them to provide information on the sustainability of their business when granting a loan. If companies can show that they have no negative environmental impact or have measures in place to mitigate it, they will qualify for more favourable loans, while those without non-
financial reporting will de facto have their doors closed. For selected companies (mainly banks, insurance companies and publicly traded companies) with 500 or more employees, non-financial reporting is already mandatory, based on the 2014 European Non-Financial Reporting Directive (European Parliament and Council, 2014), which the CSRD is building on to clarify and extend the rules to a wider range of entities. However, non-financial reporting has so far been defined in general terms and the individual metrics that companies should report are not specified. The CSRD will apply to all entities that have more than 250 employees and an annual net turnover of more than C40 million or an annual balance sheet total of more than C20 million. The CSRD will also be mandatory for publicly traded companies, with the exception of micro-enterprises. While currently non-financial reporting is mandatory for about 11,500 large companies in the EU, CSRD will apply to more than about 50,000 companies. Some will, however, "avoid" this obligation, as parent companies can make a consolidated report, but they will still have to provide their parent

company with the necessary inputs, and this is also something to prepare for. To support the implementation of the CSRD, the European Sustainability Reporting Standards (ESRS) (EFRAG, 2024) are developed as a set of detailed guidelines. These standards are designed to provide companies with a framework for disclosing sustainability-related information, ensuring transparency and comparability across the EU market. The ESRS covers environmental, social, and governance topics, offering a standardized approach to reporting that aligns with the CSRD's goals of enhancing corporate accountability and investor trust. The European Financial Reporting Advisory Group (EFRAG) plays an advisory role in the development of these standards, acting as an advisory body to the European Commission. EFRAG collaborates with various stakeholders, including businesses, civil society, and government institutions, to create reporting guidelines that reflect the needs of both companies and investors. By bridging the gap between legislation and reporting practices, EFRAG ensures that the ESRS not only align with the CSRD's requirements but also provide a roadmap for companies to follow in their sustainability reporting efforts. The fundamental concept within the ESRS is the Double Materiality Assessment. It requires companies to evaluate and disclose information from two distinct perspectives: how sustainability issues affect the company's financial performance (financial materiality) and how the company's operations impact society and the environment (environmental and social materiality). This dual approach ensures that organizations provide a comprehensive view of their sustainability performance, addressing the concerns of a wide range of stakeholders, including investors, customers, employees, and regulators. Under the ESRS framework, conducting a Double Materiality Assessment is crucial for identifying the material topics that should be included in sustainability reports.

3 Challenges with EU Sustainability Reporting

3.1 Heavy administration

As previously mentioned, reporting under the CSRD (European Parliament and Council, 2022) and its ESRS standards (EFRAG, 2024) is rather burdensome and remains unclear in important details. This uncertainty may be caused by the fact that only a few companies have submitted their reports so far, and standard practices are still evolving. The lack of established guidelines makes it challenging for organizations to navigate the reporting process effectively. Many consultancies see significant business potential in offering services for CSRD reporting and often prefer extensive interpretations of the legislation, resulting in very long reports. Some of these consultancies are highly influential, which may pose problems by promoting exhaustive reporting practice that is not necessarily required. A critical factor determining the extent of the report is the Double Materiality Assessment, which defines material topics for the ESRS report (EFRAG, 2024). However, the lack of clear rules regarding the extent and selection of these topics poses challenges for companies. Organizations must determine which issues are most significant without definitive guidelines, leading to variability in reporting practices. We advocate for

focusing on fewer, but more thoroughly elaborated topics, emphasizing real projects over extensive reporting. This approach aligns with the principle that tangible actions, rather than lengthy documents, drive genuine progress in sustainability. In other words, the emphasis should be on implementing real projects rather than just reporting; after all, Excel sheets do not save the planet—real projects do. With the exception of the carbon footprint calculations, all the information required for the CSRD according to the ESRS standards already exists within companies, albeit in different forms. For example, strategies are often included in ISO 9001 certifications, waste information is covered by existing national legislation, and employee statistics are maintained in company IT systems. The challenge lies in consolidating this information into a coherent report. Problems arise when consolidating reports of multinational companies, as legal definitions may not be consistent across countries. For instance, the definition of an employee's full-time equivalent varies between Germany and Portugal, complicating the aggregation of employee data. These discrepancies highlight the need for clearer guidelines and standardized definitions within the CSRD framework.

3.2 EU Taxonomy Discussions

The EU Taxonomy (European Parliament and Council, 2020) is a classification system established by the European Union to identify environmentally sustainable economic activities. Its primary purpose is to guide investors, companies, and policymakers by providing clear definitions of what constitutes a sustainable activity, thereby facilitating the transition towards a low-carbon, resilient, and resource-efficient economy. The Taxonomy focuses on six environmental objectives:

- Climate change mitigation
- Climate change adaptation
- Sustainable use and protection of water and marine resources
- Transition to a circular economy
- Pollution prevention and control
- Protection and restoration of biodiversity and ecosystems

While the criteria for activities related to climate change are well-developed and detailed, the other environmental objectives remain somewhat vague and are still under development. The EU Taxonomy is an evolving framework, with new economic activities being added to its scope over time. This ongoing expansion aims to encompass a broader range of industries and activities, but it also contributes to the current uncertainty and complexity in reporting. Information from the EU Taxonomy is incorporated into the ESRS reports, linking a company's reported activities to standardized sustainability criteria. However, this integration poses challenges for companies whose activities are not yet included in the Taxonomy. These companies face difficulties in determining how to align their reporting with the Taxonomy's requirements, leading to potential inconsistencies and confusion. Another area of ambiguity is the level of detail required when classifying a company's activities. For example, a company manufacturing automotive parts may

also have logistics operations. Since logistics is not their core business, it is unclear whether this activity should be included in their Taxonomy-related reporting. This lack of clarity makes it challenging for companies to decide which activities to report and to what extent. Moreover, there is a divergence in how different stakeholders interpret the purpose of the EU Taxonomy. EU banks, for instance, often view the Taxonomy as a tool for classifying and financing sustainable projects. However, the Taxonomy was originally intended as a classification system for companies based on their economic activities. This misalignment can lead to inconsistencies in how the Taxonomy is applied across different sectors and uses. In summary, while the EU Taxonomy serves as a critical tool for standardizing sustainability efforts within the EU, its current state of development presents several challenges. The incomplete nature of the classification system, especially beyond climate-related activities, and the lack of clear guidelines on the depth of reporting required, contribute to the complexities faced by companies. Addressing these issues is essential for the effective implementation of the CSRD and for achieving the EU's broader sustainability goals.

3.3 Compatibility with Carbon Footprint Standards

The European Sustainability Reporting Standards (ESRS) mandate companies to report their greenhouse gas (GHG) emissions. Surprisingly, despite being an EU regulation, the GHG reporting requirements are not based on the widely recognized International Organization for Standardization (ISO) standards but instead rely on the American-developed GHG Protocol (WRI and WBCSD, 2004). This choice raises questions about compatibility and consistency with existing European standards.

Both the GHG Protocol (WRI and WBCSD, 2004) and ISO 14064-1 (ISO, 2018a) are fundamentally de signed as risk and opportunity management standards. Developed in the early 2000s, these standards aim to help organizations measure and manage their GHG emissions effectively. However, the ESRS focuses solely on the reporting aspect, utilizing these longstanding standards in a manner that diverges from their original intent. This narrow focus on reporting, rather than on managing risks and opportunities, can lead to challenges and potential misalignments in how companies approach their GHG emissions.

Moreover, the ESRS does not consider the reporting company's ability to reduce GHG emissions in specific categories. Under the ESRS framework, all emissions must be reported regardless of the company's capacity to influence them. This extensive reporting requirement may not accurately reflect the company's efforts or potential to mitigate emissions in areas where they have control. Furthermore, this requirement puts an unnecessary reporting burden on the reporting companies.

Additionally, even small companies may fall under the CSRD indirectly if they are suppliers to large companies. These larger companies, obligated to report under the CSRD, may request their suppliers to provide carbon footprint data to account for Scope 3 emissions in their value chain.

Consequently, small and medium sized enterprises (SMEs) may be asked to report their carbon footprint either at the organizational level using the GHG Protocol or ISO 14064-1, or at the product level using ISO 14044 (ISO, 2006) or ISO 14067 (ISO, 2018b). This indirect impact extends the reporting requirements beyond the initially targeted large companies, potentially placing a burden on smaller businesses that may lack the resources or expertise to conduct detailed emissions reporting.

Another issue arises from the terminology used within the ESRS. Although it is based on the GHG Protocol, the ESRS employs different terms, which can cause confusion among reporting entities. For example, the term estimation is not clearly defined in the ESRS. It is unclear whether this term refers solely to actual estimates based on measured data or if it also includes spend-based methods, which estimate emissions based on financial expenditure. This lack of clarity can lead to inconsistencies in reporting and difficulties in comparing data across companies.

Overall, the divergence between the ESRS requirements and established carbon footprint standards presents challenges for companies striving to comply with the new regulations. Aligning the ESRS with existing standards like ISO 14064-1 and clarifying ambiguous terminology would enhance compatibility and facilitate more effective GHG reporting and management. Addressing these issues is crucial for ensuring that companies can effectively contribute to sustainability goals without unnecessary administrative burdens.

4 Conclusions

In conclusion, our experience with ESG reporting under the European CSRD framework has highlighted several key takeaways that both companies and consultants must be aware of as they navigate the evolving sustainability landscape:

1. Complex and evolving regulations: The ESRS reporting requirements, though designed to provide a standardized approach, remain complex and somewhat unclear, particularly as the regulations continue to evolve. This creates significant administrative burdens, particularly for companies that lack clear guidance on how to interpret and apply these standards.

2. Double Materiality and GHG reporting: The ESRS framework's reliance on the Double Materiality Assessment and the GHG Protocol presents challenges in how companies define material issues and re port emissions. The absence of alignment with ISO standards and the varying terminologies used create additional complexity in ensuring compliance and accuracy in reporting.

3. Impact on smaller companies: While CSRD reporting is primarily targeted at large companies, small and medium-sized enterprises (SMEs) are indirectly impacted, especially if they supply goods or services to larger firms. These SMEs are increasingly required to report carbon emissions, to an unnecessary ex tent, placing a reporting burden on companies

that may lack the resources or expertise to manage these requirements effectively.

Addressing these issues will be essential for improving the clarity and effectiveness of sustainability reporting across the EU. Companies must focus on tangible sustainability projects and real impact, while regulators and stakeholders work towards refining the standards to ensure they are practical and manageable.

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Victor Kweku Bondzie Micah (Author) *Takoradi Technical University*	**Corporate Governance and Firm Performance in the Alternative Investment Market: Evidence from UK**

Abstract

The study investigates the link between corporate governance (CG) and firm performance for AIM listed firms in the UK. This involves analysis of various corporate governance mechanisms and its impact on financial performance. This study relies on a sample of 82 AIM listed firms in the UK from 2012 to 2016 to examine the relationship between corporate governance and firm performance using panel regression analysis. The findings of the study revealed that board size is negatively related to all the performance indicators (ROSF, ROA and EPS) but statistically significant for only ROSF. However, the number of non-executive directors on board has a statistically positive effect on ROSF and ROA but statistically insignificant for EPS. The study adds new dimensions to the corporate governance literature by contributing to the policy debate with respect to appropriate governance mechanisms relevant to AIM companies whose compliance with CG differs from companies on the main stock market.

Keywords: Corporate Governance; Firm Performance; Agency Theory, Resource Dependency Theory, Alternative Investment Market; UK.

1. Introduction

Following the spectacular corporate scandals and failures resulting from the weak governance system that occurred in Europe and the USA (e.g., Enron, WorldCom, Xerox and), the question as to whether corporate governance matters for firm performance has interested practitioners in the field. In an attempt to address the question that hangs the neck of corporations around the globe, several empirical studies (Lee and Filbeck, 2006; Abdullah , 2007) have been conducted to examine the impact of corporate governance on firm performance, yet the results have been mixed and inconclusive and the question as to whether corporate governance matters for firm performance still remains a puzzle. Whilst some empirical studies have documented positive relationship between corporate governance and firm performance other studies have shown negative relationship (Beiner et al., 2004; Ghosh, 2006; Agyemang and Castellini, 2015; Patel, 2017). Other empirical studies have also documented statistically no significant relationship between corporate governance and firm performance. (Prevost et al., 2002; Weir et al., 2002). The inconsistencies in the results of the literature can be explained in different ways. However, a contextual view, particularly, in the case of Alternative Investment Market (AIM) companies is limited. The few existing empirical studies on the (AIM) companies have focused on minimum compliance with good governance practices and the rate of disclosure (Mallin and Ow-Yong,

2012; Shah, 2014). Therefore, owing to the limited studies that exist on corporate governance and firm performance and the fact that corporate governance structures for AIM listed firms differ from those in the main market, we expect to gain in-depth evidence on the implications of corporate governance on firm performance in the AIM listed firms .

The findings of the study were as follows: Board size is negatively related to all the performance indicators (ROSF, ROA and EPS) but statistically significant for ROSF. However, the number of non-executive directors on board has a statistically positive effect on all the performance measures but is statistically significant for only ROSF and ROA. Regarding ownership and firm performance, the study documented negative relationships between ownership and firm performance and was statistically significant in the case of institutional shareholdings for all the performance measures.

The study adds novelties to the existing literature as it departs from the conventional use of the agency theory to include the resource dependency theory and market for corporate control to examine the impact of corporate governance on firm performance.

2.1 Empirical Review and Hypothesis

2.1.1 Board size and firm performance

Drawing on the resource dependency theory it is argued that directors of a corporation provide the firm access to wealth of resources such skills, information, key constituencies including but not limited to customers, suppliers, policy makers, social groups, bankers and assures the firm of external legitimacy which reduces uncertainty and ultimately leads superior firm performance (Gales and Kesner, 1994). These assertions have been supported by various empirical findings including Adams and Ferriera (2007), who observed that larger board represent pool of expertise, ensure greater management oversight and provide access to wider range of resources and contracts.

Contrary to the foregoing assertion, Yawson (2006) found that that lager boards are often bewildered with a lot of challenges which stem from higher agency problems, and thus they become less effective in comparison with smaller boards size. Empirical findings by Guest (2009) on UK listed firms from 1981 to 2002 revealed that board size is negatively related to profitability. However, drawing from the argument of the resource dependency theory, we hypothesize that:

H1: Large board size is positively related to firm performance

2.2 Non-executive directors and firm performance

Based on the perspective of agency theory, it can be deduced that a board consisting of a high proportion of NEDs will ultimately lead to the implementation of strategies that will consequently increase shareholders wealth. This is because NEDs deepen the independence of the board, ensures greater managerial oversight and control and add to the diversity and expertise of the board (Abdullah, 2004). As emphasised by Boakye (2018), the addition of the independent outside directors is important in balancing the scale of decision making at the boardroom to prevent management's opportunistic behaviour

Contrarily to the foregoing assertions, Agrawal and Knoeber (1996) documented that the number of NEDs on board are often driven political machinations which results in too many outsiders on the board which impact negatively on firm performance. Based on both the theoretical and empirical arguments, the study hypothesized that:

H2: The proportion of independent directors is positively related with firm performance

2.3 Managerial ownership and firm performance

The agency theory suggests that managerial ownership helps in reducing the conflicts of interest that exist between shareholders and professional managers (Jensen and Meckling, 1976; Fama, 1980). This convergence-of-interests model asserts that as the percentage of shares owned by managers increases, their interests and those of shareholders become more aligned, and therefore, no incentive to engage in opportunistic behaviour. This has been emphasised by Gugler et al. (2008) that Managers opportunistic behaviour will cease to exist if they own large proportion of shares in the firm.

However, another strand of literature debates managers' entrenchment as an alternative hypothesis to convergence-of-interests (Morck et al., 1988; McConnell and Servaes, 1990; Short and Keasey, 1999). The entrenchment hypothesis proposes that the market forces, both internally and externally, aid in aligning shareholders' interests with those of the managers when managerial ownership is at low levels. This has been supported by the empirical findings of Davies et al. (2005). Thus, the study hypothesized that:

H3: A positive relationship exists between managerial shareholding and firm performance.

2.4 Institutional investors

Institutional blockholders such as pension funds, e.g. CULPERS, mutual trusts and fund managers by virtue of their relatively large share have incentives to monitor and exercise greater control over managers. This helps to mitigate the agency problems that have taken the centre stage of modern corporate finance (Jensen and Meckling 1976). Consistent with the work of Jesen and Meckling (1976), Shleifer and Vishny (1997) pointed out that blockholders thus help reduce the principal-agent conflicts as they have keen interest in both profit maximization and a

commanding control over the assets of the company to have their interest respected. Empirical findings based on S & P 100 firms by Cornett et al. (2007) discovered that institutional share ownership impact positively on operational performance of the firms.

On the other hand, Shleifer and Vishny (1997) cautioned that "Large investors may represent their own interest, which need not coincide with the interest of other investors in the firms, or with the interests of employees and managers

It is hypothesize that.

H4: Institutional shareholdings are positively related to firm performance.

3. Research methodology

3.1 Sample Size

The study focused on AIM listed firms in the UK which has not been focussed by existing empirical studies contrary to the large listed firms. Purposive sampling was used to draw the sample from the 982 companies listed on AIM as at December 2016. This is to ensure only firms that disclose the variables that address the research objectives were selected. In line with Ntim and Soobaroyen (2012) banks, financial institutions, insurance firms and investment companies were excluded from the sample due to the significance variations in capital structure and operational requirements. The criteria resulted in a final sample of 82 companies, with a total of 410 observations across 9 industrial sectors.

3.2 Variables

The study relied on accounting-based measures, specifically, return on assets (ROA), earnings per share (EPS) and return on shareholders fund (ROSF) as dependent variables which take retrospective assessment of what the firm has already accomplished. In relation to the independent variables, the study employed both internal and external corporate governance mechanisms (Board Size, Managerial shareholding, Non-Executive Directors) and external corporate governance mechanism as operationalised by institutional investors or block holders consistent with existing studies.

Previous empirical research (Short and Keasey, 1999; Vo and Phan, 2013 and Fahart, 2014) have considered control variables such as firm size, industry, leverage, firm age and country of origin, in examining the relationship between corporate governance and firm performance.

Consistent with the position of previous empirical studies, the researcher controlled for other variable that could mask the relationship between corporate governance and firm performance. The control variables used in the study were firm size (based on market capitalisation), firm age and leverage. The study could not include "firm industry" in the model as a control variable since the number of firms for each industry group was too small. Whilst the dependent and control

variables were obtained from FAME and Amedeaus database; the independent variables were hand picked from the annual reports of the sampled firms.

3.3 The Regression Model

Regression analysis in STATA and SPSS was used to estimate the study's model. The model used to examine the relationship between firm performance, and corporate governance is summarized as follows:

$$FP_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 Controls_{it} + \mu_{it} + \lambda_{it} + \varepsilon_{it}$$

*Where FP: Financial performance (ROA, EPS and ROSF), CG: Corporate Governance Variables (independent variables) which comprise of Board Size (BSIZE), Board Independence (IDEP), Executive Director ownership (*XDOIROWN), *Non-Executive Director Ownership (NXDOIROWN) and INIVT (Institutional Investors). Controls represent control variables Firm Size (FRMSIZE), Firm Age (FRMAG), Financial Leverage (LEVG). The subscript i denotes the nth company (i = 1... 82), and the subscript t denotes the year (t=1...5). μi is the unobservable heterogeneity (individual effects) which is specific for each firm, λt is the parameters of time dummy variables, and εit is the error term,*

4.0 Presentation and Analysis of the Results

The descriptive statistics of both dependent and independent variables as summarized in Table 1, revealed minimum market capitalization is $ 440000, and the highest market capitalization of $30,545,000,000. The level of financial leverage ranged from 0.01 to 666.73, and some of the firms were as young as one year old from the period under consideration, and some have been in existence for 97 years. Whilst some firms the executive directors have no shareholdings; in some cases, executive directors own about 99.87%. Likewise, percentage of shares owned by non-executive directors ranged from 0.00% to 52.03%. Number of non-executive directors also ranged from 1 to 8.

With regards to the performance indicators operationalised as dependent variables, the results are equally mixed. The minimum return on shareholders' funds for some of the firms in the period under review is as low as -711.31, and the maximum return on shareholders' fund is 113.17, Earnings per share also peaked at 2.30 and in some cases as low as -5.22. Return on assets was as high as 34.27 in some companies but dived into -541.56 in some cases.

Table 1: Descriptive Statistics about here

The correlation table revealed that the Firm Age does not have a significant correlation with the firm performance. Firm size correlates positively with the Earnings per Share. The level of financial leverage also does not correlate significantly with Earnings per share, return on shareholders' fund, and return on assets.

Table 2: Correlation Matrix about here

Table 3: Regression Results about here

4.1 Regression results and Discussion of Findings

Regarding board size, the study documented a negative relationship between board size and all the performance measures and therefore, the study hypothesis 1 is rejected. However, the relationship is only statistically significant for only ROSF. These findings contradict the hypothesis developed and challenge the assumption that underlines the resource dependency theory, which argues for large board size. It has also been argued that large board size leads to superior firm performance only when there is element of diversity (Cadbury, 2002). Considering the fact that a substantial number of AIM companies are family owned, the board mostly consisting of family members. et al.; Guest 2009). In line with the study hypothesis 2, the result confirmed large proportion of independent directors on board has a significant positive effect on ROSF. This result is in line with the Cadburry position, and consistent with the arguments of many corporate governance codes that advocate for the inclusion of more non-executive directors on board. The findings reinforce the agency theory assertion that a board consisting of a high proportion of Non-Executive Directors provides effective monitoring mechanism for executive directors and will ultimately lead to the implementation of strategies that will consequently increase firm performance.

This convergence-of-interests model asserts that as the percentage of shares owned by managers increases, their interests and those of shareholders become more aligned, and there would be no incentive to engage in opportunistic behaviour. In contrary to the forgoing assertions, the study documented a negative relationship for all the performance measures and as a result, reject the study hypothesis 3 which argued for positive relationship between

managerial shareholding and financial performance. The relationship is, however, not statistically significant in all cases. It was concluded that high proportion of equity owned by directors is often associated with director entrenchment which often serve as a friction to beneficial takeovers, and thus negatively affect firm performance.

The results of the study reject the study hypothesis 4 as statistically significant negative relationship was reported for all the independent variables. The finding of the study is also inconsistent with the position of Shleifer and Vishny (1997) who pointed out that blockholders help to reduce the principal-agent conflicts as they have keen interest in both profit maximization and a commanding control over the assets of the company to have their interest respected.

The negative relationship reinforces the widely held notion that concentrated ownership are less efficient as compare to disperse ownership (Anderson and Reeb, 2003). The finding is viewed on perspective that, combining ownership and control empower blockholders to trade firms' profits for private benefits. Another strand of literature that underpins the negative relationship is that blockholders may forgo pecuniary consumption and thus take scarce resources away from profitable projects (Demsetz 1983). Moreover, it is argued that large premiums are associated with superior voting rights and control which allows blockholders to restrict board position to cronies which restrict the labour pool where talent can be obtained thereby leading competitive disadvantages ownership (Anderson and Reeb, 2003).

5. Conclusion

The analysis of the link between corporate governance and firm performance for AIM listed firms in the UK revealed that the relationship is complex one as the study produced mixed results.

The study revealed the aspect of corporate governance practices that is likely to enhance firm performance. Supporting the recommendation of Cadbury position and in line with agency theory, management of AIM listed firms can consider the inclusion of more non-executive directors Second, it is expected that AIM listed firms with large board size will draw a lesson from this study and reduce the board size and also brings in diversity in order to enhance performance. Third, the study offered guidance to the policy makers of AIM listed firms that high level of managerial shareholding should not be encouraged as it inhibits performance. Fourth, the study also identified that large proportion of institutional investors are not helpful for AIM listed firms.

Finally, the study, like many other empirical studies has limitations. The findings of the study were, therefore interpreted in the light of the limitations. First, the study also selected only three performance measures; selecting other performance measures could have impacted on the results. Second, the study also relied purely on accounting-based measures; however, inclusion of market-based measures could have produced different results, and therefore it is expected that future studies will include both accounting and market-based measures.

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Appendices

Table 1: Summary Statistics

Variable	Observation	Minimum	Maximum	Mean	Standard Deviation	Pr (Skewness)	Pr (Kurtosis)	adj chi2 (2)
Firm Age	404	1	97	22.9975	19.24757	0	0.0038	63.47
Market Capitalization	410	0.44	30545	539.366	3355.5183	0.8787	0	28.02
Leverage	368	0.01	666.73	44.4087	60.76283	0	0	-
Return on Asset	410	-541.56	34.27	-6.1051	50.4652	0	0	-
Return on shareholder Fund	408	-711.31	113.17	2.0412	55.21926	0	0	-
Earnings Per Share	410	-5.22	2.3	0.1055	0.37401	0	0	-
Board Size	409	2	11	6.4303	1.48874	0.1757	0.6971	1.99
Executive Director Ownership %	410	0	71.99	9.7139	13.79576	0	0	-
Non-Executive Director Ownership %	410	0	52.03	6.4712	10.70935	0	0	-
Number of Non-Executive Directors	409	1	8	3.3741	1.28697	0.0001	0.4855	13.7
Institutional Investors	401	0	99.87	44.5461	24.19715	0.8542	0.0009	10.07

Table 2: Correlation Analysis

	ROA	EPS	ROSF	F.AGE	MRKT CAP	LVG	B.SIZE	XD%	NON XD%	NON XS NUM	INST.INVMT
ROA	1										
EPS	0.35**	1									
ROSF	0.79**	0.44**	1								
F.AGE	0.044	0.032	-0.02	1							
MRKT CAP	0.052	0.97**	0.047	-0.027	1						
LVG	0.008	0.022	0.012	-0.005	-0.06	1					
B.SIZE	0.267	0.18	0.143	0.073	0.043	-0.0745	1				
XD%	0.086	0.07	0.075	-0.058	0.228	0.047	-0.008	1			
NON XD%	0.140**	-0.024	0.045	0.096	-0.026	-0.079	0.587	-0.225**	1		
NON XS NUM	0.0161	-0.048	0.0116	0.269**	-0.077	-0.006	-0.003	-0.022	0.060	1	
INST.INVMT	-0.021	0.008	0.012	0.081	0.0193**	-0.014	0.122	-0.499**	-0.233**	0.227**	1

Table 3: Regression results

	(Model 1) ROSF	(Model 2) ROA	(Model 3) EPS
Firm Age	1.142 -0.7	-0.174 (-0.11)	0.0244*** -1.97
Market Capitalization	-0.00195 (-0.11)	-0.00288 (-0.17)	0.00000343 -0.03
Leverage	-0.112* -2.17	0.00554 -0.11	-0.00022 (-0.56)
Board Size	-14.40*** (-3.87)	-3.91 (-1.10)	-0.0257 -0.92
Executive Director Ownership%	-0.276 (-0.61)	-0.0418 (-0.09)	-0.000305 -0.88
Non-Executive Director Ownership%	0.714 (-1.26)	-0.876 (-1.60)	-0.000133 -0.03
Number of Non-Executive Directors	18.28*** -4.32	11.96** -2.94	0.0494 -1.55
Institutional Investors	-0.649** -2.83	-1.136*** -5.25	-0.00586*** (-3.46)
_cons	52.64 -1.23	42 -1.02	-0.151 (-0.47)
N	351	353	353

t statistic in parentheses
* p<0.10, ** p<0.05, *** p<0.01

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