

A simplified model to enhance SMEs' investment in renewable energy sources in Ghana

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ABSTRACT

Although, the Renewable Energy Act 2011 (Act, 832) was enacted to facilitate development and investment in the Renewable Energy sources in Ghana as part of the efforts to achieve Sustainable Development Goal 7, the actual impacts of the policy are yet to be felt as manifested in the amendment Act 2020 (Act, 1045). There is the need to develop alternative model to enhance investment in the renewable energy sector. Drawing from the Resources Based View (RBV) and Porter's Five Forces this paper is aimed to develop a simplified model to explain Small and Medium Enterprises (SMEs) investment determinants in the renewable energy sources in Ghana. We argued that the simplified integrated model provides robust predictability and wider generalization. Our paper is anchored on the positivists' epistemology and quantitative methodology. Our hypotheses have been tested using a cross sectional data from the Ghanaian SMEs. Variance Based Partial Least Squares (PLS) method has been used to analyze the survey data. Our results indicate that entrepreneurial competency, financial resource, marketing capability and technological usage significantly relate to investment in renewable energy. Moreover, the results have showed that competitive rivalry, threat of entry and bargaining power of customers significantly relate to investment in renewable energy. These results substantiate the well-known argument that industry forces and resource competitive strategies are significant determinants of firm's competitiveness and behavioural intentions. Overall, these results have theoretical and practical implications to facilitate the capacity of SMEs and create enabling renewable energy local content policy to enhance SME's participation in the sector.

Keywords

Porter's Five Forces;
Renewable Energy Sources;
Resource Based View;
Small and Medium Enterprise
Investment

<http://doi.org/10.54337/ijsepm.7223>

1. Introduction

Amidst its priorities, the Ghana Energy Sector Development and Strategic Plan called for renewable energy to account for 10% of the country's energy production by 2020 [1]. To achieve this goal, the Ghanaian Parliament enacted the Renewable Energy Act (Act No. 832 of 2011), which provides the legal and regulatory framework for the development and expansion of the renewable energy sub-sector in Ghana [2]. The Act aims to establish a favorable regulatory and fiscal regime and attractive tariff incentives for the

development and deployment of renewable energy [3], [4]. Its provisions will support the development, deployment, and efficient management of renewable energy in the country, while contributing to climate change mitigation [5]. The Act provides for the establishment of a renewable energy framework, the creation of an enabling environment for renewable energy investments, the development of indigenous capacity in renewable energy technologies, the training of the public sector in the production and use of renewable energy, and the regulation of the production and supply of fuels and biofuels [4], [6]. Although, the

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Renewable Energy Act 2011 (Act, 832) was enacted to facilitate development and investment in the Renewable Energy Technologies in Ghana as part of the efforts to achieve Sustainable Development Goal 7, and Paris Climate Agreement, but the actual impacts of the policy are yet to be felt as manifested in the amendment Act 2020 (Act, 1045)[1], [2]. There is the need to develop alternative model to encourage indigenous investment in the sector.

Prior studies [7], [8] have argued that modeling investment strategy for SMEs will not only expedite stability and growth in the industry, unarguably it will also ensure dynamics and strategic positioning for sustainability. Existing competing theories such as the Porters' Five-Forces Model and RBV have become imperative in the formulation of business strategies due to mainly competitiveness brought about by globalization. Developing a winning strategy has however become very challenging especially when only a single model or theory is relied upon. Recent studies [3,9] averred that effective strategic process is built through integrations of many theories or models. With respect to the external factors, [10] forces are employed by SMEs to formulate effective competitive strategy of which [11] avowed those competitive strategies as measures, plans and patterns employed by an organization to achieve business goals and objectives usually in a turbulent and dynamic business environment. As explained, an organization can develop competitive strategy by relying on only the internal resources of the firm likewise, a firm can base on external favorable conditions to formulate a business strategy [12]. Nevertheless, it is very appropriate for firms to ensure that there is an integration of multiple theories and models to develop fierce competitive strategies that could stand the test of time [13], [14]. The paper thus, suggest that combining both internal and external factors together overtime can win competitive advantage for SMEs and can also strengthen SMEs to invest in emerging industries such as the renewable energy sources in a low resource context.

Drawing from the RBV and Porter's Five Forces this paper is aimed to develop a simplified model to explain SMEs investment in renewable energy sources in Ghana. The paper argued that the integrated model provides robust predictability [15] and wider generalization of results [16]. This paper is expected to contribute immensely towards investment in the renewable energy sector: Foremost, previous studies [17], [18] argued that the internal resource approach was the best way to

develop investment strategy wherein internal resources such as entrepreneurial competency, financial resource, knowledge sharing marketing capability and technological usage were utilized in modeling business strategy. Moreover, the available evidence [9], [19] further suggests that environmental approach with a focus on industry forces such as competitive rivalry, threat of entry, bargaining power of customers, degree of substitutes, and bargaining power of suppliers as determinants of business strategy and survival. In the present paper the researcher has modelled a simplified model by integrating the both the internal determinants and environmental determinants into a simple model to enable SMEs conduct quick assessments of the investment environment to enhance their investment propensity in the sector. Secondly, this paper is among the very few studies in Ghana to develop a simplified model to enhance SMEs investment participation in the renewable energy sources in order to ensure access to affordable, reliable and modern and sustainable energy. Besides, most previous studies [15], [18] concentrated mostly in developed and high-income economies, there is the need to conduct a paper which focus on the emerging economy to address this knowledge gap. It is against this backdrop that the present paper is conducted to ascertain how SMEs competitive resources and the industry forces affect its investment behaviour in the renewable energy sector with a focus on the Ghanaian SMEs.

The reminder of the report is organized as follows: the review of pertinent literature has been presented in the next section, which is followed by the methodology adopted for the paper, then the results of the paper, discussions, conclusions and implications.

2. Theoretical Framework

This paper is anchored on two main competing theories namely; RBV theory and Porter's five forces model. RBV theory is based on the proposition that a firm drives its sustained competitive advantage from inimitable, rare, valuable and non-substitutable resources [12], [13]. That is the ability of SMEs to create or acquire these resources will exert influences on their investment behaviour. Apparently, given the highly competitive nature of the renewable energy sector, a robust theoretical model was needed to explain the extent to which Ghanaian SMEs can use their internal resources, skills and capabilities to gain a competitive

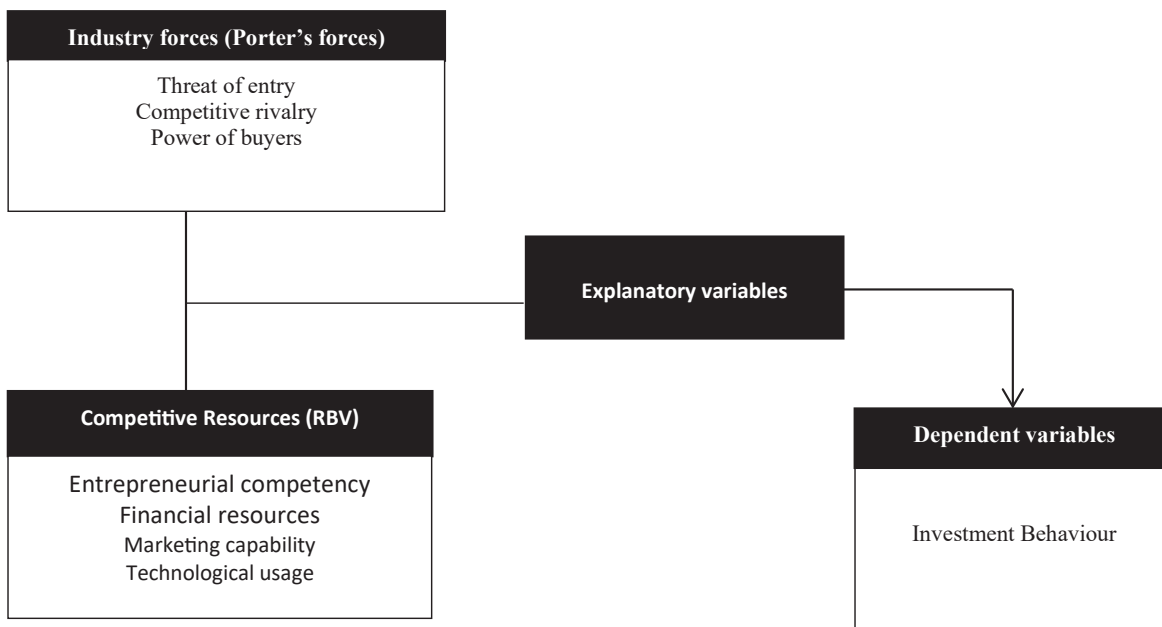


Figure 1: Simplified Research Framework

advantage and invest in renewable energy. This paper presents a resource-based theory of competitive advantage as a framework to describe, understand and predict the traditional adoption and diffusion of renewable energy technology investments by SMEs. The inclusion of RBV theory in this study is justified on the basis that sustainability of a firm's innovation (e.g., renewable energy technology) is based on (1) the internal resources of the firm providing the innovation, (2) the firm's ability to exploit these resources, (3) the competitive advantage provided by the firm's resources and capabilities [8], [14], (4) the attractiveness of the market in which the firm competes [16], and (5) the impact of the innovation on the firm's financial performance [7]. This paper argues that resource-based competitive advantage theory provides a framework for comparing the results of different research frameworks and studies in the context of renewable energy investments and business models. It is asserted that the resource-based approach is a sound strategy and that it is still necessary for a company to achieve sustainable competitive advantage by focusing on its resources, capabilities and competences. The researcher therefore argues that, Ghanaian SMEs that are able to acquire and maintain these unique resources would be able to take investment opportunities in the renewable energy sector.

As a compliment to the RBV theory, Porter's five forces model has been utilized as a framework to assess

the overall investment landscape of a given industry [19], [20]. The five forces include; competitive rivalry, threat of entry, bargaining power of customers, degree of substitutes, and bargaining power of suppliers [21], [22]. Using Porter's five forces framework, SMEs are able to assess the renewable energy sector and take investment decision. The application of Porter's model in this study is justified on the basis that, given the inherent competitive nature of the renewable energy sector, applying Porter's Five Forces Analysis to Ghana's renewable energy sector is crucial to enable SME owners to identify threats and opportunities facing their business and focus their resources on developing unique opportunities that could give them a competitive advantage in the renewable energy sector [20]. Such an assessment is important because it helps SMEs understand the market conditions in the RE sector [21]. Besides, Porter's Model helps to predict supply and demand and thus the economic performance of companies [22]. Again, Porter's five forces help to assess the threat of new entrants, the threat of substitution, the bargaining power of suppliers and the bargaining power of buyers [21]. All these factors contribute to the competitiveness of an industry. This will help SMEs to understand the current competitive situation in the industry so that they can adapt their business strategy accordingly. Porter's model provides information on the strengths of suppliers and buyers, as well as the risks of

new entrants and substitutes. It helps SME owners and managers understand their strengths and potential threats. Take proactive measures against threats and continue to improve strengths.

It is argued in this paper that, there is the need to integrate these two theories to provide robust predictability and wider generalization. Inferring from the ongoing arguments the integrated model is developed as showed in the Figure 1.

2.1 Hypotheses Development

Drawing from the RBV theory and Porter's Five Forces model, the following seven (7) hypotheses have been formulated to guide the study.

2.1.1 Effect of competitive rivalry on SMEs investment in RE sources

The level of competition within a given industry has effect on investment decisions of prospective investors, growth and survival. Competition between existing firms depends largely on the extent to which direct competition adds value to the industry [23]. Competition between firms results from distortions in the structure of the industry, i.e., structural factors such as many or the same competitors, low growth in the industry, high fixed or inventory costs, lack of differentiation or switching costs, high incremental capacity and a large number of competitors [24]. In the renewable energy sector, fierce competition is driven by firm growth, the introduction of new products and the introduction of non-traditional products [25]. Rather, competition is the result of competitors recognizing the need to improve the quality of products in order to seize new opportunities [26]. In the renewable energy sector, competition arises when prices, market segments and proximity are similar [27]. According to [27], competition in the renewable energy sector cannot be attributed to any single factor and firms are not independent but rather driven by the actions of other firms. It is influenced by situational effects. This implies that renewable energy companies should not treat their competitors in the same way, as they may affect renewable energy companies differently. Inferring from the ongoing argument, the paper proposes that

H1: Competitive rivalry has positive and significant influence on SMEs investment in RE sources

2.1.2 Effect of Bargaining Power of Buyers on SMEs investment in renewable energy sources

In any given industry the extent of customers bargaining power affect investment behaviour. An industry's growth

and success mostly depend on the choices made by the buyers. If buyers fail to procure certain products of a particular industry, the business turns to collapse since the market yields of the industry determines its profitability margins. Buyers always compete with the industry by making quest of price reduction whether or not if the industry will run loss [24]. Most renewable energy companies counteract the power of customers by introducing loyalty programmes that reward customers for regular purchases of products and services [26]. From the ongoing argument, the paper proposes that:

H2: Bargaining power of buyers has positive and significant influence on SMEs investment in RE sources

2.1.3 Effect of New Market Entrants on SMEs investment in RE sources

The entry requirements of a given industry has effect on the investment decisions. Market entrant is the process whereby new competitors enter into an existing industry. Most firms face the following barriers to entry: product differentiation, economies of scale, switching costs, capital requirements, access to distribution channels, cost barriers and government policies [24]. The renewable energy sector has high upfront costs, including high capital expenditure and the need to build electricity grids. There is threat of investment in the Renewable energy sector by those companies with less experience in the industry [25]. We therefore postulate that:

H3: New Entrants has positive and significant influence on SMEs investment in RE sources

2.1.4 Effect of Entrepreneurial Competency on SMEs investment in RE sources

There are numerous studies that regard entrepreneurial competencies as firm specific strategy [16], [28]. Companies have different levels of control over resources, which are unique from one another in terms of their product and services. Organizational assets like the human capital, employee capabilities and managerial policies are employed to develop and implement innovative strategies. When the human resource of a company possesses much skill, which is aligned to the company's requirement, this has positive effect on the performance of an organization [29]. This claim substantiates the argument that, the growth and success of a company emanates from within the organization. Hence, organizations that have superior resources coupled with enhanced employee capability lay the

bases for companies to gain and sustain a competitive edge over their competitors. We postulate based on the above that:

H4: Entrepreneurial competency has positive and significant influence on SMEs investment in RE sources

2.1.5 Effect of Financial Resource on SMEs investment in RE sources

The next factor considered by researchers [30] include financial resources. There are number of studies that have touched on the influence of financial resources on SMEs [8], [19]. SMEs that have regular adequate financial resources or have access to finances are likely to survive and expand. Likewise, SMEs with the least financial resources risk survival in the event of fierce competition. This proposition has been supported by researchers like [31]. We hypothesize that:

H5: Financial resources has positive and significant influence on SMEs investment in RE sources

2.1.6 Effect of Marketing Capability on SMEs investment in RE sources

The marketing domain is regarded as important to penetrate the local as well as the international markets [13]. Number of businesses also considers the failure experienced by SMEs to mean the lack of marketing capabilities [32]. The marketing domain is regarded as important to penetrating the local market as well as the international market [18]. The reasons why SMEs from the international front poses much power is because they have enough marketing resources but the local SMEs have fewer resources to conduct market research, lacks large and readily accessible market and have brands that are difficult to recognize [33], [34]. We hypothesize from the ongoing that:

H6: Marketing capability has positive and significant influence on SMEs investment in RE sources

2.1.7 Effect of Technological usage on SMEs investment in RE sources

Nonetheless, there are studies that have recognized the significance of SMEs in the promotion of new and emerging ideas, skills, knowledge, innovations and others through analytical perspectives to enhance their market leadership in their industries [30],[33]. In this regard, technology also play significant role in amassing resource strength. We postulate based on the above that:

H7: Technological usage has positive and significant influence on SMEs investment in RE sources

3. Data and methods

3.1 Profile of SMEs in Ghana

In Ghana, qualitative and quantitative [8], [19] indicators are usually used to classify SMEs. Quantitative indicators include; number of employees and total asset whiles qualitative indicators include; ownership structure, legal status, technological usage and industrial type (Agric, industry and services) [35], [36]. Ghanaian SMEs were chosen due to their immense contribution in terms of Gross Domestic Products (GDP) growth, employment, innovation and human resources development to the Ghanaian economy in general [37]. We argue that development and growth in the SMEs sector affect every other aspect of the Ghanaian economy. These make Ghanaian SMEs ideal location for the present paper. Although individuals answered the survey questionnaires the unit of analysis for the paper is firm level.

3.2 Research Design

The paper employed a quantitative design, which focuses on the use of numerical measures to estimate the degree of occurrence. The quantitative design was chosen due to the following attributes; numerical data collection, it uses a positivism and objectivism approach to address real social situation [38]. Quantitative data was collected to develop a simplified model to explain SMEs investment in renewable energy sources in Ghana. The paper also used explanatory research because due to the cause-and-effect relations between the variables. Survey strategy was used since, the paper was based on pool of opinions, perceptions and attitudes. These methods were employed due to their consistencies with the positivists' epistemology and objectivist ontology

3.3 Population and Sampling Procedure

The target population of the paper comprised of SMEs that were registered with Ghana Enterprise Agency (GEA) formerly known as (National Board for Small Scale Industries (NBSSI)) with active membership of six years or better were given priority. The Registrar General Department is the main agency in-charge of business registration and incorporations in Ghana. According to the Ghana Statistical Service report, as low as one percent of all registered business survives within every five years [7]. Besides, Appiah et al. [8]

reported that business stability is a major challenge facing formal SMEs in Ghana. A recent report by the Ghana Enterprise Agency (Formerly known as National Board for Small Scale Industry) reported that, although there are over 1.7 million businesses in Ghana, only 2825 formalized SMEs can be boosted. Therefore, this formalized SMEs formed the population of the study. As part of the selection criteria only SMEs within Kumasi and Accra Metropolises were selected for the paper due to their respective administrative and commerce positions. According to the records of the NBSSI, most registered SMEs operates in the urban centers due to factors such as large market, different ethical background and diverse customer groups. The sample size used in the paper was extraverted from [39] rule of ten (10) criterion. The minimum sample

size of 160 was required for the paper based on the number of paths. However, the paper used 475 sample sizes. Prior studies [1], [8] have argued that the larger the sample size the better the results. Stratified sampling technique was used for the selection of the participants. The industrial type was used as strata, then within each stratum the SMEs were randomly selected for the paper. This sampling technique was used to reduction in sampling errors and enhancement in representativeness.

3.4 Constructs Measurement

The constructs measurements have been presented in this section. As showed in Table 1, the name of the sub-constructs, number of items, scale type, and sources of the measurement constructs have been provided.

Table 1: Constructs Measurement

Constructs	Descriptions (Number of Items)	Scale- Type	Sources
Threat of Entry	“It is difficult for new SME to enter into RE resources”	Likert’s Scale	[40]
	“Economic of scale have impact on new entrant in RE resources”		
	“Access to distribution channels can affect new entrant in RE resources”		
	“Specialized knowledge can affect new entrant in RE resources”		
	“Large capital requirements affect new entrant in RE resources”		
Competitive Rivalry	“Brand loyalty makes it difficult for new entrant to enter RE resources”	Likert’s Scale	
	“The RE resources has fewer competitors”		
	“The competition in my area is less fierce”		
	“High barriers lead to competition in RE resources”		
bargaining power of buyers	“High product differentiation leads to competition in RE resources”	Likert’s Scale	[40]
	“Buyer’s abilities to force down prices will affect investment in RE resources”		
	“Buyer’s demand for high quality product will affect investment in RE resources”		
	“Buyer’s abilities to switch to competing brands will affect investment in RE resources”		
Entrepreneurial Competency	“The rise in consumer right protection activities will affect investment on RE resources”	Likert’s Scale	[40]
	“I have an ambitious goal with clear vision and mission”		
	I have leadership managerial skills and decision-making skill”		
	“I am autonomous, competitive aggressor and risk taker”		
Financial Resource	“I am motivated and have high confident to run my business”	Likert’s Scale	[41]
	“I am innovative and proactive”		
	“Our company has a good financial base and cash resources”		
	“We have accounting systems to manage our operations”		
	“We make use of public financial support and grants”		
	“We keep reports on the sales, purchase and income statement”		

Table 1 continued

Table 1 continued

Constructs	Descriptions (Number of Items)	Scale- Type	Sources
Marketing Capability	“We can continuously scan emerging market trends and events”	Likert’s Scale	[42]
	“We are quite alert to changing market conditions”		
	“Everyone in our company is sensitized to listen to latent problems and opportunities relating to RE resources”		
	“We can anticipate market trends and events accurately before they are fully apparent”		
	“We can triangulate market information from different RE resources”		
Technological Usage	“We can effectively listen to, understand and rapidly respond to relevant RE resources conversation”	Likert’s Scale	[43]
	“The use of technology brings along high-tech image”		
	“The use of technology helps us to profile and keep up to date records on our customers”		
	“The use of technology improves working relationship with our suppliers”		
Behavioral Intentions to Invest	“The use of simplify operation processes”	Likert’s Scale	[7,8]
	“Our company will invest in oil and gas due to high probability”		
	“Our company plan to invest in the RE resources”		
	“Our company want to invest in the RE resources”		
	“Our company intend to invest in the RE resources”		
	“Our company is likely to invest in the oil and gas business”		
	“Our company would like to invest in the RE resources”		

Author’s Compilation

3.5 Data Collection Instrument

Structured questionnaire was the main data collection instrument employed for the paper. The questionnaire instrument was adopted because of its cost effectiveness, and time saving potentials. The questionnaire was structured into three sections comprising of industry forces, internal competitiveness as well as profile of SMEs with emphasis on firm age, firm size, industry types, location, and legal status. The paper adopted 7-point Likert’s type scale due to its predictability effectiveness. To address the issue of non-response, 500 questionnaires were distributed to the targeted participants out of which 488 were received. To obtain accurate data, all suspicious responses were evicted from the original data to ensure accuracy. By this approach, 13 questionnaires were removed. The overall useful questionnaires received were 475. The questionnaires were mostly administered using in-person approach given the low educational profile of majority of the Ghanaian SMEs. In some cases, the questionnaires were interpreted in the local language (Twi) for ease understanding. Only few of SMEs requested for drop and pick. These explained why a whopping 95% response rate was attained for the survey.

3.6 Data Analysis

Our hypotheses have been tested using a cross sectional data from the Ghanaian SMEs. Variance Based Partial Least Squares (PLS) method has been used to analyze the survey data. The paper concurrently employed Smart-PLS version 3.0 and Statistical Package for Social Science version 23 for the data analyses. Construct validity of the measurement scale has been assessed using Discriminant and convergence validities. Cronbach Alpha scores were used to assess the reliability of the measurement scales. The details have been provided in the result and discussion sections.

4. Results of the study

4.1 Results on Exploratory Factor Analysis (EFA)

As showed in the Table 2, the main purpose of the EFA was to explore the underlying factors within the dataset that were appropriate and the suitable for modelling. Exploratory Factor Analysis (EFA) is a prerequisite for Structural equation model as part of the quality control (validity measure) [1]. Appiah et al. [7] have reported that EFA is a vital tool for earlier stage of SEM analysis. Accordingly, Meyer-Oklin score (KMO) must be > 0.50,

the Bartlett's Tests of Sphericity (BTS) tests must be significant i.e $p < 0.05$, Measures of Sampling Adequacy must be greater 0.50 ($MSA > 0.50$) and eigenvalue must be $>$. Inferring from the Table 1, the results have showed that KMO scores were greater than 0.50 in all cases, the BTS showed significant chi-square values in all the cases, eigenvalues were >1 and MSA exceeded 0.50, establishing suitability for loading.

4.2 Convergent Validity and Discriminant Validity

As clearly showed in the Table 4, the validity of the model had been assessed using convergent and discriminants validity which respectively replied what measures that were theoretically expected to relate to one another indeed related to each other while those that were expected to depart from each other indeed departed from each other. Convergent accuracy was assessed using the average variance extracted ($AVE \geq 0.5$) and composite reliability ($C.R \geq 0.70$) drawing from the [44]

guidelines. As shown in the Table 4, all the AVE scores were higher than 0.50, i.e., in the range 0.57-0.87. CR values were higher than the acceptable minimum score (0.70), i.e., in the range 0.84-0.97, suggesting satisfactory AVE and CR scores. Contrariwise, discriminant validity was accessed by comparing the square root of the AVEs scores with the scores of the intra-construct correlations. To achieve discriminant validity in the paper the square root of the AVE should be greater than the inter-construct correlation which has been showed in the diagonal with italic in the Table 4. Having satisfied the conditions of convergence and discriminant validity, we proceeded with the path estimation.

4.3 Construct Reliability

As indicated in the Table 5 we have again conducted Cronbach Alpha (α) to validate CR scores. For Cronbach Alpha to be acceptable a minimum recommended value of 0.70 was required [39]. As indicated in the Table 4 the

Table 2: Exploratory Factor Analysis (EFA)

Construct		Mean	Std. D	Skewness	Kurtosis	Loading	Eigenvalue
Marketing Capability (MC)	MC1	5.33	0.69	-0.55	-0.80	0.837	4.41(73.56)
	MC2	5.25	0.78	-0.47	-1.22	0.964	
	MC3	5.19	0.74	-0.32	-1.14	0.944	
	MC4	5.39	0.72	-0.73	-0.74	0.716	
	MC5	5.45	0.72	-0.92	-0.52	0.930	
	MC6	5.45	0.72	-0.92	-0.52	0.718	
KMO=0.837, $X^2=2958.020$, $df=15$, $p\text{-value}=0.000$							
Financial Resources (FR)	FR1	5.80	0.64	-1.22	2.03	0.950	3.26(81.55)
	FR2	5.75	0.58	-1.86	2.89	0.885	
	FR3	5.86	0.61	-1.60	3.66	0.892	
	FR4	5.87	0.60	-1.68	4.02	0.883	
KMO=0.745, $X^2=1837.162$, $df=6$, $p\text{-value}=0.000$							
Entrepreneurial Competency (EC)	EC1	5.53	0.81	-1.24	-0.32	0.970	4.53(90.67)
	EC2	5.60	0.70	-1.46	0.59	0.956	
	EC3	5.66	0.69	-1.76	1.41	0.961	
	EC4	5.47	0.79	-1.06	-0.58	0.944	
	EC5	5.53	0.79	-1.23	-0.28	0.929	
KMO=0.834, $X^2=3690.582$, $df=10$, $p\text{-value}=0.000$							
Technology Usage (TU)	TU1	6.22	0.51	-0.18	2.74	0.827	2.79(69.75)
	TU2	6.05	0.45	0.23	1.93	0.784	
	TU3	6.14	0.49	0.28	0.65	0.845	
	TU4	6.13	0.49	0.30	0.81	0.882	
KMO=0.792, $X^2=856.549$, $df=6$, $p\text{-value}=0.000$							

Table 2 continued

Table 2 continued

Construct		Mean	Std. D	Skewness	Kurtosis	Loading	Eigenvalue
Threat of Entry (TE)	TE1	5.76	0.78	-0.63	0.22	0.837	4.50(74.94)
	TE2	5.70	0.77	-0.66	0.20	0.850	
	TE3	5.67	0.76	-0.56	0.07	0.891	
	TE4	5.58	0.71	-0.84	0.14	0.876	
	TE5	5.57	0.72	-0.81	0.04	0.857	
	TE6	5.58	0.71	-0.86	0.15	0.883	
KMO=0.735, X ² =2556.020, df=15, p-value=0.000							
Competitive Rivalry (CR)	CR1	5.49	0.71	-1.04	-0.29	0.871	2.71(67.85)
	CR2	5.48	0.71	-0.99	-0.36	0.809	
	CR3	5.57	0.71	-1.11	0.22	0.839	
	CR4	5.67	0.65	-1.68	1.49	0.773	
KMO=0.815, X ² =2253.111, df=6, p-value=0.000							
Power of Buyers (PB)	PB1	5.56	0.73	-0.75	-0.03	0.948	3.28(81.95)
	PB2	5.44	0.68	-0.77	-0.48	0.929	
	PB3	5.54	0.66	-1.06	0.06	0.851	
	PB4	5.59	0.65	-1.31	0.47	0.890	
KMO=0.775, X ² =1873.020, df=6, p-value=0.000							
Investment Behaviour in renewable energy (IB)	II1	6.80	0.40	-1.51	0.27	0.802	4.37(72.79)
	II2	6.74	0.44	-1.08	-0.84	0.795	
	II3	6.73	0.57	-1.98	2.78	0.897	
	II4	6.66	0.61	-1.63	1.47	0.854	
	II5	6.86	0.34	-2.12	2.51	0.957	
	II6	6.80	0.40	-1.51	0.27	0.802	
KMO=0.837, X ² =2445.155, df=15, p-value=0.000							

Table 4: Convergent Validity and Discriminant Validity Fornell-Larcker Criterion

	CR	AVE	BP	CR	EC	FR	TU	II	MC	TE
TE	0.900	0.751	0.193	-0.005	-0.020	0.266	0.106	0.199	0.138	0.816
MC	0.841	0.572	0.821	0.356	0.540	0.297	0.371	0.748	0.827	
IB	0.926	0.762	1.053	0.315	0.533	0.505	0.374	0.823		
TU	0.972	0.879	0.366	0.060	0.163	0.082	0.836			
FR	0.922	0.749	0.493	-0.096	-0.202	0.865				
EC	0.867	0.698	0.537	0.519	0.938					
CR	0.925	0.684	0.318	0.756						
BP	0.913	0.666	0.867							

Note: Square Root of Average Variance Extraction (AVE) shown on diagonal in italic

Table 5: Construct Reliability with Cronbach's Alpha

Construct	No. of Items	Cronbach's Alpha
MC	6	0.924
FR	4	0.924
EC	5	0.974
TU	4	0.855
TE	6	0.933
CR	4	0.841
IB	6	0.924

Cronbach Alpha values were greater than the minimum recommended value i.e., Cronbach Alpha values were of the range 0.841 to 0.974. These results further confirmed the suitability of the internal consistencies of the measurement instruments.

4.4 Hypotheses Testing – Effect of Industry Forces on Investment in RE Energy

As presented in the Table 6 we tested our hypotheses on the relationship between industry forces and behavioral intention to invest in renewable energy using the path coefficients. We found that our model had a strong predictive power (81%). Thus, industry forces can accurately predict 81% of SMEs investment in renewable energy sector. For instance, H1 assumed that competitive rivalry significantly related to investment behaviour in renewable energy($\beta = 0.245$, $P < 0.05$ and T-statistics = 18.671), H2 assumed that threat of entry significantly related to investment behaviour in renewable energy ($\beta = 0.096$, $P < 0.05$ and T-statistics = 5.941), and H3 assumed that power of customers significantly related to investment behaviour in renewable energy($\beta = 0.106$, $P < 0.05$ and T-statistics = 3.635). All the three (3) hypotheses in this section of the simplified model have been confirmed fully. All the relationships were positive.

4.5 Hypothesis Testing – Effect of Competitive Resources on Investment in RE Energy

As showed in the Table 7, we have tested our hypotheses on the relationship between competitive resources on investment in renewable energy using the path coefficients and found that our model had a strong

predictive power (70%). Thus, competitive resources accurately predicted 70% of SMEs investment behaviour in renewable energy. For instance H4 assumed that entrepreneurial competency significantly relate to investment behaviour in renewable energy ($\beta = 0.105$, $P < 0.05$ and T-statistics = 5.899), H5 assumed that financial resource significantly relate to investment behaviour in renewable energy ($\beta = 0.095$, $P < 0.05$ and T-statistics = 4.006), H6 assumed that technological usage significantly relate to investment behaviour in renewable energy ($\beta = 0.059$, $P < 0.05$ and T-statistics = 6.170) and H7 assumed that marketing capability significantly relate to investment in renewable energy ($\beta = 0.113$, $P < 0.05$ and T-statistics = 5.426). All the relationships were positive.

5. Discussion of results

This paper drawn on RBV theory and Porter's 5 Forces to develop a simplified model to explain SMEs investment behaviour in renewable energy sources in Ghana. The implications of the results have been discussed below.

5.1 Effect of Industry Forces on Investment Behaviour in Renewable Energy

Inferring from Porter's 5 forces the paper hypothesized that Porter's forces such as Threat of entry, Competitive rivalry and Power of buyers have significant relationships with investment behaviour in renewable energy sources. The paper has revealed that Threat of entry, Competitive rivalry and Power of buyers have significant industrial

Table 6: Hypotheses Testing – Effect of Industry Forces on Investment in RE Energy

Hypothesized Path	Path Coefficient (β)	T Statistics	$R^2(Adj. R^2)$	Results
H1: CR->IB	0.245	18.671*		Confirmed
H2: TE-> IB	0.096	5.941*	0.86 (0.81)	Confirmed
H3: PB->IB	0.106	3.635**		Confirmed

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

Table 7: Hypotheses Testing – Effect of Competitive Resources on Investment in RE Energy

Hypothesized Path	Path Coefficient (β)	T Statistics	$R^2(Adj. R^2)$	Results
H4: EC->IB	0.105	5.899*		Confirmed
H5: FR->IB	0.095	4.006*	0.73(0.70)	Confirmed
H6: TU->IB	0.059	6.170*		Confirmed
H7: MC -> IB	0.113	5.426*		Confirmed

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

influence on SMEs investment behaviour in the renewable energy sources. These results are consistent with Porter's assumption that the five forces provide a framework to assess the overall investment landscape of a particular sector of given business. Using Porter's five forces framework, SMEs are able to assess the renewable energy sector and take investment decision. Competition between existing firms depends largely on the extent to which direct competition adds value to the industry [23], [54]. Competition between firms results from distortions in the structure of the industry, i.e., structural factors such as many or the same competitors, low growth in the industry, high fixed or inventory costs, lack of differentiation or switching costs, high incremental capacity and a large number of competitors [24], [50]. In the renewable energy sector, fierce competition is driven by firm growth, the introduction of new products and the introduction of non-traditional products [25]. Rather, competition is the result of competitors recognizing the need to improve the quality of products in order to seize new opportunities [26]. In the renewable energy sector, competition arises when prices, market segments and proximity are similar [27]. Accordingly, [27], [45] asserted that competition in the renewable energy sector cannot be attributed to any single factor and firms are not independent but rather driven by the actions of other firms. An industry's growth and success mostly depend on the choices made by the buyers. If buyers fail to procure certain products of a particular industry, the business turns to collapse since the market yields of the industry determines its profitability margins [48]. Buyers always compete with the industry by making quest of price reduction whether or not if the industry will run loss. As a result, customers demand better quality and service, which causes competitors to fight each other [24], [51]. Most renewable energy companies counteract the power of customers by introducing loyalty programmes that reward customers for regular purchases of products and services [26]. Market entrant is the process whereby new competitors enter into an existing industry. Most firms face the following barriers to entry: product differentiation, economies of scale, switching costs, capital requirements, access to distribution channels, cost barriers and government policies [24], [53]. The renewable energy sector has high upfront costs, including high capital expenditure and the need to build electricity grids [46]. There is threat of investment in the Renewable energy sector by those companies with less experience in the industry [25], [55].

5.2 Effect of Competitive Resources on Investment Behaviour in Renewable Energy

Inferring from the RBV theory, the paper hypothesized that competitive resources of SMEs such as entrepreneurial competency, financial resource, marketing capability and technological usage significantly relate to investment behaviour in renewable energy sources. The paper has revealed that competitive resources of SMEs such as entrepreneurial competency, financial resource, marketing capability and technological usage have significant influence on investment behaviour in renewable energy sources. These results are consistent with RBV which stipulate that a firm drives its sustained competitive advantage from inimitable, rare, valuable and non-substitutable resources [12], [13]. We therefore, argue that Ghanaian SMEs that are able to acquire and maintain these unique resources would be able to take investment opportunities in the renewable energy sector. There are numerous studies that regard entrepreneurial competencies as firm specific strategy [16], [28] which has been supported by the present paper. The next factor considered by researchers [30] include financial resources. SMEs due to their ability to have access to funding resort to family and friends and personal funds, which are woefully limited [47], [52]. Limited access to finances invariably restricts large amount of investment, which hinders growth and development within an organizational setting [15,16]. The marketing domain is regarded as important to penetrating the local market as well as the international market [18]. The reasons why SMEs from the international front possess much power is because they have enough marketing resources but the local SMEs have fewer resources to conduct market research lacks large and readily accessible market and have brands that are difficult to recognize [34], [49]. Nonetheless, there are studies that have recognized the significance of SMEs in the promotion of new and emerging ideas, skills, knowledge, innovations and others through analytical perspectives to always be the market leader in the industry [30,33]. In this regard, technology also play significant role in amassing resource strength. This suggestion has been supported by researchers like [31].

6. Conclusions and implications

The main objective of this paper was to draw on RBV theory and Porter's 5 Forces to develop a simplified model to explain SMEs investment behaviour in

renewable energy sources in Ghana using a cross sectional survey. The key findings emanating from the paper are that threat of entry, competitive rivalry and power of buyers have significant industrial influence on SMEs investment behaviour in the renewable energy sources. Besides, the paper has revealed that competitive resources of SMEs such as entrepreneurial competency, financial resource, marketing capability and technological usage have significant influence on investment behaviour in renewable energy sources. These results have theoretical and practical implications.

Theoretically this paper is to the best of the researchers' is the first of kind to develop a simplified model to enhance investment participation in the Ghanaian renewable energy sector. The emergency of the integrated model will enhance predictability and generalization of critical determinants of SMEs investment behaviour in the renewable energy sector. The RBV and Porter's five forces could be combined to form a new model to be called "RBV-Plus 5". The newly developed simplified model provides empirical evidence on applicability of such theories in modeling investment strategy within emerging economy (Ghanaian) context.

Practically, the paper has provided useful determinants to explain SMEs investment intentions in the renewable energy sources. These results may encourage the judicious use of the following critical success factors; entrepreneurial competency, marketing capability, financial resources, knowledge sharing, threat of entry, competitive rivalry, power of buyers, technological used and human resources to maximize chances of investing in the renewable energy sector. Another important contribution is that SMEs have not actively participated in the renewable energy sector investment due to lack of investment strategies. These results confirm previous literature on barriers to SME investment. For example, [36] find that despite the significant contribution of SMEs, their growth and expansion is still hindered by certain challenges such as lack of standardization and lack of access to credit.

They also provide data on factors that may influence SMEs' decision to participate in the renewable energy industry. This information is important for SMEs to participate in the development of comprehensive investment strategies and effective policies and to remain internationally competitive, thereby increasing their chances of participating in Ghana's renewable energy sector. This paper is therefore a guide for investors, researchers, policy makers and practitioners.

With the active support of the Government of Ghana, the World Bank Group and the International Monetary Fund (IMF), it will also enable small and medium enterprises to successfully participate in renewable energy development.

Areas for Further Studies

This paper has number of limitations that should be taken to account by future researchers. Foremost, generalizability of the paper findings is limited to the Ghanaian SMEs specifically within the manufacturing, service and retailing industries. This article refers only to small and medium-sized enterprises. The paper recommends that future researches should focus on large companies. In particular, a comparative analysis of differences in investment readiness between large companies and SMEs in the renewable energy sector should be considered. Geographically, this paper is limited to Ghanaian SMEs, this could be replicated in other emerging economies.

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