SUSTAINABLE VALUE AND ECO-COMMUNAL MANAGEMENT: SYSTEMIC MEASURES FOR THE OUTCOME OF RENEWABLE ENERGY BUSINESSES IN DEVELOPING, EMERGING, AND DEVELOPED ECONOMIES

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"Knowledge is an expression of the shared responsibilities for the collective well-being of humanity and the planet as a whole"

"Energy regimes shape the nature of civilizations"

J. Rifkin

Dedication

To our beloved daughters Haikle and Abigail.

Proverbs 4:5 – 7 NIV

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Sustainable Value and Eco-Communal Management: Systemic Measures for the Outcome of Renewable Energy Businesses in Developing, Emerging, and Developed Economies

Abstract

by

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The International Energy Agency (IEA) forecast of 2014 indicates a 37% energy demand increase in the next 25 years. To meet the forecasted energy demand increase and ameliorate ecological stress associated with meeting the demand, the increased deployment and effective operations of renewable energy projects and businesses are of paramount importance.

This study sought to understand the factors impacting renewable energy businesses and identifies an integrative measure for the performance of these businesses in the context of developing, emerging, and developed economies. Our research data have revealed that the performance of renewable energy (RE) systems cannot be viewed or determined in isolation (contextual reduction) from the social system of the host community. Hence, the best way to understand its implications is using integrative approaches.

Our research suggests well-developed and deployed eco-communal management practices, a type of innovative management, is the best way to create value proposition of RE businesses/projects into sustainable value. For developed economies the primary

value path is from knowledge creation => eco-communal management => sustainable value, whereas, it is from connectedness => eco-communal management => sustainable value for emerging economies. In the context of emerging economies, the impact of knowledge creation on sustainable value is primarily indirect through hastening and affecting transformational changes, hence deploying effective transition engagements and instituting accurate methods to measure the efficacy of knowledge creation are imperative. In the context of developing economies knowledge creation and integrated vision frame the outcome of the RE business or project mediated by both eco-communal management and market creation.

Our research further suggests the level of managerial authority bifurcates the translation of strategic objectives of businesses, and the relatedness of the key decision maker into sustainable value through its strategic management practices in emerging economies, while it does not have significance in developed economies.

Our research makes theoretical, and practical contribution to the theory of innovation by discovering a novel type of management strategy, which is effective and instrumental in creating sustainable value from the initial conditions of integrated vision, knowledge creation, and connectedness.

Keywords: performance; nested complexity; connectedness; eco-communal management; transition engagement, technology & business model innovations, entrepreneurship, and sustainable value.

CHAPTER 1: INTRODUCTION

The availability of sustainable and affordable energy regimes has been identified as key to economic, ecological, and social developments (Brent & Kruger, 2009). Furthermore, the strong correlation between the availability of cost-effective energy and economic development has been evident from the early history of people as hunters and gatherers through the development of the modern day economy (Rifkin, 2011). Power generation and distribution, in general, have significant impacts on the economic, social, ecological, and security spheres of society. They are seen as critical links that enable the creation and utilization of infrastructures in developing, emerging, and developed economies (Rinaldi, Peerenboom, & Kelly, 2001).

We define developing economies as economies, which have lower Gross National Income (GNI) that is consistent with The World Bank classifications (2015), and that are less industrially developed, when, compared to emerging and developed economies. Emerging economies are characterized by fast economic growth, increased industrialization and marketing orientation (Bruton, Ahlstrom, & Obloj, 2008). The prime examples of these economies include China and India. Developed economies are marked by higher GNI, high industrialization and well-developed market structures (The World Bank, 2015).

Corollary, renewable energy here is defined as energy produced from sustainable renewable resources that include solar, wind, biomass, geothermal, and small-scale hydropower generations, which are compatible with distributed generations ranging up to 5MW (Ackermann, Andersson, & Söder, 2001; de Vries, van Vuuren, & Hoogwijk, 2007; Viral & Khatod, 2012).

Gaining a better understanding of the factors and conditions that impinge on the outcomes of renewable energy businesses (projects) is essential to ensuring a reliable and cost-effective energy resource mix, increasing energy security, mitigating concerns for the ecosphere, and compensating for fuel cost volatility associated with conventional energy resources (United Nations, 2015). The International Energy Agency (IEA) forecast of 2014 indicates a 37% energy demand increase, primarily coming from emerging economies in the coming three decades (IEA, 2014). To meet the forecasted energy demand increase and ameliorate the environmental stress associated with the increased demand, large-scale deployment and effective operations of renewable energy businesses, as measured by the sustainable value it creates, and the meaningfulness of these businesses to the key decision makers of these projects, are of paramount importance (Cohen & Winn, 2007).

The conventional way of gauging business performance in discrete economic terms has a long tradition in the energy sector. However, as it pertains to renewable energy projects in the context of these economies, the approach lacks the capacity to address the overarching business model innovations, environment, infrastructure, and social concerns that are detrimental to the success of the businesses and the renewable energy project of interest (Porter & Kramer, 2011).

The guiding principles of the business in concert with the collective vision of the host community have significant implications on the outcome of renewable energy businesses and projects. In light of these factors, we propose that the performance of renewable energy businesses to be measured in two dimensions: the sustainable value of the project measured by the integrated economic, ecological, and social value (Hart &

Milstein, 2003; Laszlo & Cooperrider, 2007), and the meaningfulness of the RE project to the key decision makers of the project (Hackman & Oldham, 1980; Renn & Vandenberg, 1995).

In this research work we make major contributions by extending the theory of innovation, and the application of sustainable value as a measure of RE business performance and developed models, which tie together the strategic, operational, and relational dimensions of RE businesses with its management, innovation and marketing orientations, which enables the RE project or firm key decision makers to translate the strategic vision into desired outcomes (Boons, Montalvo, Quist, & Wagner, 2013; Laszlo et al., 2014).

For this mixed method research, we conducted 25 semi-structured interviews (qualitative strand in developing economies), administered web-based survey instrument to 204 key decision makers of renewable energy businesses in emerging economies (quantitative strand 1), and 222 key decision makers in developed economies (quantitative strand 2)

The surveys administered were designed to measure the implications of integrated vision, management practices, business model and technological innovations, relational dynamics, and marketing orientations on the outcome of the RE businesses and projects.

Problem of Practice

Despite substantial interest in renewable energy projects/businesses, there is a lack of comprehensive understanding of factors which impact or explain the practical and perceptual outcomes of renewable energy businesses in developing, emerging and developed economies.

Extant literature treatments of RE businesses (projects) are discrete, descriptive, or highly focused quantitative. Furthermore, the outcome measures utilized do not adequately address the integrated benefits of RE businesses and projects, which combine its high impact applications with cognitive, and perceptual performance drivers (Menguc & Ozanne, 2005).

Gaps In Extant Literature

There is a lack of a systemic and integrated method of evaluating the performance of renewable energy businesses that takes into account all the stakeholders including the ecosphere. Extant conventional renewable energy businesses performance measures are discrete and focus primarily on financial returns paying little attention at best or more accurately paying no attention to the social, environmental, and perceptual dimensions that are significant and substantial to key decision makers of these businesses (Menegaki, 2008).

The two anchoring literatures (theories) for our research are the theory of innovation by Nelson and Winter (1977) and social system theory (Luhmann, 1995). The theory of innovation, which encompasses the processes of inventing new elements, has implications on technology and business model innovations, which are part and particle of RE businesses. On the other hand, Luhmann's work on social systems provides us the emergent environment selection phenomena, which impinge on the outcome of RE businesses.

Descriptive and qualitative literatures on the performance of renewable energy businesses include papers by Achtenhagen, Melin, and Naldi (2013), and Brent and

Kruger (2009). Focused quantitative treatments of RE business outcome include research work by Awerbuch and Sauter (2006).

Literatures on sustainability and flourishing (Boons et al., 2013; Cooperrider, 2008; Ehrenfeld & Hoffman, 2013; Laszlo et al., 2014) provided us frameworks for better understanding the wider implications of RE businesses. In our research, we strived to fill the gap for an integrated and systemic treatment for the high impact application of RE businesses with the associated cognitive, and perceptual business outcome drivers in the context of developing, emerging, and developed economies.

Research Motivation and Goals

The objectives of this exploratory sequential mixed method research is to determine what factors and to what extent these factors explain the outcome of RE businesses, and develop a systemic and integrative approach to evaluating the outcome of renewable energy businesses and projects in developing, emerging and developed economies to fill the gap in current literature.

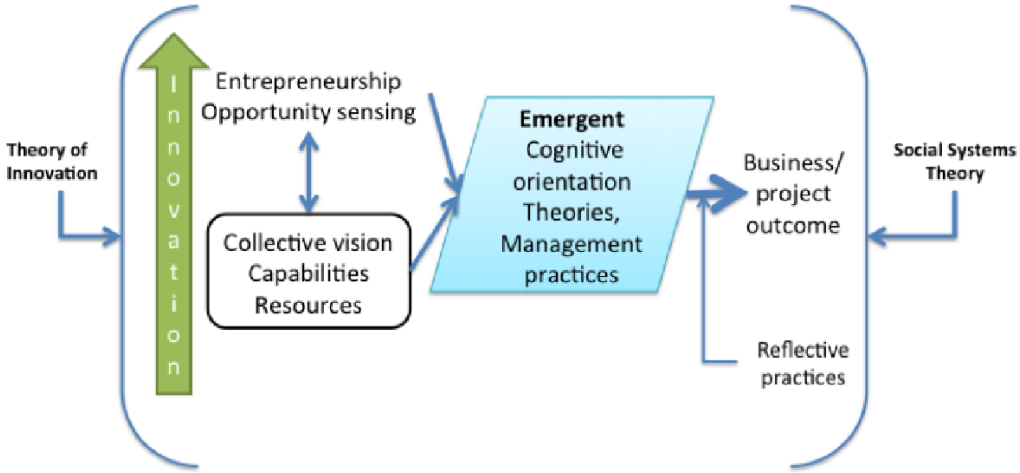
Our research will be underpinned by social systems theory, theory of innovation, techno-economic paradigms, principles of flourishing enterprises, ecological modernization theory, and complexity theory.

CHAPTER 2: THEORETICAL FRAMEWORK

This research strived to answer the following key questions about the outcome of RE businesses and projects in developing, emerging and developed economies. What explains the performance of renewable energy projects in developing, emerging and developed economies? How and to what extent the identified variables impact the outcome of RE businesses and projects in these economies?

Based on the current literature on renewable energy systems, theory of innovation, and social systems,, we have developed an overarching theoretical framework as shown in Figure 1.

Figure 1. Theoretical Framework



As shown in Figure 1, innovations and the workings of the social system where the RE Businesses that include environmental sections anchor the RE business space. Entrepreneurship supported by innovations play a major role in the creation of the desired

outcome of RE businesses. Furthermore, the cognitive and perceptual benefits of RE businesses to the key decision makers of these businesses

Firms engaged in renewable energy projects in developing and emerging economies are developing business models that tend to be different from the RE business models in developed economies (Wüstenhagen & Wuebker, 2011). The business models in developing and emerging economies seem to be anchored on available resources despite the lack of available infrastructures, where, lack of infrastructure is seen as an opportunity for technology and business model innovations. Extant literature informs us that the key drivers for the outcome of RE businesses and projects in emerging and developing economies may be different due to the differing prevailing economic, social, and ecological contexts (Asif & Muneer, 2007; Hall, Daneke, & Lenox, 2010).

As such value propositions, delivery, and value creation of RE businesses are highly correlated with business model innovations, integrated vision, and knowledge creation it undertakes, which are translated into sustainable value via its management practices, transition engagements, and market creation (Baden-Fuller & Haefliger, 2013; Lyberopoulos, Theodoropoulou, Mesogiti, Makris, & Varvarigos, 2014; Nonaka & Toyama, 2003).

Considerable number of renewable energy projects in emerging economies have transitioned from technology demonstration projects to becoming essential and a vital part of the energy resources mix increasing energy security dimensions and giving rise to some capabilities which ameliorate fuel cost volatility and ecosphere issues (Asif & Muneer, 2007; Zhou, Ang, & Zhou, 2012). These transitions have introduced emergent paradigms that focus on business model innovations embedded in local contexts and

strive to meet local market needs utilizing available local energy resources (Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002; Peteraf, 1993).

Hence, strategic technological and business model innovations, which key business decision makers implement, management practices, and marketing orientations they deploy have significant and substantial implications on the integrated performance of RE businesses and projects, including project finance instruments, and investments it attracts (Wüstenhagen & Menichetti, 2012).

We focused on the theory of innovation (Nelson & Winter, 1977), social systems theory (Luhmann, 1995), and ecological modernization (Mol, 2006) as the primary underpinning theories for this research.

Ecological modernization, and theory of innovations provide the rationale for RE project developers/firms for sensing the opportunity/market, selecting the appropriate technology and business model innovations that create sustainable value as part of the value proposition of the business or project for a specific market (Achtenhagen et al., 2013; Baden-Fuller & Haefliger, 2013), whereas, social systems theory provides the bigger selection environment for the workings of the RE project/firm (Hendry & Seidl, 2003; Luhmann, 1995). Environmental selection here includes market structures, regulatory and policy framework, financing instruments, and organization structures that are emergent and self-organizing (Leydesdorff & Ahrweiler, 2014).

Disruptive technology and business model innovations are being utilized to provide creative solutions through entrepreneurial actions and create new markets, which suggest new paradigms in the development and implementation of energy projects that may be significantly different from developed economies (Chang, Chung, & Mahmood,

2006; Elfring & Hulsink, 2003). Chesbrough (2010) has identified the relative importance of technology and business model innovations, which have a significant bearing on our research interest—namely the performance of renewable energy projects and businesses.

Theory of Innovation

The theory of innovation is defined as the process of inventing new elements or ideas (Nelson & Winter, 1977). The origin of innovation theory goes back to Joseph Schumpeter (1934).

According to Schumpeter, innovation is understood to be the prime mover for economic development. Entrepreneurs are the forces that innovate and bring new products and services to the market.

In his later work, Schumpeter emphasized that innovation as a collective process, which signifies the link between innovations in the context of institutions and cultures, which impinge on economic, and social developments (Lundvall, 2010). The innovation process occurs at the micro and macro levels, and national innovation policies are developed to enhance innovation and its outcomes in impacting national economies (Sundbo, 1998).

Innovation in the renewable energy space have complex, emerging, and nested relationships in social system settings (Nelson & Winter, 1977). It has bi-directional effects with emerging business models, technology innovations, market orientations, policy frameworks, ecosphere concerns, and economic configurations (Langton, 1992).

Technology innovations that have been accompanied by business model innovations seem to have substantial and significant implications in RE developments in

emerging economies (Boons et al., 2013; Markides & Sosa, 2013). Innovations in RE sector include understanding customers, market configurations, technology, and business model innovations, encompassing the introduction of cost-effective disruptive technologies, which may have wider consequence in the sector, and beyond (Hall & Vredenburg, 2012; Hart & Christensen, 2002; Wüstenhagen, Wolsink, & Bürer, 2007).

The innovation process involves dynamic and system-wide socio-technical-ecological change in renewable energy systems development, its deployment, and the business models that undergird it (Bohnsack, Pinkse, & Kolk, 2014; Hockerts & Wüstenhagen, 2010). Innovations that are configured according to the local needs, and capabilities, re-constituting business practices, technology appropriations, post-industrial knowledge creation, and conditioning customer behaviors in direct market-incentive based interventions and through decision support systems have significant implications for the outcome of RE businesses, and projects (Brentani & Reid, 2012; Chakrabarti, Kyriakides, Bi, Cai, & Terzija, 2009; Dinica, 2006; Elzen, Geels, & Green, 2004; Loorbach, 2007). Besides changing the socio-technical landscape, it embodies the social construction of technology, and knowledge creation (where knowledge creation is defined to include the shared responsibility of caring for self, society, and the ecosphere), cultural meaning, and redefining development and the development path of a society (Milbrath, 1989; Rifkin, 2009). Such approach is identified to be synthesized, contextualized, and holistic, which yields the most sustainable value to all the stakeholders including the ecosphere not only as a tool to gain market advantage, but one that leads towards flourishing (Baregheh, Rowley, & Sambrook, 2009).

Contextualized technological and business model innovations are supported by modular system configurations, which enable adaptive capacity building and resiliency by reducing cross-interface risk transfer and increasing the flexibility of the system (Weick, 1976). This theory helps us to understand the fundamental socio-technical paradigm shift, which is associated with deployments of renewable energy projects, and system- wide changes that it introduces (Cooperrider & Whitney, 1999).

These changes may include economic relations, entrepreneurship engagements, social construction and meaning of technology, education and health impacts, marketing & pricing strategies for electricity and other goods and services, which impacts the overall direct and indirect performance of the RE project of interest. As such the theory of innovations helps us to gain a better understanding of knowledge creation, eco-communal management, transition engagements, and the outcome of RE projects in our research. However, this theory alone does not capture the full complement attributes of RE businesses and projects, which include the perceptual and relational dimensions associated with these businesses

Social Systems Theory

The performance of renewable energy projects is in nested relationships with major sectors in social system settings and cannot be viewed in isolation from the social system (Holling, 2001; Luhmann, 1995). It is related to the selection environment, organized complexities in knowledge creation at the individual and community level, integrated vision/paradigm on development, innovation environments, and overarching social conditions.

Here, knowledge includes customer, product, business model, and cultural knowledge, which are application oriented, and prevalent in the social system (Dewey, 1929), participatory (Buchecker, Hunziker, & Kienast, 2003), and "post-industrial" scientific knowledge (Ziman, 2002). Knowledge creation in our research context includes social-ecological memory (Berkes & Turner, 2006), which has significant implications on the outcome of renewable energy businesses. An integrated vision of the RE project/firm in concert with the collective vision and connectedness in social systems formulate the foundational building blocks for the entrepreneurial motive for technology and business model innovations, which provide solutions to prevailing economic, business, social, and ecological challenges. Technological and business model innovations, stranded assets, institutional/cultural, ecological, and economic conditions, which are related in feed-forward and backward relations, impinge on the performance of renewable businesses.

Social systems theory with its premise of environmental selection and allowance for organized complexity helps us to gain a better understanding of the performance of renewable energy systems that are embedded in interconnected economic, social, ecological, and perceptual spheres (Hendry & Seidl, 2003; Luhmann, 1995). Hence, social systems theory enables us to gain systemic, deeper and richer insights of connectedness, integrated vision, and knowledge creation, and their implications on the performance of RE projects.

Hence, the theoretical frameworks we have identified help us to formulate an integrative approach, which accounts for the embedded complexity RE projects in social systems, which include the effects of nested social, economic, political, and ecological concepts (Page, 2010).

Ecological Modernization Theory

Ecological modernization theory states that the best way to mitigate ecological degradation is by continued industrial development (Mol, 1995). Here ecological modernization theory indicates that technological and business model innovations to be part of the pathway for development and addressing ecological concerns. As stated in the earlier sections of the paper, renewable energy projects are identified as enablers for sustainable development and creating synergistic and symbiotic relationships between sustainable value creation for the stakeholders, and sustainable ecosphere development.

The primary premise of ecological modernization theory (EMT) is investigating and gaining a better understanding of ecological challenges and ecosphere concerns in the modern energy intensive economy (Mol & Sonnenfeld, 2000). As York and Rosa (2003) have summarized this concept of EMT by stating, "In sum, EMT suggests the possibility that inherent in the process of late modernization are self-referential mechanisms such as the need to internalize environmental impacts in order to ensure future production inputs that have the potential to lead to ecological sustainability" (p. 274). Here, York and Rosa are suggesting a closed loop system dynamics that has built-in balancing loop to mitigate environmental concerns without demanding far-reaching behavioral and consumption pattern changes in society. However, a deeper review of this theory demonstrates the theory to embody adaptive processes that can be tailored to geographical, ecological engagements. As Mol (2006) states, "The basic premise of ecological modernization theory is the centripetal movement of ecological interests, ideas and considerations within social practices and institutional developments of modern societies" (pp. 33–34).

Ecological engagements vary on regional factors among others affecting the premise of RE projects from technology & business model innovations, management practices (London & Hart, 2004), techno-economic paradigm shifts, and the creation of knowledge (Hessels & Van Lente, 2008) and markets affected by overarching nested complex social systems (Page, 2010). Hence, this theory helps us to gain deeper and differentiated implications of integrated vision, knowledge creation, and connectedness on the outcome of renewable energy projects in developing, emerging, and developed economies.

Furthermore, ecological modernization theory has implications on how RE project/firm's integrated vision is framed and how it initiates and deploys transition engagements, how knowledge is created and the effectuation of the underlying relational dynamics, which has a bearing on the desired outcome of the project (Jänicke & Jacob, 2005). Above and beyond these, EMT's valuation methods offer comprehensive assessment methods, which accounts for externalities associated with non-renewable energy resources. When externality costs are accounted for in the ledger of energy productions and distributions, renewable energy projects seem to have favorable valuations in comparison with power generations that are based on non-renewable based resources (Menegaki, 2008).

Ecological modernization theory helps us to better understand the performance of RE projects by inherently associating modernization, which has a marker attribute of energy intensity with a self-referenced drive to internalize environmental costs. However, this closed loop relationship is conditioned by other factors such as the efficacy of policy

frameworks, market structures, and regulation regimes that have resulted in differentiated outcomes (Owen, 2006).

Ecological modernization theory provides us a helpful yet discrete lens for measuring the performance of RE projects. However, when this theory is augmented by the theory of innovations and social systems theory as proposed in our research, we anticipate developing a more systemic and integrated understanding of the outcome of RE projects.

Resource-Based Theory of Competitive Advantage

The resource-based theory of competitive advantage is defined as a strategic approach that integrates the firm's resource base, capabilities, profit-earning potential, and enhances its pooled resources and capabilities (Barney, 2001; Grant, 1991). This strategy utilizes a five-step process to determine the firm's resources and capabilities and develop an optimal strategy to orient the firm towards successes. We surmise this type of strategic formulation may be instrumental in providing better positioning to renewable energy projects and businesses engaged in the energy sector in general.

This theory asserts that the capability of a firm to generate and keep profitable markets is tied to its access to competitively beneficial resources, which are useful for production and distribution while denying its competitors from gaining accesses to them (Conner, 1991).

Using resource-based theory for renewable energy projects is beneficial to formulate a sound strategy that captures the differentiated resource-based capabilities generated by renewable energy projects, which include proper site selection among other variables. Menegaki has developed a sound framework for cost-benefit valuation and

evaluation of renewable energy resources. As Menegaki has identified, valuation here is concerned with assigning a value to the attributes of renewable energy, whereas, evaluation is concerned with the overarching cost-benefit analysis (Menegaki, 2008).

According to Menegaki, stated and revealed valuation methods "produces the most inclusive values for renewable energy" by taking into account consumer preferences and externalities. Option theory and portfolio analysis captures the monetary values associated with renewable energy in terms of fuel risk mitigation, overall portfolio cost and risks (Lee, 2011; Menegaki, 2008). This framework is alternative to Capital Asset Pricing Model (CAPM) that correlates risks and returns for investments. Hence, resourced-based theory helps us to gain a better understanding of the performance of renewable energy projects by combining consumer preferences, cost volatility containment using less volatile renewable energy resources, and deploying full scope valuation methodologies.

Energy analysis is the most efficient of all the three methodologies and it is ecological engineering-based. It attempts to measure the net value of ecosphere friendly projects to society at large (Menegaki, 2008). This methodology is not a substitute for market valuation of projects, but it could be utilized as an alternative to market valuation for projects that can tolerate additional risks.

Resource-based theory utilizes effective techniques to evaluate renewable energy projects, and this could be instrumental in capturing comprehensive benefits of RE projects. Such benefits include reduced greenhouse gas emissions, thermal and noise pollutions, enhanced energy security, improved economic efficiency, improved employment, social, and cultural developments, and enhanced international relations

(Awerbuch & Sauter, 2006). Hence, the resource-based theory of competitive advantage in our research context helps us to gain a better understanding of knowledge creation, which entails the creation of value through entrepreneurial actions, transition engagements, and eco-communal practices.

However, this methodology alone does not capture the full scope of emergent and self-referencing attributes of the complex relationships of RE projects that are embedded in the social system.

Complexity Theory

Renewable energy businesses seem to be complex due to its nested nature and the impact of the economy, politics, and governance. Renewable energy development with impinging emerging technologies, alliances, policy frameworks, and economic configurations is dynamic and at the cusp of change through the development and implementations phases; which has embedded nontrivial behaviors that seem to be chaotic (Langton, 1992).

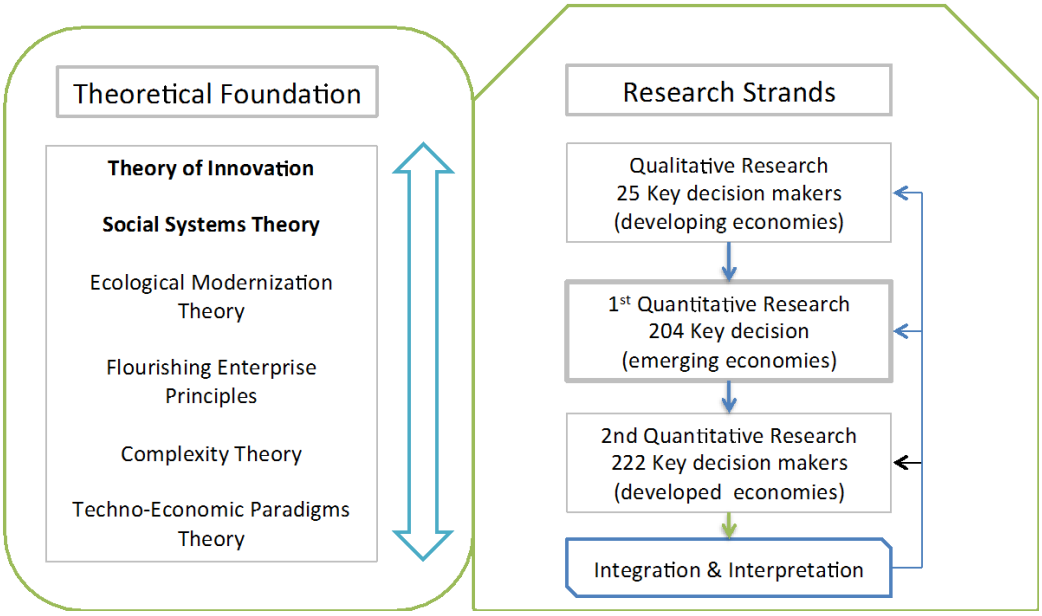
The management of renewable energy businesses and projects will benefit by adapting insights from complexity theory to formulate an effective strategy of directing a system that needs to be optimized at its current state while at the same time taking into considerations its future behavior (van den Bergh & Bruinsma, 2008).

CHAPTER 3: RESEARCH METHOD AND DESIGN

Overall Research Design

Our research design is a quantitative priority mixed method exploratory sequential research design (qual => QUAN => QUAN) because of the plural and practice-oriented theoretical frameworks and data collection methodology (interviews and survey instruments) that best fits our overall research objectives (Creswell, 2013; Crotty, 1998). The selected research design is presented in Figure 2.

Figure 2. System Level (Overall) Research Design



We surmise that this quantitative priority sequential mixed method research with integration at interpretation illuminated the multiple variable and complex relationships resulting in significant and substantial implications on the performance of RE projects. A synthesized, systemic, and integrated method/model to evaluate the aggregate

performance of RE businesses and projects in the context of developing, emerging, and developed economies is presented.

The findings of our qualitative research and current literature on renewable energy informed us that seven factors that include emergent integrated vision (Ireland, Covin, & Kuratko, 2009; Milbrath, 1989), business model and technology innovations (knowledge creation and its applications) (Baden-Fuller & Haefliger, 2013; Bohnsack et al., 2014) creative management practices (eco-communal management), and transition engagements (Boyatzis, 1982; Hall & Vredenburg, 2012; Hart & Dowell, 2010), and relational dimensions or connectedness (Sosik, 2005; van Bel, Smolders, Ijsselsteijn, & de Kort, 2009) affect the desired integrated outcome of renewable energy projects (Achtenhagen et al., 2013; Laszlo et al., 2014). Our 1st strand quantitative research supports the findings of our qualitative research, which ties together integrated vision, eco-communal management, and connectedness as the predicator variables explaining 59% and more of the variance of the outcome variables.

Furthermore, our research highlights the multilevel interactions among business model & technology innovations, ecological modernizations, and innovative management practices that are emergent and embedded in complex environments of social systems (Hessels & Van Lente, 2008; Hunt, 2011; Luhmann, 1995; Manyika et al., 2013; Zott & Amit, 2010). These dynamic and emergent relationships inform and shape the performance of renewable energy projects in near and long-term horizons in developing, emerging and developed economies.

Due to the real-world complex and plural knowledge bases that are required to address the interconnected and self-referencing economic, social, ecological, and

perceptual issues, which are embedded in our research, mixed method research offers the best alternative approach to developing a more rigorous, and integrative approach to the performance of renewable energy project.

Strand 1: Qualitative Research

Qualitative, grounded theory formulated by Glaser and Strauss (1967) was used to conduct this research (Glaser & Strauss, 1967). Grounded theory is an integrative methodology with the goal of discovering "theory from data" as opposed to developing hypotheses from existing theories. This methodology is chosen because of its fidelity to address research topics concerned with people's lived experiences and events that unfold during the initiation, development, and implementation of the projects.

Furthermore, Grounded Theory has been chosen because of its strengths in conducting qualitative research that is focused on people's lived experiences. Maxwell details five areas of interest that are "especially suited" for qualitative studies. Each of these five areas has a pertinent impact on the measurable and perceived performance of renewable energy projects in the context of developing economies. "Understanding the *meaning*, for the participants of the events, situations, experiences, and actions they are involved with or engage in. Understanding the particular *context* within which the participants act, and the influence that this context has on their actions. Identifying *unanticipated* phenomena and influences, and generating new, "grounded" theories about the latter. Understanding the *process* by which events and actions take place. Developing "causal explanations" (Maxwell, 2012).

We started our research with a qualitative research conducting semi-structured grounded theory based (Glaser & Strauss, 1967) interviews with 25 key decision makers

of renewable energy projects across seventeen developing economies. The objective of the research was to explore the factors that influence the performance of renewable energy projects from the lived experiences of key decision makers of RE projects in developing economies. In conducting the structured interview we explored how and to what extent does innovation, business strategy, policy and regulatory framework, job creation, cost, security (economic and political), culture, climate change, health impacts, deforestation, customer value of service, and capacity development affect the performance of renewable energy projects.

Strand 2: Quantitative Research 1

We used web-based survey instrument to gather data from 204 key decision makers (completed surveys) of renewable energy projects and firms that have developed renewable energy projects in a representative sample of emerging economies that include China, India, Indonesia, Malaysia, and the Philippines.

Forty-five percent of the respondents were senior executives (CEO, COO, CFO, CTO), and 55% senior manager/managers with titles of project director and program manager.

We utilized Structural Equation Modeling (SEM) to investigate the underlying relationships among that impinge and explain the outcome of RE businesses and project in the context of these emerging economies, which, were revealed by our qualitative study.

Research Questions

How and to what extent do Integrated Vision, Knowledge Creation, Connectedness, Eco-Communal Management, Transitions Engagements, and Market Creation affect the outcomes of RE projects in emerging economies?

Strand 3: Quantitative Research 2

Our qualitative research has revealed key factors that affect the performance of RE project, and our 1st quantitative research was instrumental in characterizing the effects of the identified predictor variables on the outcome variables sustainable value and meaningfulness in the context of emerging economies.

For this (2nd quantitative research) strand of the research, we utilized web-based survey instrument to gather data from 222 executives and senior managers with renewable energy business and project experience in seven representative developed economies (U.S., Canada, Germany, Japan, UK, France, Norway).

Forty-five point five percent of the respondents were executives (CEO, COO, CFO, CTO), and 54.5% senior manager/managers with titles of project director and program manager. We used Structural Equation Modeling (SEM) to investigate the underlying relationships among that factors that impact and explain outcomes of RE businesses and project in the context of developed economies.

Research Questions

How and to what extent do Integrated Vision, Knowledge Creation, Connectedness, Eco-Communal Management, Transitions Engagements, and Market Creation affect the outcomes of RE projects in developed economies?

Are business/project drivers, mediators, and outcomes relationships different or the same in emerging and developed economies?

What are the implications of reflective practices on RE project/business outcome in developed economies?

Integration of the Three Strands

The quant priority sequential mixed method research is integrated and interpreted. The findings of the three strands are integrated and the implications of the integrated findings yielding rich insights about the outcome of RE business across the three economies.

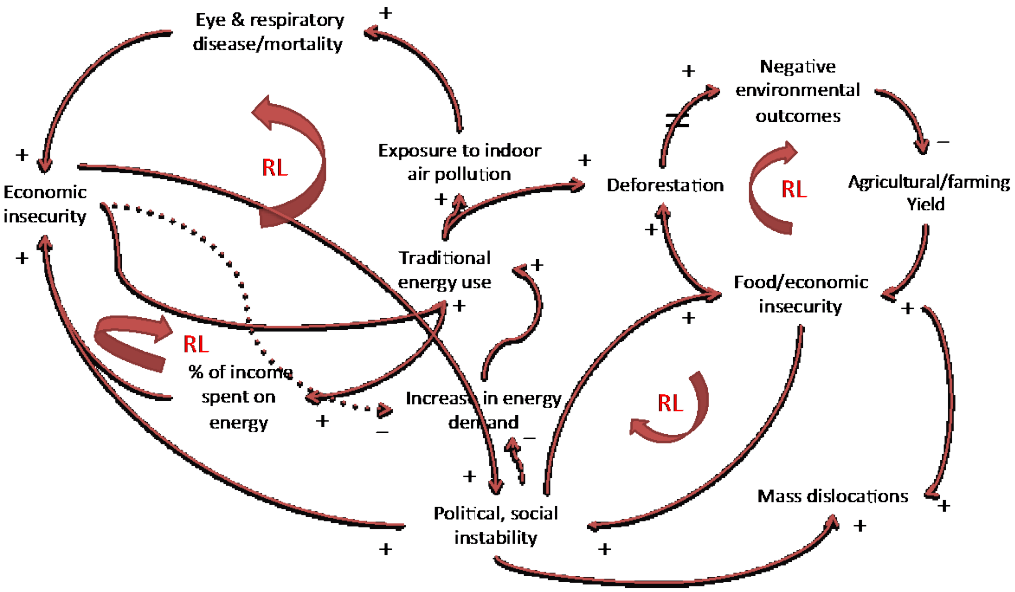
CHAPTER 4: QUALITATIVE STRAND

Introduction

Most developing economies have abundant RE energy resources; however, access to affordable and reliable electricity is very limited. In some developing or less developed economies access to electricity is estimated to be 30% or less. This problem is more acute for the rural population in developing countries, who meet their energy needs from traditional fuels that have compounded negative economic, social, environmental and health impacts (Brew-Hammond & Kemausuor, 2009; Kanagawa & Nakata, 2007). It is estimated that 50% of all households and 90% of the rural households use coal and biomass as their primary source of energy, which significantly contributes to the estimated 3 billion people in the world that are exposed to harmful indoor air pollution. It is further estimated that 1.6 million deaths annually may be attributed to the intensive use of biofuels for cooking and heating in developing countries (Torres-Duque, Maldonado, Pérez-Padilla, Ezzati, & Viegi, 2008).

The problem is more perplexing since it has a feedback loop where the majority of the rural population in developing countries spend significant portion of their monthly income (5–20% in sub-Saharan Africa) on fuels (Barry, Steyn, & Brent, 2011), and the utilization of these traditional fuels further causes economic insecurity, significant health problems (Torres-Duque et al., 2008), and promotes deforestation that causes further insecurity as illustrated in Figure 3.

Figure 3. Wider Implications of Energy Systems in Context of Developing Economies



Legend: RL: Reinforcing loop
Traditional energy use: use of coal, wood, crop residues, dung, peat,

The availability of reliable and cost-effective energy sources are imperative for the overall betterment of developing countries. To that end, the performance of energy producing projects in general and renewable energy businesses,in particular, are essential for sustainable economic and social development of these countries (Barry et al., 2011). There are numerous publications reporting on renewable energy in developing economies; however, there is little to no literature reporting on the overall performance of these businesses (Schilling, Freier, Hertig, & Scheffran, 2012; UNIDO, 2009). Therefore the intent of this research strand is to better understand the performance of renewable energy businesses and projects from the context of developing economies as it has been

identified as a key enabler for the integrated and overarching development of these economies (Chineke & Ezike, 2010; United Nations, 2015; Vera & Langlois, 2007).

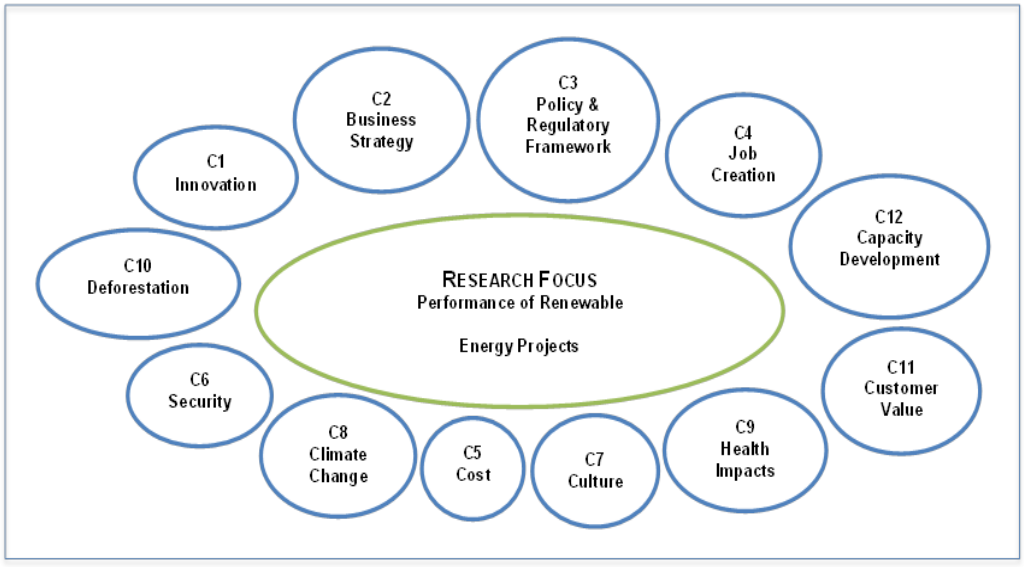
Research Question and Situational Map

What influences or explains the outcome of renewable energy projects (research focus) in developing economies? How and to what extent do innovation, business strategy, policy and regulatory framework, job creation, cost, security (economic and political), culture, climate change, health impacts, deforestation, customer value of service, and capacity development affect the performance of renewable energy producing projects in developing economies? The situation map is presented in Figure 4.

Performance of Renewable Energy Projects

The performance of renewable energy projects for our purpose is defined as the sustainability attributes that measures the integrated economic and environmental impacts on society on the short and long-term basis both from local and global perspectives.

Figure 4. Situational Map for the Outcome of RE Businesses



The desired research focus includes meeting target revenue for continued, and proper operation of the business/project (Eberhard & Shkaratan, 2012), improving the quality of life, and social conditions of the people, reduction in CO_2 and other greenhouse gases (Akella, Saini, & Sharma, 2009) and improving the integrated economic, social, and cultural dimensions of the host community of the business/project.

In the context of developing economies, the performance of renewable energy projects includes increasing accessibility of reliable and cost-effective electricity, creating sustainable and profitable businesses, improving the living standards, economic opportunities, social, environmental, and cultural developments, increasing energy security, and decreasing energy poverty (Assmann, Laumanns, & Uh, 2006: 72–75; Brent & Kruger, 2009; Javadi et al., 2013).

Innovation [C1]

Innovation here is defined comprehensively as a "multi-stage process whereby businesses transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh et al., 2009).

As it pertains to renewable energy in the context of developing countries, selecting the optimal innovation strategy that includes appropriate renewable energy technologies, which, meet the needs and harness the available energy resources is one of the primary variables that impact the performance renewable energy projects (Barry et al., 2011). Cost, reliability, maintenance, and cultural orientation need to be considered for innovation & technology selection (Murphy, 2010; Thorne, 2008).

Technology

Technology for this study is defined as technologies that adequately address the market and consumer's requirements (Teitel, 1978). Technology selection is identified as a determinant factor for renewable energy businesses/projects and by synthesis, it is critical for sustainable economic and social developments in developing economies (Barry, Steyn, & Brent, 2009; Barry et al., 2011). Choosing a technology that matches the available renewable resources is one of the essentials for the success of a renewable energy business/project (Deichmann, Meisner, Murray, & Wheeler, 2011).

Technology adoption here is defined as the transfer and acceptance of renewable energy technologies by the host country based on its available renewable energy resources, social, economic, and political needs (Stephens, Wilson, & Peterson, 2008). Furthermore, the efficacy of renewable energy technology diffusion and adoption is dependent on policy instruments that are designed for reducing initial capital requirements of a project (Neij, 1997).

Business Strategy [C2]

At the basic level, a business model is defined as how the firm stays profitable and sustainable over a long period of time. It is "a statement of how a firm will make money and sustain its profit stream over time" (Stewart & Zhao, 2000: 288–292). Effective business strategy for renewable energy includes transition management at its core that adjust, adapt and influence the business processes to attain long-term sustainable business outcomes (van den Bergh & Bruinsma, 2008).

However, business strategies for renewable energy in developing countries needs a paradigm shift from large-scale operations to highly efficient and distributed small scale

operations. The lower pyramid market for energy has a great potential to service two-thirds of the world's population in meeting their energy needs in ways that are sustainable and economically profitable (Prahalad & Hart, 2002). The lower pyramid markets include the base of the pyramid that has more than 4 billion people whose annual income is about $2,000 US, and other lower income people outside of the top of the pyramid with household income of $10, 200 or less (Prahalad & Hammond, 2002).

The risks identified for renewable energy businesses in developing economies often include financial, political, cultural, and technical risks (Komendantova, Patt, Barras, & Battaglini, 2012). Among these identified risks, concern for financial risk is highly correlated with governance, regulation, market stability, and is most often cited as the most important parameter by stakeholders (Drine, 2012).

Cost Leadership Strategy

Cost leadership strategy is defined as the overall least cost leader on a long-term basis that is garnered from varying cost structures, accesses to non-volatile fuel cost, learning effects, and accounting for externality costs (Murray, 1988).

Renewable energy projects business strategies in developing economies have taken the form of low-cost providers on a long-term basis. Renewable energy projects are structured to provide low-cost alternative energy by utilizing available renewable energy resource streams, which mitigate fuel cost volatility, decrease transmission and distribution costs, while mitigating environmental concerns, and increasing accesses to energy in developing countries (Prahalad & Hart, 2002). Combining low-cost alternatives with corporate social responsibility (Porter & Kramer, 2006) especially mitigating environmental concerns for these projects could yield significant benefits over non-

renewable resources-based energy projects. Renewable energy in developing countries is an emerging industry with great potential for growth.

Investment

Investment for our purpose is defined as investing capital into a project or business for the purpose of making a profit. Investment is identified as one of the key parameters for renewable energy projects in developing economies (Brew-Hammond & Kemausuor, 2009; Murphy, 2010; Quirke, 2012; UNIDO, 2009).

Finance

Finance is defined as all the resources needed for the establishment, sustainable and profitable operation of the project (Winborg & Landström, 1997). Selecting the right mix of financing mechanisms for a renewable project in developing economies is a key factor in determining its outcome (Chaurey & Kandpal, 2010). RE projects and businesses could be financed by governments, private interests, or local communities. The appropriate financing mechanism depends on the prevailing conditions of the selected project development site. The energy service company (ESCO) model has gained traction in many developing countries. ESCOs use fee-for-service arrangements for providing electrical power and associated maintenance services.

Policy and Regulatory Framework [C3]

Policy and regulatory frameworks are defined as instruments that are designed to create sustainable and profitable renewable energy market by establishing regulations that ensure access to markets, establishing pricing mechanisms, environmental standards that govern emission and pollutions, provide information, education, and encourage stakeholders' involvement (Assmann et al., 2006).

Coherent policies and regulatory frameworks have been identified as key parameters for the performance of renewable energy projects. Such frameworks are deemed to provide clear guidelines, which encourage private and public concerns to be vested in the projects for the long run (Odeku, Meyer, Mireku, & Letsoalo, 2011; Thorne, 2008). The importance of sound and coherent policies on the outcome of projects has been demonstrated in established businesses and projects implemented in many developing businesses (Ellegård, Arvidson, Nordström, Kalumiana, & Mwanza, 2004).

Job Creation [C4]

Job creation is defined as the provision of new opportunities for paid employment, especially for those who are unemployed, according to the Oxford dictionaries.

The utilization of renewable energy to generate income is expected to create further favorable conditions for extending accesses to electricity and mitigating environmental concerns (Mathiesen, Lund, & Karlsson, 2011). The correlation between the success of Re projects and productive use of energy or job creation is identified as a critical factor in the success of renewable energy projects in developing economies (Brew-Hammond & Kemausuor, 2009).

Cost [C5]

Cost or levelized cost of energy (LCOE) is defined as the lifetime cost of energy production divided by lifetime generated energy (Branker, Pathak, & Pearce, 2011; Darling, You, Veselka, & Velosa, 2011). This cost model does not account for externality costs associated with energy production and distribution. A more wholesome LCOE is determined by including environmental impacts, energy security, transmission and

distribution costs (Roth & Ambs, 2004). The initial cost of energy projects, in general, is higher than other projects. While developing countries spend 10–20% of their GDP on energy infrastructure development, accesses to reliable and safe energy is very limited (UNIDO, 2009).

Energy Affordability

Here, energy affordability is defined as the financial capability of a household to pay for basic energy services. In other words, it could be expressed as the monthly energy expenditure of a household divided by its monthly income (Fankhauser & Tepic, 2007).

Energy affordability includes affordability of accesses and affordability of consumption. The availability of reliable, cost-effective, and environmentally sound energy that is produced from indigenous and renewable resources is essential for the sustainable development of transitional economies (Vera & Langlois, 2007).

Security [C6]

Energy security is defined as the reliability, resilience, and the diversification of primary energy resources (Pepermans, Driesen, Haeseldonckx, Belmans, & D'haeseleer, 2005).

Energy is essential to sustain modern life. Here security implies the economic, social, and environmental impacts of energy on the wellbeing of a society (Asif & Muneer, 2007). The energy regime that a country chooses has wider implications on its national security strategy and foreign relations. It affects the economic and technological path it takes and impinges on overall developments that include industry, education, environment, and the way of life (Yergin, 2006).

Culture [C7]

Culture is defined by Hofstede as the collective mental efficacy that is common among the people of a nation, a region or a group (Hofstede, 1983).

Firms and businesses are cultural constructs that are supported by institutions (Granovetter, 1992). Culture plays a significant role in entrepreneurship and moreover, on sustainable entrepreneurship that combines creating economic benefits and sustainable communities (Cohen & Winn, 2007). The impacts of culture on business style, leadership development, technology adoption and innovations are significant (Bhaskaran & Sukumaran, 2007). The emergence of new international ventures that combine capabilities, resources and management strategies from different countries and regions present a different perspective (Di Gregorio, Musteen, & Thomas, 2008).

Climate Change [C8]

Climate change is defined as the change in climate that is induced by human activities that surpass natural variations (Karl & Trenberth, 2003). It includes the change in concentration of carbon dioxide, methane, and nitrous oxide in the atmosphere (IPCC, 2007; United Nations, 2015). These changes may include a change in agro-economics, rainfall, sea level, and change in general weather patterns (Parry, Rosenzweig, Iglesias, Livermore, & Fischer, 2004). The impact of such possible changes is expected to be more severe in developing countries due to the cost and capabilities required to mitigate the impacts associated with these changes.

Health Impacts [C9]

Health impacts here are defined as negative health outcomes that include morbidity and mortality associated with exposure to indoor pollution from the use of

biomass as a source of domestic energy. These negative health impacts include lung cancer, acute respiratory infection, chronic obstructive pulmonary disease, asthma, tuberculosis, eye diseases, blindness, cataract, and low birth weight that plague developing countries (Ezzati & Kammen, 2002).

The health impacts of burning traditional fuel include the use firewood, charcoal, kerosene, and agricultural byproducts for cooking and heating purposes in developing countries. According to Carlos Torres-Duque et al. (2008), the fatalities associated with biomass fuel ranges from 1.5 to 2 million annually. It is estimated that 50% of households and 90% of the rural household use biomass making the problem a significant respiratory global health concern (Torres-Duque et al., 2008).

Deforestation [C10]

Deforestation here is defined as the removal of vegetation for fuelwood and other uses. Deforestation affects biodiversity, rainfall, and weather patterns that affect the health and the livelihood of the continent's population (Duveiller, Defourny, Desclée, & Mayaux, 2008). There are complex relationships among economic, social, and ecological systems that call for a sound and integrated sustainable development approach to mitigate deforestation and promote economic and social developments (Folke et al., 2002).

Customer Value of Service [C11]

Customer value of service in this research context is defined as the market-perceived worth of the service provided to the customers (Gale & Wood, 1994). The customer values of energy services in developing countries are higher in discrete terms. The lack of reliable electricity in developing countries significantly affects their economy; to name a few Nigeria, India, Pakistan, Kenya, and South Africa suffer from

significant electricity outages hampering their economic activities (Adenikinju, 2005).

Capacity Development [C12]

Capacity development here is defined as integrating indigenous know-how, local social resources, and institutions for economic, social, and political development (Fukuda-Parr & Lopes, 2013).

Capabilities in innovation, entrepreneurship, management and other disciplines are essential for large-scale adaptation of renewable energy in developing countries. With climate change expected to create a climate of uncertainties, developing capacities that are adaptive and forward looking will be essential for developing countries (Lemos, Boyd, Tompkins, Osbahr, & Liverman, 2007).

Research Design

Sample

Twenty-five practitioners engaged in at least twenty-five different renewable energy projects were interviewed to elicit rich lived experiences. All interviewees worked on renewable energy projects in developing countries, and were key stakeholders in the identified RE projects. They were key decision makers on the overall scope of the projects and, as such, they were entrepreneurs, owners, founders, CEO, general managers/managing directors, and project managers of renewable energy projects.

All the participants were contacted through the researcher's personal and professional networks. They were selected based on their lived experiences and authority in the field verified through information available in the public domain. The participants were categorized into three general groups based on their years of lived experiences working in the RE sector. The three categories are early professional stage with less than

10 years of experience, middle with ten to twenty years, and mature with more than twenty years of experience. Research interviews were conducted via Skype, telephone, and in person until saturation was achieved.

Background information, qualifications, and demographic data of the research participants are presented in the Tables 1–4.

Table 1. Professional Experience of Qualitative Research Interview Participants

Professional Experience of Qualitative Research Interview Participants		
Early [< 10 yrs.]	16 out of 25	64%
Middle [10 - 20 yrs.]	5 out of 25	20%
Mature [> 20 yrs.]	4 out of 25	16%

Table 2. Gender of Qualitative Research Interview Participants

Gender of Qualitative Research Interview Participants		
Female*	5 out of 25	20%
Male	20 out of 25	80%

*Proposal target was 10%

Table 3. Responsibility of Qualitative Research Interview Participants

Responsibility of Qualitative Research Interview Participants		
CEO/COO/Founder/ Owner	6 out of 25	24%
Consultant	2 out of 25	8%
Director/Managing Director	10 out of 25	40%
Educator/Center Director	1 out of 25	4%
Investment Banker	1 out of 25	4%
Program Manager	4 out of 25	16%
Senior Advisor	1 out of 25	4%

Table 4. Educational Background of Qualitative Research Interview Participants

Educational Background of Qualitative Research Interview Participants		
High School Diploma	1 out of 25	4%
Bachelor's Degree	3 out of 25	12%
Masters degree	16 out of 25	64%
Ph.D.	5 out of 25	20%

Data Collection

Data collection commenced May 2013. Interviews were conducted in person, via telephone, and Skype, adhering to proper protocol describe in Appendix A. The selected research interviewees were contacted by phone or email and invited to be part of the research. Once their willingness to participate in the research was established, the selected candidates were advised of the established protocols to ensure their privacy and protect their identities.

The confidential, semi-structured interviews on average lasted 50 minutes. The research interviews participants were involved in at least 25 RE projects across 17 developing countries. The research participants have RE business/project experiences across a wide spectrum of developing economies, which include countries with the fastest growing GDPs in the past ten years (2006–2015) to less developed economies (Pasquali, 2015).

During the interview, participants were asked open-ended questions about their lived experiences, their assessment of the projects being successful or less successful, and their experiences were captured through their narratives (Boyatzis, 1982, 2009). After a brief introduction, using the interview protocol as a guide (Appendix A), each participant was asked about what affected the performance of the renewable energy project that they have been engaged as key stakeholders. They were further asked to provide specific examples from their lived experiences working on what the interviewee defined to be the most successful project. Based on the participant's response, further questions were asked about the people who worked on this project with them and they were asked to provide specific examples from their work and life experiences. Follow-up questions were asked

about the impact of the identified concepts on the project and similar question were asked about the interviewees most memorable and less successful projects.

Data Analysis

Data analysis commenced after the interviews were transcribed and continued throughout the research process. During the interview process, I took significant research notes that were effectively used during data analysis. Once the interviews were transcribed, I listened to the interviews, while reading the transcript and research notes. The coding process was dynamic and iterative, starting with initial coding/open coding, theoretical framework reviews, and then axial coding (Saldaña, 2009). Throughout the process, I remained open to emergent ideas, themes, and trends from the data consistently. A dynamic research model was used going back and forth from the data to the literature to research design and protocol to ensure that all the components of the research work harmoniously to make the research endeavor efficient and successful (Maxwell, 2012).

In initial open coding, 198 codes were identified. During these processes, transcripts of interviews were reviewed, while listening to audio recordings of the interviews. Iteration of open coding, accompanied by literature reviews, and axial coding reduced the codes to 59 codes. During these processes, interview transcripts were continuously reviewed in concert with theoretical framework reviews. Further reviews of interview transcripts, research notes, memos, and re-listening to the audio recording of the interview identified nested codes that were collapsed to primary codes yielding 33 final codes as shown in Table 5.

Table 5. Final Codes

1	Affordability	The ability of the end user to pay for products or services
2	Aggregation	Seeded micro motive that creates macro behavior
3	CBO [community-based organizations] engagement	Self-organizing/emergent community-based organizations engagement in societal endeavors
4	Connectedness	"Building a large tent". Rich and complex capacity of blending/separating personal and work life, living and relating with plenty & meager material resources, "backward" and advanced technologies, tradition and non-traditional values, peace & chaos simultaneously
5	Climate change impacts	Significant climate variations that include drought, flooding, and unseasonal weather effects outside of historically normal variations
6	Culture	Shared intellectual expressions, arts, and customs of a community
7	Corruption	Use of authority for unlawful personal benefits
8	Eco-communal mgmt.	Outcome-based management that is people, ecology and efficiency focused
9	Family	A social group that shares blood and strong social relationships that include extended relationships
10	Localization	Translation of technologies, knowledge, instruments to that which are more consistent with the local culture, resources, and capabilities
11	Governance	The ability of the government to do good for the people
12	Security	Feeling safe
13	Socially constructed powerlessness	A mindset of helplessness and dependence on charity and others to meet basic needs and for the betterment of life
14	Transition engagement	Engagement in hastening and effecting transformational change
15	Financial model	Real world financial architecture of the firm or company that includes how it will secure necessary monies/assets to conduct sustainable business and create sustainable value to all the stakeholder
16	ICT initiated leap-frogging	Developments that followed the introduction of ICT [mobile phones] and the need to charge the devices
17	Availability	The percentage of time that power [electrical power] is available for customers over a given period of time. Note: equivalent availability factor accounts for partial capacity availability
18	Job creation	Providing employment that payment for work and other benefits

19	Modular system configuration	A configuration that allows for incremental increase/decrease of members of a system without/significant negative interdependence across interfaces [loosely coupled systems]
20	Survivalism	A mindset of resignation to accept the status quo
21	Health impacts	Outcomes that has bearing on health and well-being
22	Synthesized/contextualized innovation	Innovation that yields maximum holistic/wholesome benefit to all stakeholders [ecosphere]
23	Infrastructure	Sociocultural mechanisms, institutions, artifacts that support the proper functioning of a society
24	Maximization	Getting more for less effort or utilized resources through increased capability, capacity, and other emergent behaviors
25	Environment/ecosphere	The air, the rain, the tree, the tiger, everything that surrounds an organism
26	Stretching/discovery	Intentional effort that takes oneself outside one's current or past boundaries to new vistas
27	Network resourced relationship	Nested relationship and partnerships that are fluid/dynamic
28	Coupling	Association and inference of a community's actions, attitude, behavior, language, and values
29	Making a difference	Altering the conditions of a person, locality, community, society, ecosphere
30	Poverty alleviation	Reduction of lack of meeting basic needs, and increasing access to physical, emotional, cultural, ecological benefits
31	Globalization	Increased interdependence of global economies, its tendency to inform manufacturing for export
32	Awareness	Being informed & mindful
33	Inspiration	Propensity for imagination and lift one's spirit and actions

Table 6 summarizes coding results of the research. From the analysis of the research thirty-three codes were identified that have significant implications on the performance of renewable projects as experienced by the research participants. The associated weights of the codes are presented in the table as the percentage of the participants who identified the importance of each code to the success of the renewable energy project

Table 6. Summary of Coding Results

		Number of participants who identified the code as important for the success of RE projects or practice it	%	Total number of participants (n) = 25
1	Affordability	13	52%	
2	Aggregation	14	56%	
3	CBO [community based organizations] engagement	17	68%	
4	Connectedness	17	68%	
5	Climate change impacts	16	64%	
6	Culture	18	72%	
7	Corruption	11	44%	
8	Eco-communal mgmt.	15	60%	
9	Family	17	68%	
10	Localization	16	64%	
11	Governance	13	52%	
12	Security	9	36%	
13	Socially constructed helplessness	10	40%	
14	Transition engagement	16	64%	
15	Financial model	13	52%	
16	ICT initiated leap-frogging	14	56%	
17	Availability	19	76%	
18	Job creation	20	80%	
19	Modular system configuration	19	76%	
20	Survivalism	14	56%	
21	Health impacts	17	68%	
22	Synthesized/contextualized innovation	22	88%	
23	Infrastructure	18	72%	
24	Maximization	17	68%	
25	Regulation/Policy framework	21	84%	
26	Stretching/discovery	20	80%	
27	Network resourced relationship	18	72%	
28	Coupling	15	60%	
29	Making a difference	22	88%	
30	Poverty alleviation	17	68%	
31	Globalization	15	60%	
32	Awareness	17	68%	
33	Inspiration	15	60%	

Findings

Performance of RE Projects

Twenty-four out of twenty-five participant reported having had both successful and less successful lived experiences working on renewable energy projects while one surmised that all the projects the respondent has been engaged in have been successful.

Finding #1: 22 out of 25 respondents reported wanting to make a difference and imagining a better alternative as a key source of their motivation.

These participants elucidated that their motivation was underpinned by their value reference and connectedness to the community. They stated they want to make a difference in a multi-dimensional way for the benefit of the host community, environment, and society at large by doing good business and changing the status quo. Figure 5 presents evidence of this finding.

Figure 5. Finding 1: Making a Difference

Finding 1: Making a Difference	
Successful project experiences	**Successful project experiences**
"My strongest motivation and a force that pushes me to do things are really around people. The fact that everything is done for people and trying to get the biggest potential out of each individual is one of the strongest for me."	"... Because I do business, but at the same time I also do a lot of charity work. Is like we should help the poor and the needy. And so when I'm working I'm not just looking at money. Because I feel I'm also obliged to do ... to use what God has given me to help those who are in need. And so I do that."
"Well, it is a lot of work. You know most of East Africa people use firewood and charcoal for cooking and electrification is only about… in Kenya, it's about 20% electrification. In Tanzania is about 10%. The whole of East Africa I think is an average of 15 or less percent. 15% or less so there is a lot of need to electrify rural areas and other places using renewable reason being that there is a lot of dependence on hydroelectricity, small and big dams; geothermal and petroleum."	"My passion is to transform societies through the work that I've done, and so far I've been given opportunities in both the road sector and the energy sector and to a small extent in the processing sector. I've had opportunities to see that happen, and people can actually improve their livelihoods. That really is my motivation, seeing that change in communities and in societies through interventions."
"It's taking essential infrastructure to people who, poor people who don't have it. That's one of my ... I'm very, very happy to be doing that, and that's some things that motivate me."	"Well, it's really just to be a purpose to introduce new ways of doing things that have a visibly significant impact on development, that's my primary motivation."
"I'm a capitalist by heart, I'm a family man, and I want what's best for my family, so getting up bright and early and getting to bed late at night and being able to account for early single minute of every single day is something that I pride myself on. But also I'm passionate about, you know, evolving with the times and creating jobs. We've created a number of jobs as a result of our business. At the moment, we employ 12 permanent staff members at and times have to sort of tweak and critique depending on the size of the contract that we're busy with. So being able to feed people that come into your office."	

Finding #2: 17 out of 25 respondents reported Community Based Organization (CBO) engagement to be a key enabler of the success of RE projects.

A CBO is a self-organizing/emergent community-based organization that engages in societal endeavors (Fabricius, 2004).

Our findings indicate that emergent community-based organizations tend to increase access to market and finance by aggregating resources, increasing awareness and mobilizing the community.

On the other hand, the lack of such organizational engagements seems to intensify less successful RE project engagement experiences. Evidence is shown in Figure 6.

Figure 6. Finding 2: CBO Engagement

Finding 2: CBO Engagement	
Successful project experiences	**Less successful project experiences**
"What we did is to have a community-based organization as the entry point for the larger businesses. Every community group organizes itself together and receives the equipment, and they pay a small installment every month for about 4 to 6 months to complete the payments. What we see with that is that people are now able to afford what they could not afford a few months, a few years back."	"Yeah, there were a couple of instances when there were unforeseen delays in terms of the product arriving on site. We had a range of strikes recently within our port structures where we had some unions come jump on board and demand a 50% wage increase. We won't even discuss that. And so our stock was delayed for 3 weeks."
"It is nice. Our business is growing so far because all the community, not all, but some part of the community is familiar with the solar system there; so the need from the community is increasing. Our business is also increasing"	"We have to be careful because most of the sites that require this system are remote, and in some we have to hire police in order to visit the sites. The other thing is that we have to ensure they are installed in a manner that is hard for somebody to steal or damage them."
"That would be the normal way to do things, is the chief of the village, and then talk with him, and then for him to organize a meeting or, get some local women together, and then, if it happens from there, they realize the potential for the village and then."	

Finding #3: 17 out of 25 respondents reported connectedness as a very important factor for the success of the project.

Connectedness is defined as building a large tent, rich and complex capacity of blending/separating personal and work life, living and relating to plenty and meager material resources, employing "backward" and advanced technologies, tradition and non-traditional values, peace and chaos simultaneously. Here, its definition is similar to Raskin's (2006) and to what Schultz calls *inclusion* (Schultz, 2002).

Research participants reported experiences of affinity and connected with key project stakeholders while they were engaged in RE projects.

Furthermore, our research indicates more research participants who had successful renewable energy project lived experiences tend to have more connected with the stakeholders of the project, the host community, the locality, and the environment of the project than those who had less successful project experiences. The connectedness is expressed in multi-dimensional attributes of identification, understanding, differentiating, communications, and contextualized symbiotic relationships.

Figure 7 shows evidence of connectedness for both successful and less successful project experiences gather during the research.

Figure 7. Finding 3: Connectedness

Finding 3: Connectedness	
Successful project experiences	**Less successful project experiences**
"She more or less lived with the community and assessed and came out with this product. How we do it currently is that we take a lot of feedback from the market."	I'm still adjusting to it now. Trying to fit in has been somewhat frustrating. I'm really different in my thinking, in the way I act, and whatnot. Finding that happy medium where I'm fitting in but I'm still maintaining the sense of individuality has been an interesting balance to try and work out.
"We were working on their school and then on their health center, they just surprised us. We didn't know anything, but they were organizing a ceremony at night with the system we have installed. When we finish, they just invite us and then there was a large group. There was a lot of local drinks and then, there was actually a dinner. They give us their traditional music, and then they played and they even … they were appreciating with their own music. It was really a special moment for me. It was really nice."	"They have to know that you are in charge. You do not have to be around all the time, but that have to know that you are around."
"And we've developed, many, a lot of great friendships. We've made a lot of good relationships, friends. Friends from that kind of interaction. And some people have even told us, and we, we, we're not a big, we're not a very big company. But they've compared us to big companies that they contracted before, and they say that they find our approach more easy to use. To adapt to."	

Finding #4: 16 out of 25 respondents reported transition engagement to be an important factor in RE projects.

Transition engagement is defined as engagement in hastening and effecting transformational change (Elzen et al., 2004; Escobar, 2011; Kemp, Loorbach, & Rotmans, 2007). Our research suggests that there is emergent and dynamic transformational engagement in renewable energy development that is contextualized to the local needs, capabilities and is creating and re-constituting business practices, technology appropriations, education training, and customer behavior.

Research participants have reported a correlation of these engagements and successful renewable energy lived experiences. Figure 8 shows evidence of such engagement by research interviewees.

Figure 8. Finding 4: Transitions Engagement

Finding 4: Transitions Engagement	
Successful project experiences	**Successful project experiences**
"So that project we designed ... we designed it in such a way that physics was ... had to be relevant to the community. Instead of being just something that is taught at the university. And because of that, that particular department won that grant."	"The point, the aim of the project was really not just the technology but incorporating entrepreneurship into that as a way of increasing access to these technologies as well as a later plan for looking at behavioral changes which over years has come to the light of researchers as a key factor in increasing access that beyond the technology and economics, human factors have to be looked into."
"Out of the time, we did a project we had information on about 2600 communities with population ranging from between 300 to about 1000 a community and we managed to use the tool to model electrification costs for all those communities. We came up with results that show whether or not one of three technologies that was more ideal for each of these communities. Then for each of these three technologies, we came up with the cost for doing electrification so that among the three, I mean once we have the cost of the three different [inaudible we were able to choose which one we thought was the cheapest of the three."	"When clients transition from conventional power generations systems for example from biomass to biogas, we provide safety training, and provide maintenance for up to two years."
"We see more and more that there's a certain shift in the mindsets of the people who go to the center here, the young people on not just doing bachelors and masters and Ph.D. subjects for the sake of finishing the course but really looking at the practical challenge in the field and links to solving that problem through they're technologies exposed to here."	"Doing something that can actually be taken to the market, that can drop industry or a small business somewhere as opposed to the old and conventional way of training that we found we have over here where people are just told."

Finding #5: 16 out of 25 respondents reported that Localization is an important factor in RE projects.

Localization is defined as a translation of technologies, knowledge, and instruments to that which are more consistent with the local culture, resources, and capabilities (Li, 2005; Liu, Yang, Wang, & Jian, 2010). Our research indicates an emergent shift of emphasis on harnessing and applying local resources, knowing,

capabilities, technologies/adaptation of appropriate technologies to meet local needs in the context of the local culture.

This phenomenon is expressed in terms of adaptation of efficient cook stoves that is flexible to cook the varied cultural foods, the utilization of corn cubs as a fuel to power a bioenergy power generation, which supply power to a local agricultural cooperative, reconfiguration of education and training to standards that promote sustainable living, and requirements of increasing local content to imported technologies. In Figure 9, quotes from different research participants who had successful RE experiences, while less successful RE experiences do not mention such engagements.

Figure 9. Finding 5: Localization

Finding 5: Localization	
Successful project experiences	**Successful project experiences**
"We sold products from local manufacturers, local energy manufacturers and we're actually in the process of designing our own range of products to meet demands locally. We could not find the quality overseas and when we did find the quality from companies overseas the cost of the products are three, four times what we can manufacture the stuff for and get it to market for here locally with exactly the same, as I put quality in terms of parts and quality components. So with our sense of quality, a long road and make our own products and force cheap stuff which generates short terms profits but probably not long term so we're a long-term plan rather than a short-term plan, and I'll take quality."	"So anyways, the technicians did never have anybody ask them to develop something, and they had a helluva a good time, and they did a helluva good job, so we brought that out, and it worked well and were greatly received because people liked it far better than the stuff that was coming in from overseas and. And so we put out a number of those systems we put them into small homes, small businesses, etc. They worked great."
"So the design of the workshop was done at a five-day workshop including all these other elements that I've mentioned to you. Energy audit, passive building design, solar light and assembling keeping the biogas, solar bulbs and taking those things that affect people. They have people that have training and can go back to their towns and implement this project. It also works as a peer education. Teaching peoples their own things especially family members."	"At the center, we made the technology adoptable, tested it out of our facilities here in the biomass center. After that teams mixed. People involved in stove business were trained to take it up as a business."

Finding #6: 22 out of 25 respondents reported that contextualized and synthesized innovations are enablers for the successful implementation of RE Projects.

Contextualized and synthesized innovation is defined as a holistic innovation that yields the most sustainable value to all the stakeholders including the ecosphere (Asheim & Coenen, 2006; Zelaya-Zamora & Senoo, 2013). Our research suggests the association of contextualized and synthesized innovation with successful renewable energy development engagements, and less association with less successful project experiences.

In Figure 10, evidence for the above-mentioned two conditions is presented.

Figure 10. Finding 6: Contextualized & Synthesized Innovation

Finding 6: Contextualized & Synthesized Innovation	
Successful project experiences	**Less successful project experiences**
"I took a couple of my top technicians, and I said, "Okay, build me some LED lights I want to use, see what you can do." Damn, they did a fine job. They developed LED lights and came up with one concept originally and then they didn't like it, I thought it was quite good, and they went back to their drawing boards and came up with some new one."	"I think that most of the innovation we borrowed from overseas like that."
"The interesting part is that that power will be used for productive use to power small cooperatives, or agricultural groupings of people enable them have value addition on their products, their agricultural product."	"There is no impact. The business is very simple. There is no innovation required."
"That Wind Atlas that I just mentioned to you is a prime example at the moment. It's live on the web. You can actually go and see live updates of the wind resources at different points in the country."	

Finding #7: 17 out of 25 respondents reported Maximization as a very important factor for RE projects

Maximization is defined as getting more for less effort or utilized resources through increased capability, capacity, and other emergent behaviors (Jensen, 2010; Kahneman & Thaler, 2006; Rabin, 1998). Furthermore, our research findings indicate

that successful RE engagement experiences are correlated with maximization, where the businesses and the stakeholders strive to increase value creation through improved collaboration, structuring, proficiency dynamics, multi-functional platforms, and system-wide optimizations.

Evidence of these associations is presented in Figure 11. In less successful projects, such evidence was not observed.

Figure 11. Finding 7: Maximization

Finding 7: Maximization	
Successful project experiences	**Successful project experiences**
"We have two pick-up trucks for workers that transport technicians with their tools. They go from site to site according to our work program our work plan starting with the furthest coming to the nearest and bringing all the information. We structure our work in such a way that … Usually, the project takes six months. By the time the six months are over all the sites have been worked on."	"There is a lot of smoke; you actually see the smoke in the kitchens and women inhaling this and children exposed to it. It's becoming more clear the health impact from this innovation because the emissions with this gasified greatly reduced in terms of the fuel but also particular matter."
"Converting energy from maize cobs, from corn which is being wasted currently at the site that we've picked and convert that to electricity; usually, it's about 10 kilowatts."	"They worked great. They used about 40% of the power of CFL energy efficient bulbs, and they'll last for about 50,000 hours, which is about 25 years; pretty good deal."
"Maybe at the dispensaries and schools. You find that more tests can be done because of the availability of power, obviously, more diagnosis of diseases can be done and the health of the community, in general, goes up. The other thing is that school becomes easier to the people because they can go to night preps and get electricity."	"This agency seems to increasing the number of connections per year. When we do like mini-grids and things like that, that has a, we have a collaboration with them. Sometimes they pick out to fund a grid part of the whole design and they monitor that and the connection side."

Finding #8: 19 out of 25 respondents reported modular system configuration as having a major impact on the performance of RE projects.

Modular system configuration is a systems design practice that employs the concept of loosely coupled system to minimize disturbances/degradation across interfaces while allowing robust scaling up or down capabilities (Folke, Colding, & Berkes, 2003;

Schilling, 2000). As such our research indicates emergent modular and distributed systems configurations are correlated with successful RE engagement experiences. These phenomena are observed in emergent power plant and distribution architectures, financial models, flexible small enterprises, and stakeholders' engagements.

In Figure 12, research participants are quoted that associate successful RE development experiences with modular system configuration.

Figure 12. Finding 8: Modular Systems Configuration

Finding 8: Modular Systems Configuration	
Successful project experiences	**Successful project experiences**
"Every site has a power package. They are called power packages; this could have 20 lights and two sockets. They find that one is for package two, so when they see a power package. … But usually, they are 80 watts or 120 watts."	"This is the part that we would have included kind of would need a design to involve the people going to benefit either to be trained or something to work together to run this plant."
"We needed to specify a 70-kilowatt system for the site and then modularly we're putting up 5 kilowatt systems on each of the houses themselves."	"What you're doing you're giving this young woman more money at a very early age and income of around $10 a week. Every time that they go to their investment club, they'll be able to invest maybe $4, $3 and at the end, they will have enough money."
"The city or the power systems, in a way that's modular so you can add onto them, and that's been a shift that we've made in the past year or so where we've simplified things and not given people more than they can currently understand."	"The point, the aim of the project was really not just the technology but incorporating entrepreneurship into that as a way of increasing access to these technologies as well as a later plan for looking at behavioral changes which over years has come to the light of researchers as a key factor in increasing access that beyond the technology and economics, human factors have to be looked into"

Finding #9: 20 out of 25 respondents reported stretching [discovery] as a major impetus for their work in RE.

Stretching [discovery] is defined as intentional effort, which takes oneself outside ones current or past boundaries to new vistas (Ardichvili, Cardozo, & Ray, 2003; Kirzner, 1997).

Our research findings indicate that key decision makers who are engaged in stretching and discovery are more associated with successful renewable energy development engagements.

More research participants who have less successful renewable energy project experiences tend to be not involved in stretching and discoveries. Furthermore, our research indicates that those who reported that their passion was making a difference in their RE business engagements, their community, and society at large have more propensity to be engaged in stretching and discovery endeavors. This group seems to have a strong passion for what they are doing and seem to enjoy the challenge and the reward associated with their work.

Figure 13 presents data that supports the above-mentioned assertion of those who had successful renewable energy engagement experiences.

Figure 13. Finding 9: Modular Systems Configuration

Finding 9: Modular Systems Configuration	
Successful project experiences	**Successful project experiences**
"This is a constantly working progress. Right now hopefully in a year, I'm done with my research and all that because I'm developing a multi-criteria decision support tool for guiding decisions in rural electrification."	"To help us. We even took them, helped them to explain to them what exactly we were looking for in the research."
"... My microbiological background but because it's micro algae that they use to do this. We have some researchers that are in fact also looking at breading algae, which have larger vacuoles. Vacuole is like a fat inside cells that will contain the oils that are being produced by the plant, and you would want large vacuoles that you can easily extract the oil from. It would make it much easier for you, to get, for example, biodiesel straight out of algae than having to go through a lot of long processes."	"What I'm seeking to do is to perform a socio-economic assessment of using agro-residues from their farms to produce bio-energy. In this case, I'm thinking of whether it is possible to produce all that from crop residues after the crops have been harvested."
"You might find that they are using diesel generators, which is maybe 20 kilowatts, to run the dispensary. Maintaining that generator and also, the cost of fuel is expensive. So we came up with a hybrid solution whereby you only run the generator a few hours a week and use it to charge the battery as well as when they are running heavy equipment is when the switch on the generator. Otherwise, they use a hybrid system."	"Okay, So, say our sustainable energy research program I think is successful for a few things."

Finding #10: In our literature review, we found affordability as one of the most important concepts that affect the performance of renewable energy projects. However, in our research only 13 out of 25 respondents reported affordability as an important factor in regard to RE projects and our research suggest the importance, definition and applications of affordability are contested.

Affordability here is defined as the financial capability of a household to pay for basic energy services. In other words, it could be expressed as the monthly energy expenditure of a household divided by its monthly income (Fankhauser & Tepic, 2007).

Furthermore, our findings inform us that the meaning and application of affordability has a significant difference as it pertains to successful and less successful project experiences. Successful projects have utilized total energy cost, and expenditure substitution, “pay as you go, as much as you want”, and payment using bit coins [digital money] to make energy access affordable to their customers. As shown in Figure 14, successful and less successful project experiences seem to have a differentiated association with affordability.

Figure 14. Finding 10: Affordability

Finding 10: Affordability	
Successful project experiences	**Less successful project experience**
"Now they’re actually using that money that they would have spent on kerosene on their solar lights, Our job is to introduce Pay As You Go solar in various market."	“Actually, it’s not affordable. For a single household, it is very expensive.”
“When you give somebody a weekly set payment, what happens is that they tend to just stick to that payment. Even when they maybe have even more money, they’re not inclined to actually pay more so that they can shorten their payment period. When you allow somebody, just tell them “You can pay as little as you want or as much as you want whenever you want, they actually now tend to finish off the payment quickly.”	“I think most renewable energy projects are very expensive to implement. So, affordability is a, is a major, I think it's a major factor.”
“One of the facts we’ve looked at in the baseline is actually the economic level and the income levels of the consumers there, their expenditure patterns. Severally, people say this community is very poor, they won’t be able to afford a lantern or they won’t be able to avoid this or that. Many times this is just an assumption made from the desk without really having proper information from these areas. We’ve even had some people say, “I can save part of my money to buy a solar home system,” Which you would not hear before, before everyone would say, “I’m too poor I cannot buy it.”	

Finding #11: 20 out of 25 respondents reported having a standard development financial model that includes private, public, & other financing mechanisms to be an important factor for RE projects.

However, one participant has brought to our attention a different perspective that we think is worth capturing here. In His own words:

> "Before the financier put money on the project they look at the financial model and they look at the return focuses, and they make a decision whether those returns are suitable for them. Then those returns are just one physical security. Financial, also business, return, or investment security. As such as the business will be able to generate return on the long run. Based on prices which are in agreement that are legally binding, and they have always been insured including the deals that the distributer may go bankrupt is insured. The country risk is also insured. In case the country goes into political strike then there is insurance for that as well. So the financier has got insurance in the country. They have got insurance on the distributer, all the equipment that are used to build the plant is insured. The prices are known in advance and are agreed a pound and, of course, the quantity of power that is produced is agreed in before its implementation by the distributor. There's a guarantee for that. Which is covered by the insurance. Therefore, there is no risk on the business.
>
> It was not difficult to secure financing, ones the structure is in place, there is a wide universe of financing and people are willing to get exposure to get exposure in energy.
>
> Some can and some cannot pay for electricity. Those who can pay get electricity and those who cannot are not connected to electricity. But generally, there's more demand than supply. So all the power that is produced in our country is consumed. At the price that is set by the supplier."
>
> – Research participant

Discussion

We started the research by investigating and laying out concepts that impinge on the performance of renewable energy projects directly and indirectly. During iterative open, and axial coding, themes, and concepts emerged, which impact and explain the outcome of renewable energy businesses in the context of developing economies.

Based on data from the research, the performance of renewable energy projects is tenuous and fragmented. It seems to be at the cusp of re-definition and reconfiguration due to complex dynamics and interactions and nested (Kay, Regier, Boyle, & Francis, 1999) within the eco-social systems and external forces. Renewable energy development is subject to the dynamics of the social system it is embedded in and, in turn, it shapes the attributes of the social system it belongs to (Elzen et al., 2004). The double forward and backward feedback loop nested in a multivariate dynamic relationship seems to necessitate investigating the outcome of renewable energy systems in tandem with other spheres of the social system (Luhmann, 1982).

The key decision makers interviewed for this research reported wanting to make a difference and imagining better alternatives. These participants elucidated that their motivation was underpinned by their value reference and connectedness (Schultz, 2002) to the community. They stated they want to make a difference in a multi-dimensional way for the benefit of the business, host community, the environment, and society at large by doing good business and changing the status quo (Whitney & Cooperrider, 2000). These sentiments are exemplified by one research participant's comment:

> "My strongest motivation and a force that pushes me to do things are really around people. The fact that everything is done for people and trying to get the biggest potential out of each individual is one of the strongest for me."

Underpinning their connectedness and motivation to make a difference is knowledge and memory creation. Knowledge and memory creation aggregate different knowledge systems, socio-ecological, and socio-technical memory creations (Elzen et al., 2004; Folke et al., 2003), which have multi-dimensional attributes and configurations in the social system. These engagements by the research participants were manifested in

their expressed motivations and reported behaviors in their lived experiences in renewable energy businesses (projects) and overarching adaptive and resilient capacity building. While connectedness and making a difference are not prominent features of literature about businesses that create sustainable values in the context of developing economies, in our research, it was reported as a very important factor for 22 out of 25 research participants.

Our research further found that community-based organizations (CBO) to be key enablers as business gateways that create system-wide sustainable value (Laszlo & Cooperrider, 2007). The CBOs reported by the research participant are not traditional charity organizations; rather, these are community-based business organizations that were actively engaged in raising awareness, combining resources, policy formulations, building social and ecological resiliency through adaptive knowledge and memory creations (Berkes & Turner, 2006).

As it pertains to transitions engagement the emergent and dynamic transformational engagement in renewable energy development, and overarching socio-technical-ecological norms that are contextualized to the local needs, and capabilities, which include creating and re-constituting business practices, technology appropriations, education training, and customer behavior is different from transitions management (Loorbach, 2007) and systems innovations found in literature (Elzen et al., 2004).

The focus of transition engagement is not simply changing the socio-technical landscape, but it is people focused, and it embodies the social construction of technology, knowledge and memory creation, cultural meaning, and redefining development and the development path of the society. Synthesized and contextualized innovation is holistic

innovation that yields the most sustainable value to all the stakeholders including the ecosphere not only as a tool to gain market advantage (Baregheh et al., 2009). Contextualized innovation is augmented by modular system configurations that enable adaptive capacity and resiliency by reducing cross-interface risk transfer and by increasing flexibility (Weick, 1976).

Our research findings inform us that the meaning and application of affordability has a significant difference from what is in the current literature. Energy affordability is defined as the financial capability of a household to pay for basic energy services. In other words, it could be expressed as the monthly energy expenditure of a household divided by its monthly income (Fankhauser & Tepic, 2007). Expenditure substitution, digital/electronic payments for energy services, which are configured as "pay-as-you-go" have changed the affordability landscape. While affordability is an important factor, its meaning and application is nuanced from what is reported in extant literatures.

Other findings of our research include eco-communal management, aggregation, survivalism, and socially constructed helplessness, ICT-initiated technology leapfrogging.

Independent variables that were identified in our research, which are also identified in the literature include security, job creation, availability, climate change, family, and culture.

Based on the data from the research, we suggest the following guidance for framework/theories and research on the outcome of renewable energy projects (businesses).

Nested Complexity of RE Project Performance – Integrative Approach

Our research suggests the performance of renewable energy businesses (projects) to be in nested relationships with three major sectors in social system settings and cannot be viewed in isolation from the social system (Holling, 2001; Luhmann, 1995). These three sectors were identified as knowledge and memory creation at the individual and community level, collective vision/paradigm on development to be specific energy development, and Input Concepts [ICs]. Here we are suggesting knowledge, which is application oriented (Dewey, 1929), participatory (Buchecker et al., 2003), and "post-industrial" scientific knowledge (Ziman, 2002). Knowledge and memory creation at the individual and community level, and collective vision moderate input concepts. Memory creation in particular, which include social-ecological memory (Berkes & Turner, 2006) has significant implications on the performance of renewable energy projects. Collective vision is articulated to include providing solutions to challenging issues that are similar to Milbrath's (1989) learning our way out, and imagining a better alternative for the future.

Our research suggests that Input Concepts [ICs] have five sub-categories [SCs], which have direct implications on the performance of renewable energy projects. The identified sub-categories are behavioral, institutional/cultural, ecological, economic, and innovation and system design categories. These sub-categories are related in feed-forward and backward relations. Each sub-category contains varied number of elements [e]. With these embedded complexities, an integrative approach that combines the effects of nested social, economic, political, and ecological concepts (Page, 2010) may yield a robust and systemic way of gauging the performance of renewable energy projects.

New Way of Knowing & Memory Production

Our research indicates the way of knowing and memory creations at the individual and community level have a significant implication on the outcome of renewable energy businesses and projects. As it pertains to knowledge creation, we are suggesting Mode 2 type knowledge production that is contextualized to applications, multi-discipline, and heterogeneous (Hessels & Van Lente, 2008) in the cultural context. Memory creation is supplemented by strong aptitude for verbal learning (Anderson, 1983), where, there is rich oral traditions and storytelling in most developing economies.

Moreover, our research indicates four building blocks that shaped and constituted knowledge base and memory creation of the research participants. These building blocks were self-identification (Knoblich & Flach, 2003), emoting/expressions (Barrett, Niedenthal, & Winkielman, 2005), spiritual/value references, and imagining. As it pertains to values, these are values that are both constitutive and contextual (Longino, 1990). Cochran and his colleagues have indicated emotions as being a very important component of a human being, which affect knowledge, memory, and behavior (Cochran, Lee, & Chown, 2006). On imagination, we are suggesting imagination that enables co-creation what Peter Murphy and colleagues call "liberated imagination" (Murphy, 2010).

Furthermore, our research suggests that these building blocks interacting with cultural, socio-economic, political, and environmental spheres constituted knowledge and memory creation of the individual and the community.

Transition Discourse

Research participants have reported lived experiences, which contain re-orienting educational training regimes, research, and development in a new way. Initial experiences

from these endeavors indicate a positive correlation with successful project engagement experiences.

Specific transition engagements reported by research participants include:

- Companies that assign its employees to help its customer's transition from utilizing conventional energy sources to renewable energy sources for a period that extends to a year to two years.
- Re-configuration of educational systems from abstract education to education that enables solutions development to address local challenges
- Re-configuration of research and developments to applied research and development in energy and other relevant sectors
- Reconstitution and focus from incubating enterprises to entrepreneurs
- The emergence of small flexible enterprises that provide integrated/multi-functional platform solutions.

The above-mentioned activities as reported by the research participants describe in bits and pieces what the Global Scenario Group and Paul Raskin call Great Transition (Raskin et al., 2003). These activities seem also to contain the notions of what Escobar calls the alternative to development (Escobar, 2011).

In light of these conflicted observations, developing a contextualized framework that employees some aspects of the Great Initiative, and some aspects of an alternative to development may lead to a more cogent understanding of the performance of RE businesses and projects in developing economies.

Alternative Industrial Development

Furthermore, our research suggests synthesized and contextualized innovations that are locally produced as key enablers for successful renewable energy projects. These types of innovations that incubate both entrepreneurs and small flexible enterprises take

advantage of the prevailing demographics of technology-savvy young people in developing countries. We suggest such developments that are primarily locally focused and augmented by networked and distributed renewable energy based economy could usher the equivalent of what Jeremy Rifkin calls the Third Industrial Revolution (Rifkin, 2011).

New Wave Financing

Affordability has been identified a major problem for the increased implementation of renewable energy projects in developing economies (Fankhauser & Tepic, 2007; Vera & Langlois, 2007). Our research findings indicate that the importance of affordability is nuanced as the majority of the people in developing economies spend a significant amount of their income on energy (Wogan, 2013). Aggregations, expenditure substitution, investment clubs (Blavy, Basu, & Yülek, 2004), micro financing (Gupta, 2008), and pay-as-you-go payment combined with the utilization of digital money have made significant headways and are redefining affordability.

Pay as you go payment method has been modified to pay as much as you want with Cloud-based wireless usage metering and bitcoin payment that has interesting initial behavioral finance data. Initial findings indicate higher rate of repayment of loans in a shorter repayment time, when compare to conventional way of billing and payment collections.

Community-Based Organizations & Intermediary Businesses Practices

Research participants reported, community-based organization serve as gateways for RE projects facilitating key stakeholders participation, increasing access by pulling together their resources, enhancing awareness, and encouraging/demanding that relevant

regulatory agencies make an important decision on a timely basis. These activities seem to enable companies/businesses to install RE projects and develop new markets and empower the community (Perkins & Zimmerman, 1995).

Gaining a better understanding of the genesis and dynamics of these types of community organization business gateways, which involve new approaches to social innovations (Moulaert, Martinelli, Swyngedouw, & Gonzalez, 2005), collective action, governance/policy formulations, and intermediary business roles will help to make them more effective.

Based on the data from the research, we propose a conceptual model that includes three major sectors, namely knowledge & memory creation at the individual and community level, collective vision/paradigm on development to be specific energy development, and Input Concepts [ICs]. A portion of the ICs identified in our research has been the focus of prior research; however, our research findings suggest the addition of salient ICs [independent variables] that have significant implications on the performance of renewable energy projects.

The conceptual model developed as the outcome of the research is presented in Figure 15. The Input Concepts are illustrated in detail in Figure 16.

Figure 15. Conceptual Model

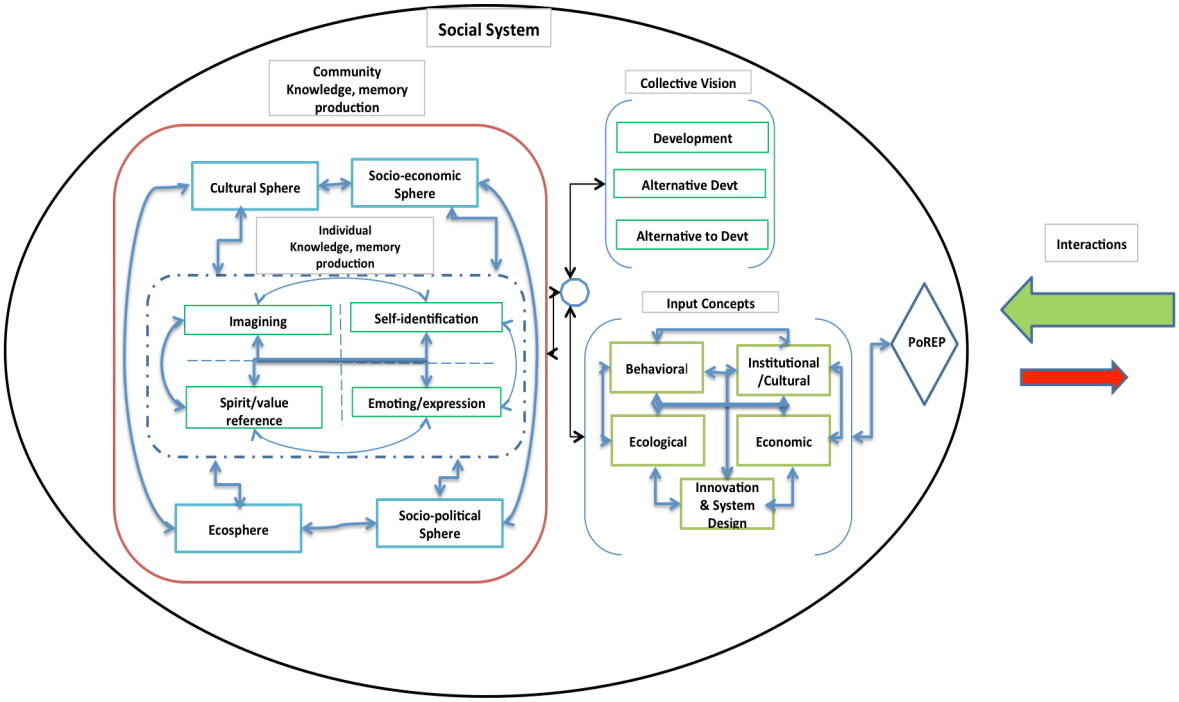
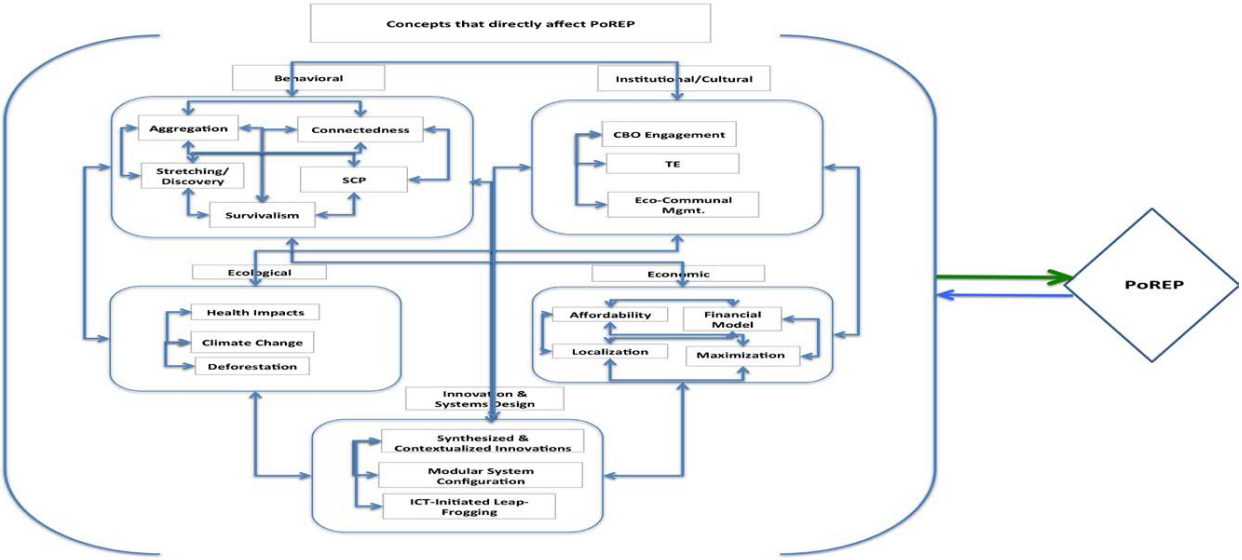


Figure 16. Input Concepts in Detail



Unit of analysis: individual key project decision maker.

Legends:
SCP: Socially Constructed Helplessness
CBO: Community Based Organization
TE: Transitions Engagement
PoREP: Performance of Renewable Energy Projects

The conceptual model was constructed based on the responses of research participants [interviewees] to our RQs. The unit of analysis is the individual key decision maker of the renewable project.

The twenty-five key decision makers that were interviewed for our research were asked, "Tell me about yourself." In response to this inquiry and to follow-up questions "tell me more", participants identified themselves in phrases such as "I came from a middle-class family," "I am one of three siblings that were born …" In doing so, all research participants identified themselves [self-identification]. As they continued to describe key moments in their lives; research participants emoted [expressed] deep feelings when talking about themselves, their families, or special/unique experiences. Some expressed the death of a loved one, some expressed strong attachments, and/or incidents that had a significant impact on them, and their work in the renewable energy sector. To a further question "what motivates you?" research participants identified different factors that motivated them. One notion that was most common [22 out of 25] was making a difference and imagining better alternatives. The participants elucidated that their motivation was underpinned by their value reference and connectedness to the community.

The four building blocks [BB] identified were self-identification, emoting/expressions, spiritual/value references, and imagining that underpinned knowledge and memory creations interacting with cultural, socio-economic, political, and environmental spheres at the individual and the community level.

Through iterative open and axial coding we identified 33 key codes, and 18 elements [e] or independent variable that have a direct impact on the performance of

renewable energy. These elements were grouped into five major themes or sub-categories [SC] and they are mediated by knowledge and memory creation [at the individual and community level], and collective vision. The input concepts [ICs] have five sub-categories (SCs) with direct feed-forward and feed-backward relationships with the performance of renewable energy projects.

Our research further suggests that knowledge & memory creation and collective vision/paradigm on energy development in particular and development, in general, impinge on input concepts we have identified.

Comparison of Conceptual Model (CM) with Initial Situational Map

The conceptual model, which we have developed as part of the research findings, is similar to the initial situational map in a sense that it contains several of the concepts that were identified in literature research albeit that the importance of the concepts is nuanced in our findings. The CM is different from the initial situational map because we have identified additional variables that have a significant bearing on the performance of renewable energy projects in the context of developing economies. Furthermore, our research findings suggest that the performance of renewable energy projects cannot be seen or gauged in isolation from its host social system. Within the host social system, knowledge and memory creation in conjunction with shared visions/paradigms have significant implications on input concepts that have direct feed-forward or backward relationships with the performance of renewable energy systems, which was not identified in the initial situation map.

Limitations

Limitations of this research include:

1. Saturation was achieved, with a sample size of 25 from 17 different developing countries. However, it may be considered narrowly focused. It would be an error to claim these findings to be universal.
2. Research participants who were interviewed for this research were highly qualified and active in discovery, and stretching themselves. As such the data could have been skewed by personality type/interests.
3. Research participants had to recall some incidents that had happened in the past and the fidelity of some of the information is dependent on their memory about it.

Implications for Future Research

We surmise that our findings contribute to gain better understandings of the performance of renewable energy from developing country perspectives; it also suggests the following areas for future research:

1. Development of a cohesive and integrative theoretical framework for the performance of renewable energy that accounts for its nested complexity including knowledge and memory creation at the individual and community level, collective vision on development, ecology, and variables that directly affect RE project performance.
2. Identifying a viable theoretical framework for the betterment of developing countries [customary development, Great Initiative, sustainable development, alternative to development, etc.].

3. Identifying and developing technologies and/or their applications for distributed energy generation in the context of developing countries that include cost-effectiveness, hardening, optimized availability, resiliency, and supply & demand side management. These areas may include synthesized and contextualized innovations, modular systems design, and multi-functional platform development.
4. Systemic measurement and assessment of health, economic, and social impacts of switching from conventional energy sources to renewables
5. Gaining a better understanding of the impacts of new technologies & its applications on end-user behaviors, and financial inclusion. Specifically, the use of pay-as-you-go, electronic payment systems, and wireless utilization sensing.
6. Identifying/developing multidimensional proactive social innovations that empower local/regional/transnational stakeholders to develop businesses and conditions that create sustainable values.
7. Developing new approaches/re-orientation of R&D, and education that promotes creativity, contextualized solutions development, and entrepreneurship for sustainable living. We suggest integrative approaches that include social-ecological resilience, adaptive socio-technical innovations, and the inclusion of indigenous experiential know-hows.

Implications for Academics and Practitioners

The contribution of this research may be summarized under three major categories:

1) Identified nested complex feed-forward/backward relationships of the performance of renewable energy systems with knowledge and memory creation at the individual and community level, collective vision on [energy] development, and input concepts that have a direct impact on the performance of renewable energy businesses and projects. Furthermore, we identified that the performance of renewable energy projects cannot be viewed or determined in a contextual reduction from the social system of the host community and its surroundings. To illustrate these finding, we have developed a new conceptual model that is different from the one that was garnered from literature reviews. We suggest the implication here is that renewable energy projects possibly could change the socio-technical (Elzen et al., 2004) and social-ecological landscape (Berkes & Turner, 2006) of the community and this entails a change in knowledge and memory creation, underlying economic, political, and policy formulation structures. Hence, the recommended approach to better understand these dynamics is through an integrative approach, and more effective results may be achieved with a system-wide change.
2) We have identified several additional elements/concepts/IVs that were not identified in literature reviews (Findings 1 through 7), which have significant implications on the performance of renewable projects. We surmise the integration of the identified independent variables or concepts will help to explain the performance of renewable energy projects better and help practitioners to design and implement more successful renewable energy businesses and projects.

3) We have confirmed the validity of several concepts that were identified in the literature review (confirmatory findings), albeit the importance of these variables is nuanced in our findings. This finding, we suggest, will assist academicians and practitioners to better focus on certain factors that may carry more weight in the outcome of renewable energy projects.

CHAPTER 5: FIRST QUANTITATIVE STRAND

Introduction

In the context of emerging economies, gaining a better understanding of the factors and conditions that impinge on the performance of renewable energy projects is essential to ensuring a reliable and cost-effective energy resource mix, sustain fast economic development, increase energy security, mitigate concerns for the ecosphere, and compensate for fuel cost volatility associated with conventional energy resources (United Nations, 2015). The International Energy Agency (IEA) forecast of 2014 indicates a 37% energy demand increase is primarily coming from emerging economies (IEA, 2014) in the next two and half decades. To meet the forecasted energy demand increase and ameliorate the environmental stress associated with the increased demand, increased deployment and effective operations of renewable energy projects are essential (Cohen & Winn, 2007).

The conventional way of gauging business performance, in only discrete economic terms, has a long tradition in the energy sector. However, as it pertains to renewable energy projects in the context of emerging economies, such approaches lack the capacity to address the overarching business model innovations, environment, infrastructure, and social concerns that are detrimental to the success of the business and the renewable energy project of interest (Porter & Kramer, 2011).

In the context of emerging economies, we propose that the performance of renewable energy projects be measured in two dimensions: the sustainable value of the project measured by the integrated economical, ecological, and social value (Hart & Milstein, 2003; Laszlo & Cooperrider, 2007), and the meaningfulness of the RE project

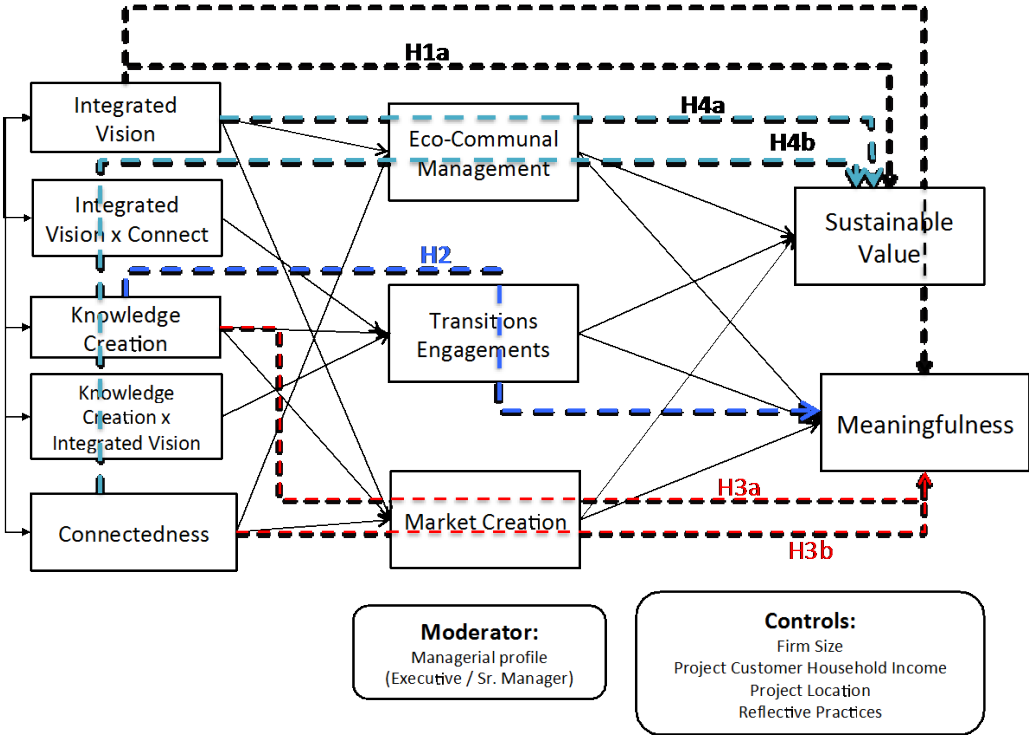
to the key decision maker of the project (Hackman & Oldham, 1980; Renn & Vandenberg, 1995).

For this research, we administered a web-based survey instrument to 204 key decision makers of renewable energy projects in representative emerging economies.

Hypotheses

We propose the hypothesized model in Figure 17 that shows the relationships between the predictor variables and the outcome variables (sustainable value, and meaningfulness) based on literature reviews, the theoretical foundation and the findings of our qualitative research.

Figure 17. Hypothesized Model



Eco-communal Management

Eco-communal Management is defined here as a management strategy for renewable energy businesses that creates a symbiotic and synergistic partnership among profit, environmental, and societal concerns (Hart & Dowell, 2010). It is relational focused and engage in a network model of relationships with its customers, partners, and stakeholders.

It is deployed to improve the return on the business investment and the competitive positioning of the project by co-creating profit, environmental, and social values (Laszlo & Zhexembayeva, 2011). In its practice, it is driven by business model innovations, and it is proactive in introducing disruptive innovations (Christensen, Horn, & Johnson, 2008; Hall & Vredenburg, 2012), utilizes project life cycle management & project stewardship to optimize value creation and create new markets. Profit, social and environmental values are designed-in in the business model or project not bolted-on to it. As such project performance is improved by maximized asset utilization and enhanced project operations (Santacana, Rackliffe, Tang, & Feng, 2010).

It employs holistic approaches, and distributed management, which yield the most sustainable value to all the stakeholders including the ecosphere. It is not merely a tool to gain market advantage; it is a means, which takes the initial conditions of the RE business and creates sustainable value (Baregheh et al., 2009).

The Mediating Role of Eco-Communal Management

Eco-communal management is an innovative management approach that mediates the relationship between the integrated vision of a renewable energy project or a firm, and the desired outcomes as expressed in sustainable value and meaningfulness of the

firm or the RE project. It strives to enhance flourishing businesses and society in multiple dimensions. As Daly has stated in his 1989 paper, the thermodynamic indicators of sustainability expressed in the principles of correlation of population growth and carrying capacity, make sustainable development the driving force for efficiency improvement, and limiting waste emissions within the environment absorption rate by the utilization of renewables. Furthermore, the utilization of renewables needs to be within the regeneration rate of the consumed renewable resources to ensure true sustainability (Daly & Cobb, 1989).

Eco-communal management integrates the efficient use of resources, reduction of waste, and modifying behaviors of the organization (the project), supply chain, and end-users to optimize the desired outcomes of creating sustainable value and enhancing the meaningfulness of the projects to the key project decision makers (the unit of analysis for our research).

Sustainable development based on an analytical framework, which combines the three dimensions of sustainability (economic, social, and environmental) and the perception of local stakeholders, economic, social, and political relationships among the stakeholders of the business formulate an integrated and comprehensive approach. This approach is capable to effectively determine the impacts of a renewable project to local sustainability and frame a more accurate assessment of the performance of RE projects (del Rio & Burguillo, 2008).

Based on these frameworks, we hypothesize that eco-communal management mediates the relationship between integrated vision with sustainable value and

meaningfulness controlling for firm size, project customers household income, and reflective practices.

Firm size is observed to have impact on innovation (Beck, Demirgüç-Kunt, & Maksimovic, 2005), wages the firm (RE project) pay (Tan & Batra, 1997), sustainable entrepreneurship (Hockerts & Wüstenhagen, 2010), and returns on investment (Hodgson & Stevenson-Clarke, 2000), which overall have implications on the performance of the project.

Socio-economic drivers such as household income have significant implications on the adaption and performance of RE projects (Aziz & Cui, 2007; Domac, Richards, & Risovic, 2005). In general, those with higher household income tend to adopt RE technologies faster than those with relatively lower household incomes. On a longer time horizon, deployment of renewable energy projects has resulted in increased entrepreneurial activities that have improved household income in the host community of the RE projects, which in turn have improved the performance of these projects. Such feed-forward and backward relationships may be captured by energy-based economic development (EBED) that has more encompassing impacts on the overall socio-economic development of the host community of the RE project (Carley, Lawrence, Brown, Nourafshan, & Benami, 2011; Miller, 2012).

Reflective practices are observed to increase creativity and collaborative innovation that enhances the desired outcomes of the project or the firm (Ghaye et al., 2008).

Furthermore, reflective practices may be a tipping point for key decision makers of the project or firm to transition from focusing on doing less harm to caring and

flourishing. As Laszlo et al. (2014) have demonstrated, there are a considerable number of enterprises that do good business and do good for the world. Such firms or projects improve the value proposition of the project or the firm, while serving the local community and society at large. Based on these rationales, we have identified firm size, project customer household income, and reflective practices as controls for our research.

An integrated vision of the RE project encompasses the strategy for creating sustainable value for all the stakeholders of the project that is in a symbiotic and synergistic relationship with the economic, social, and ecological developments and aspirations of the project host community and the region. It defines the DNA of the firm (project), its strategy, and core values that inspire it to provide creative solutions to challenging problems through its entrepreneurial actions (Ireland et al., 2009; Milbrath, 1989). Sustainable value is the integrated value in economic, ecological, social dimensions that are simultaneously created for the stakeholders. As Laszlo and Cooperrider (2007) have articulated, it is a strategic response to the dynamics of the market that has necessitated the creation of this single and unified value that is strongly correlated with the capacity to do well for business and do good in the world.

Meaningfulness here refers to job satisfaction defined by making a difference and imagining a better alternative as a key source of motivation, and value of a work goal or purpose, judged in relation to an individual's own ideals or standards (May, Gilson, & Harter, 2004; Renn & Vandenberg, 1995; Thomas & Velthouse, 1990).

Firm size is defined by the number of employees of the project developer firm, and reflective practice is a way of enhancing awareness and caring which is instrumental

in creating a flourishing business (Laszlo et al., 2014). Based on these premises, we hypothesize as stated in Hypothesis 1.

> *Hypothesis 1. Eco-communal management will mediate the relationship between integrated vision with sustainable value (Hypothesis 1a) and meaningfulness (Hypothesis 1b) controlling for firm size, project customer household income, and reflective practices.*

Transitions Engagement

Transition engagement refers to engagement in hastening and effecting transformational change (Elzen et al., 2004; Kemp et al., 2007). It is emergent and dynamic transformational engagement in techno-economic paradigm shifts (Perez, 2009), and here it refers to renewable energy developments that are contextualized to the local needs, capabilities, and introduces creating and re-constituting business practices, technology appropriations, education, training, and customer behaviors. It induces socio-technical-economic transitions that affect transformational change in a social system that creates system-wide sustainable value (Geels & Schot, 2007; Laszlo & Cooperrider, 2007).

The Mediating Role of Transitions Engagements

Transitions engagement is concerned with emergent and dynamic transformations in power generation, and distribution, and overarching socio-technical-ecological norms that are contextualized to the local needs, and capabilities, which play significant and substantial roles in translating the integrated vision, knowledge creation and relational dimensions of the RE project/firm into project performance outcomes. This engagement explains the relationship between knowledge creation and meaningfulness by creating and re-constituting business practices, business model and technology innovations, education, training, and customer behaviors that are different from transitions

management (Loorbach, 2007) and systems innovations found in current literature (Elzen et al., 2004).

Knowledge creation refers to the creation of knowledge about customer needs, the project, technology, resources, and overarching economic, ecological, and social issues. It is application oriented, participatory, postindustrial, Mode 2 type knowledge creation that is contextualized to applications, multi-discipline, and heterogeneous in the cultural context (Buchecker et al., 2003; Dewey, 1929; Hessels & Van Lente, 2008). It is created through socialization, externalization, and internalization processes and includes social-ecological knowledge (Nonaka, Byosiere, Borucki, & Konno, 1994; Yang, Watkins, & Marsick, 2004). Knowledge creation through the mediation action of transitions engagements impinge on the meaningfulness of the RE project to the key decision makers of the project.

Here, the focus is not simply changing the socio-technical landscape, but it is people focused, and it embodies the social construction of technology, knowledge and memory creation, cultural meaning, and redefining development and the development path of society (Bijker, Hughes, Pinch, & Douglas, 2012; Cottrell, 2009; Jasanoff, 2004; Srite & Karahanna, 2006). Synthesized and contextualized innovation is holistic innovation that yields the most sustainable value to all the stakeholders including the ecosphere (Baregheh et al., 2009). Furthermore, contextualized innovation is augmented by modular systems configurations that enable adaptive capacity and resiliency by reducing cross-interface risk transfer and by increasing flexibility to drive the desired outcome of the RE business or project (Orton & Weick, 1990).

Based on these assertions, we predict that transition engagements will mediate the relationship between knowledge production and meaningfulness.

> *Hypothesis 2. Transition Engagements will mediate the relationship between knowledge production and meaningfulness controlling for firm size, project customer household income, reflective practices.*

Market Creation

Market creation refers to transitions, training the customer, and forming multiple partnerships for new product or service offerings. Green marketing, also alternatively known as environmental marketing and sustainable marketing, refers to an organization's efforts at designing, promoting, pricing and distributing products, which create economic and social values without harming the environment (Kotler, 2011; Mitchell, Wooliscroft, & Higham, 2010). Market creation in the context of renewable projects may be articulated in terms of the benefits (sustainable value) that the project adds to the shareholders and stakeholders. Using resource-based theory as a framework for analysis, the key decision makers of the project/firm may develop a sound strategy that captures the full cycle benefits renewable energy projects (Fuller, 1999; Hunt, 2011).

The Mediating Role of Market Creation

Menegaki has developed a sound framework for cost-benefit valuation and evaluation of renewable energy projects. As Menegaki has identified, valuation here is concerned with assigning a value to the attributes of renewable energy projects, whereas, evaluation is concerned with the overarching cost-benefit analysis (Menegaki, 2008). Market creation assigns a value (real and perceived) to the benefits of the renewable energy business or project of interest.

Accordingly, the stated and revealed valuation methods produce the most inclusive values for renewable energy projects by taking into account consumer preferences and externalities. Option theory and portfolio analysis capture the monetary values associated with renewable energy projects in terms of fuel risk mitigation, overall portfolio cost and risks, which have bearings on the overall performance of RE projects (Lee & Shih, 2011; Menegaki, 2008). This framework is effectively used to determine the performance of RE projects, instead of the customary Capital Asset Pricing Model (CAPM) that correlates risks and returns for investments.

Emergy (exergy) analysis, an ecological engineering-based evaluation, is the most efficient method used to gage the performance of RE projects. It attempts to measure the net-value of ecosphere friendly projects to society at large (Menegaki, 2008). This methodology is not a substitute for market valuation of projects, but it could be utilized as an alternative to market valuation for projects that can tolerate additional risks. Such benefits include reduced greenhouse gas emissions, thermal and noise pollutions, enhanced energy security, improved economic efficiency, improved employment, social, and cultural developments, and enhanced international relations (Awerbuch & Sauter, 2006). As part of the sustainable marketing plan, the sustainable value of the project is communicated to its customers, potential customers, policy makers, and the host community at large to enhance the desired project outcomes.

Market creation is underpinned by the knowledge of the firm about its customers, their needs, competitive products and services, and available resources. Market creation mediates the relationship between knowledge creation and connectedness with meaningfulness. Connectedness here refers to the relations of the key decision maker of

the RE project or firm to the project itself, staff working on the project, and to the host community of the project (Laszlo et al., 2014; Pretty, 2003). In other words, it is the relatedness of the key decision maker of the project, the project's host community, and creating sustainable value through the project

With these underpinnings on marketing and valuation of renewable energy projects, we predict that market creation will mediate the relationship between knowledge production and meaningfulness and connectedness and meaningfulness as stated in hypothesis three below.

> *Hypothesis 3. Market creation will mediate the relationship between knowledge creation (Hypothesis 3a) and connectedness (Hypothesis 3b) with meaningfulness controlling for firm size, project customer household income, and reflective practices.*

Managerial Responsibility (Profile)

Managerial responsibility refers to the responsibility or the position of the key decision maker of the RE project (unit of analysis). For our research, managerial responsibility is divided into two categories; executive and management. The executive category includes CEO, COO, CFO, and CTO, who have greater oversight of RE projects and the firm. The manager or senior manager category includes project directors, and program managers with primary responsibility for RE projects, business and technology innovations.

The Moderating Role of Managerial Responsibility (Profile)

Here we argue the degree of influence, and composition of the top management team (TMT) may have significant and substantial impact on the performance of the renewable project and/or the firm following Hambrick and Mason's assertion (Carpenter,

Geletkanycz, & Sanders, 2004; Hambrick & Mason, 1984) depending on cultural context of the firm and project host community (Hofstede, 1983).

Furthermore, management interpretation of ecological concerns either as an opportunity or conformance issue will have significant and substantial implications on business and technological innovations that will further impinge on the performance of RE projects and the firm (Sharma, 2000).

Based on the above premise, we hypothesize that the level of managerial responsibility (position) will attenuate the mediated relationships between integrated vision and connectedness with sustainable value through eco-communal management that is different (bifurcated) for executives and managers.

> *Hypothesis 4. The level of managerial responsibility (position) will moderate the mediated relationships between collective vision (Hypothesis 4a), and connectedness (Hypothesis 4b) with sustainable value via eco-communal management in such a way that the mediated relationship strength increases with higher managerial responsibility controlling for firm size, project customers household income and reflective practice.*

Research Design and Methods

Measures

All variables used Likert scales except managerial responsibility (moderator) and the controls (firm size, project customer's household income, and reflective practices). The 43-item measures are shown in Table B1 with the associated factors and the construction table of these items is presented in Table B2.

Integrated Vision (IVN)

For integrated vision, we utilized three first order factors, and a total of seven items ($\alpha = .89$) adapted from the works of Carroll, Rosson, and Zhou (2005).

Knowledge Creation (KC)

Knowledge production was measured with three first-order factors and a total of seven items (α = 0.90) adapted from Schulze and Hoegl (2006, 2008).

Connectedness (Connect)

We used two first-order factors with a total of six items (α = .92) from van Bel et al. (2009).

Eco-communal Management (EcoMng)

We used two first-order factors that have a total of five items (α = .84) adapted the work of Bono and Anderson (2005) and Kayworth and Leidner (2002).

Transitions Engagements (TransEng)

Three items (α = .80) were used adapted from the works of Judge, Thoresen, Pucik, and Welbourne (1999).

Market Creation (MKC)

Two items (α = .81) adapted from the works of Jain and Kaur (2004) were used to measure market creation.

Sustainable Value

We used two first-order factors with a total of eight items (α = .94) adapted from the work of Zhu, Sarkis, and Lai (2008) to measure the integrated economic, ecological, and social outcome of the RE project.

Meaningfulness

Meaningfulness was measured using five items (α = .94) adapted from May et al. (2004).

Controls

We utilized four controls in this research:

1. Firm size, which is expressed by the number of people the firms have employed.
2. Project customer household income assess the before tax income (in US $) of RE project customers (Whitmarsh & O'Neill, 2010).
3. Project location is used as a control to capture localized effects, which include market structures, initiative and policy and regulators frameworks that have an impact on RE businesses and projects.
4. Reflective practice measures the engagement of the key decision maker in reflections, which is a powerful means to raise awareness and instrumental in creating flourishing in the person and enterprise that practice it (Laszlo et al., 2014).

Instrument Development & Testing

The survey instrument was pre-tested using a Q-sort from the responses of 15 research participants who are knowledgeable in the renewable energy business. This resulted in 90% of the items being placed correctly. Furthermore, to ensure the reliability, validity, and appropriateness of the survey instruments, we conducted a pilot test by administering the survey instrument to fifty key decision makers engaged in renewable energy businesses in emerging economies. Based on their feedback, items sd2, sd3, asc1, and m4 (Appendix B) were modified by shortening the items without changing their meaning in order to increase readability, clarity, and reduce the estimated time required to complete the survey (Cooper & Schindler, 2006; Giles, 2002).

Data and Samples

Data were gathered from 204 key decision makers of renewable energy projects and firms that have developed renewable energy projects in emerging economies that include China and India. More than 85% of the respondents have RE project development experiences in Asia and the balance in Africa, Latin America, and the Middle East. These key decision makers were identified through the personal network and business relationships of the researchers.

Forty-five percent of the respondents were senior executives (CEO, COO, CFO, and CTO), 55% senior manager/managers with titles of project director/program manager (50%), and scientists, and site manager (5%).

Data Screening

Data were screened for missing data, unengaged responses, outliers, kurtosis, and skewness. Three respondents completed the survey instrument before we have included reflective practice items in the survey (missing data was 0.034%), and the data for this construct for the three respondents were imputed using the median of the 201 respondents who had fully completed the survey. Data were adequate for further analyses.

Analysis

We conducted exploratory factor analysis (EFA), confirmatory factor analysis (CFA) with and without a common latent factor, and structural equation modeling (SEM) as part of our overall analyses. The hypothesized model was tested using a two-step procedure following Preacher, Rucker and Hayes's (2007), and Shrout and Bolger's (2002) recommendations. We used structural equation modeling in AMOS (version 22)

with bootstrapping to measure direct and indirect effects of mediation and moderated mediations.

Results

Exploratory Factor Analysis (EFA)

We submitted the 43-item scales to EFA, and several statistics indicated the data were adequate and appropriate for further analysis.

First, we observed the Kaiser-Meyer-Olkin (KMO) statistic was 0.926. Second, Bartlett's Test of Sphericity was significant ($\chi 2 = 7160$, $df = 820$, $p < 0.000$) indicating sufficient inter-correlations. Third, the commonalities were all above 0.50 further confirming that each item shared some common variance with other items (Hair, Black, Babin, & Anderson, 2010). Fourth, all Measures of Sampling Adequacy (MSAs) across the diagonal of the anti-image matrix were above 0.70, indicating that the data are appropriate for factoring.

The eight-factor solution explained 66.95% of the variance in the model, and the eight constructs with their associated 43 items are shown in Table 7.

Table 7. Survey Instrument Items and Construct Reliability

Constructs	2nd Order Factor	1st Order Factor(s)	No. of Items	Total No. of Items per construct
Integrated vision (IVN)	Yes	Managing Conflict (MC: mc1, mc2, mc3)	3	7
		Integrated Development (SD: sd2, sd3)	2	
		Autonomy in Social Services (ASC: asc1, asc2)	2	
Knowledge creation/production (KC)	Yes	Socialization (SCN: scn2, scn3)	2	7
		Internalization (ITR: itr1, itr2, itr4)	3	
		Externalization (Extrn: extrn2, extrn3)	2	
Connectedness (Connect)	Yes	Relationship Salience (RS: rs1, rs2, rs3)	3	6
		Shared Understanding (SU: su1, su2, su3)	3	
Eco-communal management (EcoMng)	Yes	Transformational Leadership (TL: tl1, tl2)	3	5
		Leader Roll (LR: lr2, lr3)	2	
Transitions engagements (TranEng)	No	ote1, ote2, ote3	3	3
Market creation (MKC)	No	pce1, pce2	2	2
Sustainable value (SV)	Yes	ecp1 -ecp4	4	8
		enp2 - enp5	4	
Meaningfulness	No	m1 - m5	5	5

Measurement Model

The confirmatory factors analysis of the measurement model yielded good model fit statistics with χ^2 = 1470.94, df (degree of freedom) = 806, CFI = .906, and RMSEA = .064 (Hair et al., 2010) as shown in Table 8 indicating the validity of the factor structure.

Table 8. CFA Model Fit Statistics

χ^2	1470.94
df	806
p	0.0000
CMIN/df	1.825
CFI	0.906
TLI	0.895
RMSEA	0.0637, 90% CI [.0586; .0689]
SRMR	0.074
PCLOSE	0.000

In Table 9, we have presented the mean, standard deviation and bivariate correlations

Table 9. Means, Standard Deviations, and Bivariate Correlations

Variable	M	SD	1	2	3	4	5	6	7	8	9
Integrated vision	1.56	0.29	(0.89)								
Knowledge production	3.00	0.57	.66***	(0.90)							
Connectedness	3.96	0.73	.74***	.89***	(0.92)						
Eco-communal management	3.10	0.62	.73***	.65***	.76***	(0.87)					
Transitions engagements	2.54	0.85	.39***	.47***	.41***	.31***	(0.80)				
Market creation	2.78	0.77	.32***	.42***	.33***	.26***	.25***	(0.81)			
Sustainable value	2.74	0.77	.40***	.42***	.52***	.73***	.05***	.11***	(0.94)		
Meaningfulness	2.96	0.73	.53***	.36 ***	. 48***	.82***	.08***	.07***	.68***	(0.94)	
Managerial responsibility	1.57	0.50	-.18**	-0.08	-0.12	-0.12	0.02	-0.03	-0.01	-0.10	

Furthermore, as shown in Table 10, the CFA meets all validity and reliability requirements indicating that the model fits the data well. Composite reliability for all the constructs was greater than 0.7 and the average variance extracted (AVE) meet the requirement for convergent validity. The maximum shared variances (MSV) are less than AVE, and the average shared variances (ASV) are less than AVE meeting discriminate validity requirements (Fornell & Larcker, 1981). Reliability requirements are met since both Cronbach's alpha and composite reliability for each construct is greater than 0.7.

Table 10. CFA Validity & Reliability

Convergent Validity		Discriminate Validity		Reliability	
CR > .7		MSV < AVE		α > .7	
CR > AVE		ASV < AVE		CR . >7	
	Cronbach's α	CR	AVE	MSV	ASV
Integrated vision	0.888	0.898	0.746	0.574	0.384
Knowledge production	0.902	0.937	0.832	0.713	0.401
Connectedness	0.918	0.847	0.734	0.713	0.441
Eco-communal management	0.839	0.795	0.663	0.646	0.449
Transitions engagements	0.801	0.823	0.621	0.320	0.181
Market creation	0.813	0.820	0.696	0.245	0.155
Sustainable value	0.935	0.974	0.950	0.543	0.294
Meaningfulness	0.940	0.941	0.762	0.646	0.317

The effects of common method bias were checked by comparing CFA results with and without a common latent factor (CLF) following Gaskin's (2012) method. There was no difference between CFA results with and without CLF indicating that common method bias does not have a significant and substantial effect on the data collected (Table B3). Results of configural and metric invariance tests are presented in Table B4 & B5 in Appendix B.

Structural Equation Modeling (SEM) Results

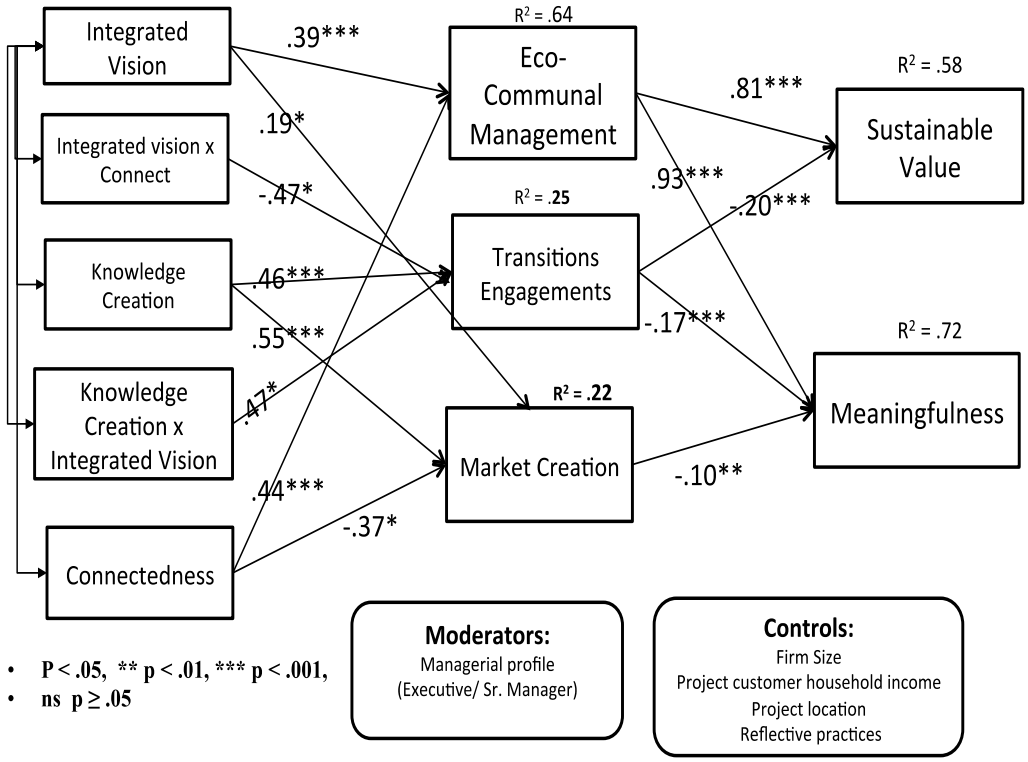
The hypothesized models tested shown in Figure 17 fits the data well with model fit statistics $\chi^2 = 45.10$, df = 26, CMIN/df = 1.74, CFI = .99, TLI = .96, and RMSEA = .06 (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004; Tabachnick & Fidell, 2007). A summary of key model fit statistics is shown in Table 11.

Table 11. Final SEM Key Model Fit Statistics

	SEM_444_1.73_Dec. 31, 2016_TRM + PRL
χ^2	45.10
df	26
p	0.0115
CMIN/df	1.735
CFI	0.989
TLI	0.963
RMSEA	0.06
SRMR	0.03
PCLOSE	0.26

As shown in Figure 18, seven antecedents and mediator relationships have substantial and significant impacts on mediators, three interactions were significant, and five out of the six effects of mediator on outcomes were significant and substantial.

Figure 18. SEM Results



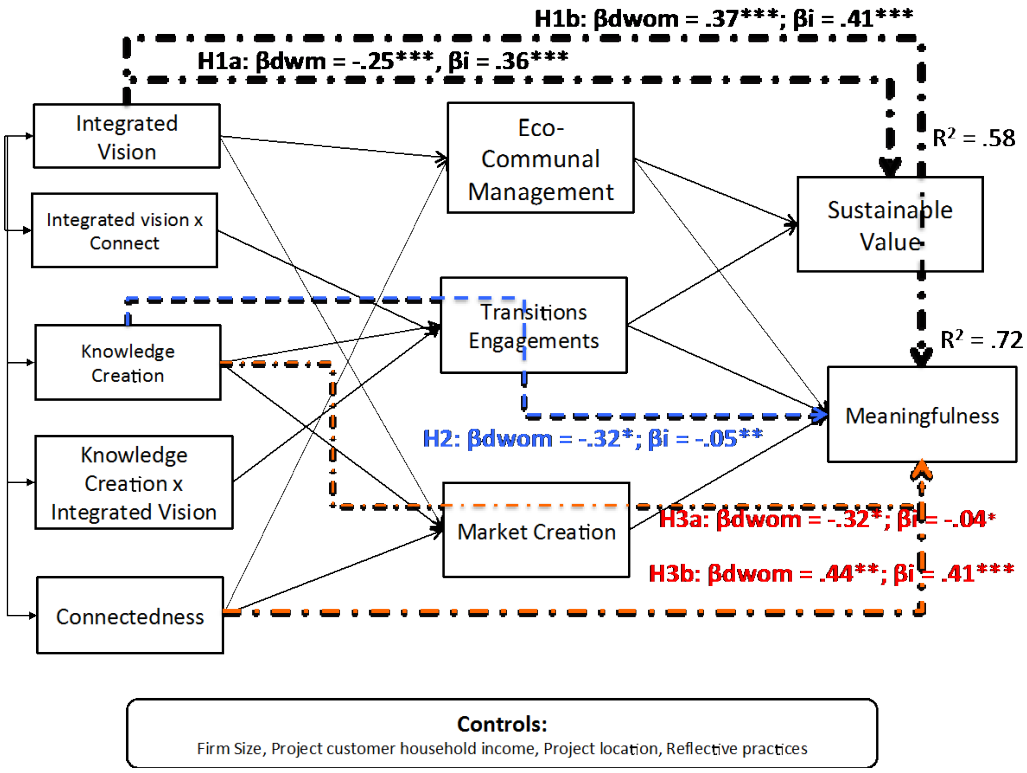
Hypotheses Test Results

As it pertains to hypothesis 1a, it is supported with partial mediation for both the direct path with mediation and the indirect path being significant (β_{dwm} = -.21, $p < .001$, β_i = .37, $p < .01$). Hypothesis 1b is supported as the mediation analysis support that eco-communal management fully mediates the relationship between connectedness and meaningfulness as both the direct unmediated path and the indirect path are significant (β_{dwom} = .48, $p < .001$; β_i = .48, $p < .001$).

As we have predicted in Hypothesis 2, transitions engagements mediates (fully) the relationship between knowledge production and meaningfulness with significant unmediated direct and indirect path coefficients (β_{dwom} = -.32, $p < .05$; β_i = .48, $p < .001$).

Hypotheses 3a and 3b were supported as we have predicted. Market creation mediates (fully) the relationships between knowledge creation and meaningfulness (3a), and connectedness and meaningfulness with significant unmediated direct and indirect paths (β_{dwom} = -.32, $p < .05$; β_i = -.05, $p < .05$ & β_{dwom} = .48, $p < .001$; β_i = .03, $p < .05$) respectively.

Figure 19. Mediation Test Results



In order to test for multi-group moderation using managerial profile as the moderator (Hypotheses 4a & 4b), we conducted configural and metric invariance tests to ensure the adequacy of the factors structure in our CFA and the difference between the two managerial profiles following Gaskin's (2012) recommendations.

The factor structure in our CFA was adequate (Appendix: B3), and there is evidence of a difference between the two groups (Appendix: B4) indicating our measurement model invariance to conducted multi-group moderation.

As we have predicted, Hypothesis 4a is supported. The level of managerial responsibility moderates the mediated relationship between integrated vision and

sustainable value via eco-communal management increasing with higher managerial responsibility (executives: $\beta_{dwom} = .36$, $p < .05$, $\beta_i = .54$, $p < .01$; managers: $\beta_{dwom} = -.2816$, $p < .01$, $\beta_i = .33$, $p < .01$).

As it pertains to Hypothesis 4b, it is not supported. The level of managerial responsibility moderates the mediated relationship between connectedness and sustainable value via eco-communal management in such a way that it decreases with a higher level of managerial responsibility as evidenced by the moderation test results (executives: $\beta_i = -.35^{**}$; managers: $\beta_{dwm} = .64^{***}$, $\beta_i = .43^{***}$). Figures 20 and 21 show the moderation implications of managerial profile (executives and senior managers) on sustainable value.

Figure 20. Moderation - Senior Managers

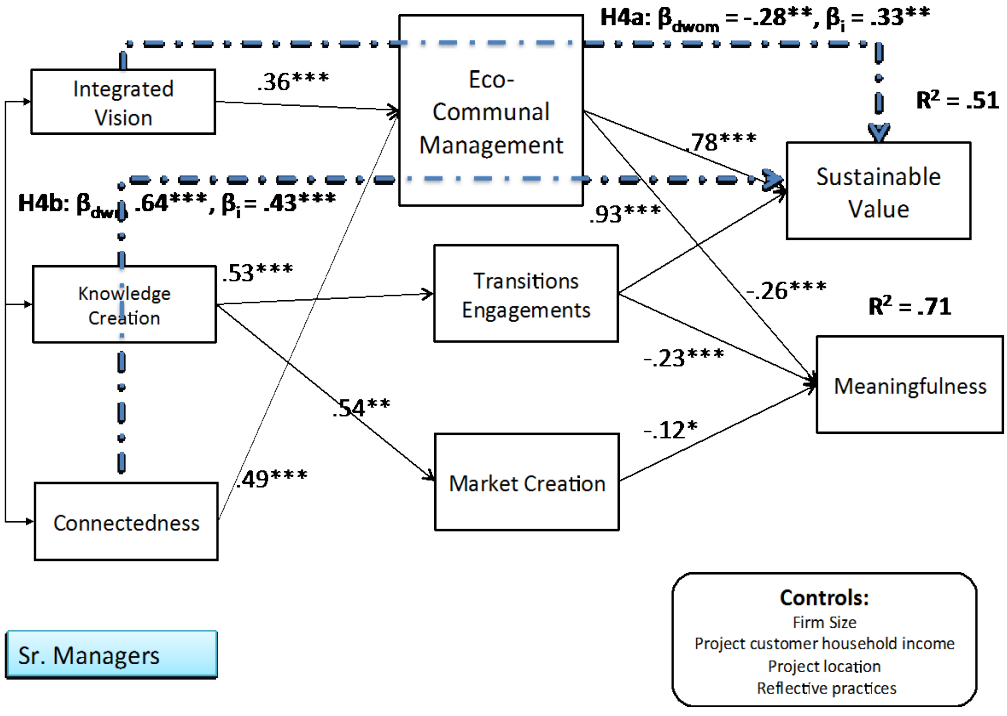
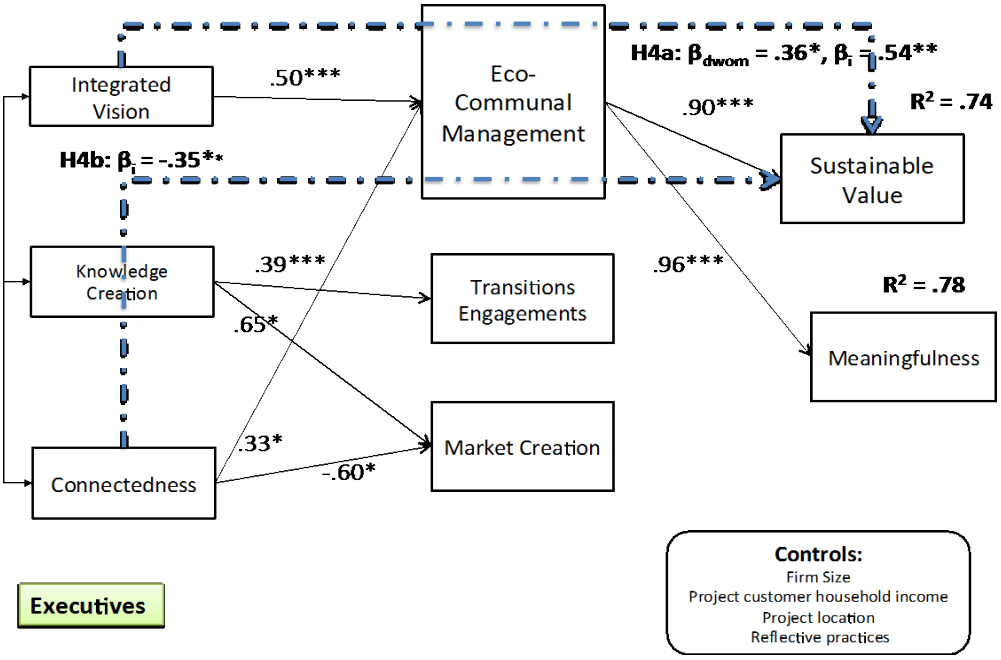


Figure 21. Moderation - Executives



The summary of hypotheses test results is presented in Table 12.

Table 12. Summary of Hypotheses Test Results

Hypothesis	Path	Type	Supported?
H1a	IVN -> EcoComMng -> SV	Partial mediation	Yes
H1b	IVN -> EcoComMng -> Meaningfulness	Full mediation	Yes
H2	KC -> TransEng -> Meaningfulness	Full mediation	Yes
H3a	KC -> MKC -> Meaningfulness	Full mediation	Yes
H3b	Connectedness -> MKC -> Meaningfulness	Full mediation	Yes
H4a	IVN -> EcoCoMng -> SV	Mediated moderation	Yes
H4b	Connectedness -> EcoComMng -> SV	Mediated moderation	No

Overall, the predictor variables explain 58%, and 72% of the variance in the outcome variables sustainable value, and meaningfulness. Further probing the bifurcation effects, for executives, the predictor variables explain 74%, and 78% of the variance of

sustainable value, and meaningfulness respectively, whereas it explains 51% and 71% for senior managers.

Alternative Model

As an extended part of our analysis, we considered an alternative model on the premise of linking market imperfections and sustainable entrepreneurship. As Cohen and Winn (2007) have stated, "market imperfection one hand contributed to environmental degradation, and that on the other hand, they provide significant opportunities for the creation of radical technologies and innovative business models" (p. 31).

This linkage is further accentuated by the significant implications of entrepreneurship on heralding whole system change and transformation through market creation (Hall et al., 2010). Hence, market creation becomes an exogenous variable (antecedent) with direct connections to the mediators' eco-communal management and transition engagements instead of being a mediator as it was in the hypothesized model.

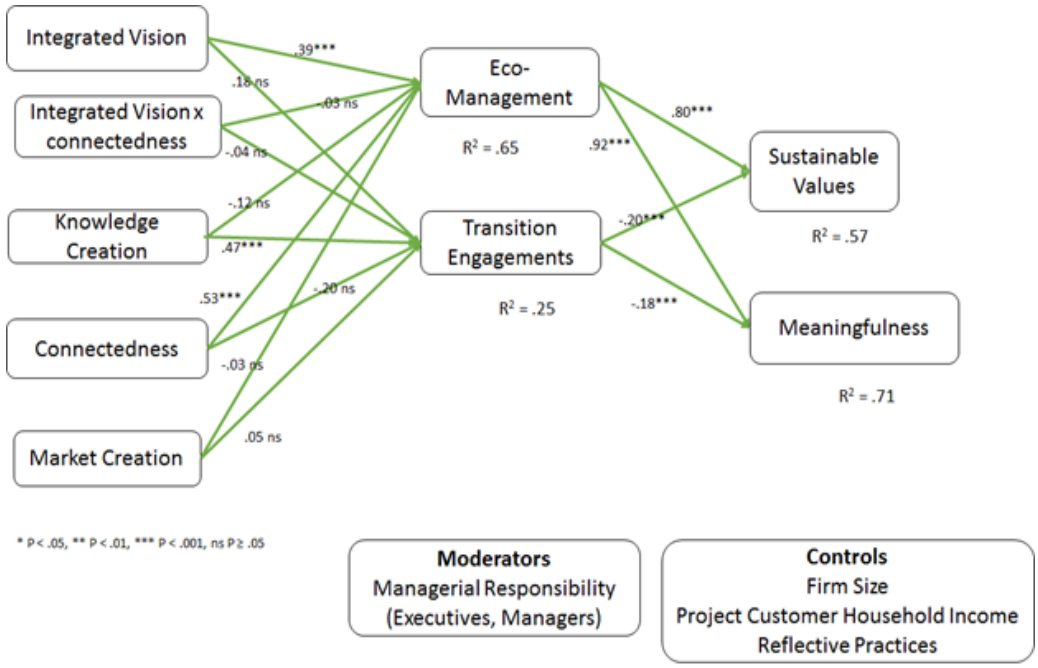
However, the model did not fit the data as good as our main model. The alternative model has statistics $\chi^2 = 93.62$, df = 36, CMIN/df = 2.60, CFI = .98, TLI = .88, and RMSEA = .063 as shown in Table 13. Note that CMIN/df is greater that the recommended threshold while PCLOSE is less than the recommended limit.

Table 13. Alternative Model Fit Statistics

	Alteranative Model	Recommended Limits	Reference
χ^2	93.62		
df	36		
p	0.0000	< 0.05	
CMIN/df	2.600	< 2.00	Tabachinck & Fidell, 2007
CFI	0.979	> 0.95	Hu & Bentler, 1999
TLI	0.882		
RMSEA	.0629, 90% CI [.0474; .0786]	< 0.06	Hu & Bentler, 1999
SRMR	0.025		
PCLOSE	0.083	> 0.5	

As it is shown in Figure 22, changing market creation from a mediator in the primary model to exogenous variable in the alternative model has made the effects of the antecedents on the mediators to be insignificant. One may surmise from this result that the effects of integrated vision, knowledge creation, relational dimensions, business model, and technology innovations to be precursors for market creations and the translation of the integrated visions of the RE project/firm to desired strategic objectives. Figure 22 shows the results of the alternative SEM.

Figure 22. Alternative SEM Results



Controls

As it pertains to the controls, reflective practice shows as significant in multi-group moderation for market creation, and meaningfulness. For executives the control firm size has significant ($p < .05$) impact on transitions engagement, reflective practice and project customer household income are found to have a significant relationship with meaningfulness (Table B6).

Discussion of Results

In this study, we have utilized the concept of sustainable value (Achtenhagen et al., 2013; Laszlo & Cooperrider, 2007) to measure the integrated economical, ecological, and social performance of renewable energy projects in the context of emerging economies. We have further augmented the performance measure for renewable energy

projects with meaningfulness dimension as a component to capture job satisfaction and higher aspirations of the key decision makers in imagining a better alternative and making a difference (May et al., 2004; Renn & Vandenberg, 1995).

Our research suggests:

1) The performance of RE projects is significantly and substantially impacted by integrated vision, knowledge creation, and connectedness, which are translated to sustainable value and meaningfulness through its management practices (eco-communal management), and transition engagements in the context of emerging markets. In this research strand, we have clearly defined the exogenous variables integrated vision, knowledge creation, and connectedness, which are nuanced from current literature. The primary vehicles, which translate the strategic vision, capabilities, and assets of the RE project or firm to sustainable value and meaningfulness are eco-communal management and transition engagements. Hence, the performance of RE projects in the context of emerging economies is heavily dependent on establishing a strategic vision that is in a symbiotic and synergistic relationship with the economic, social, and ecological developments and aspirations of the project host community and the region (Milbrath, 1989).
2) A strong and integrated management practice, which we have identified as an eco-communal management practice that is undergirded by business model, and technology innovations (Andries & Debackere, 2013; Bohnsack et al., 2014; Hart & Milstein, 2003; Laszlo & Zhexembayeva, 2011) is essential for the success of RE projects. Hence, it is imperative that the RE project or firm

develop and deploy contextualized eco-communal management for the project of interest.

3) Transition engagements, which is defined as emergent and dynamic engagement in hastening and effecting transformational change (Elzen et al., 2004; Kemp et al., 2007) is instrumental intermediary practice to translate the value proposition of RE projects into sustainable value and meaningfulness. Hence, it is essential that the RE energy project leadership and staff develop and implement contextualized transition engagement strategy that supports the integrated strategic objectives and the eco-communal management drives of the project. Note that eco-communal management and transition engagements work in tandem to achieve the desired outcomes of the projects.
4) Executive profile and authority have significant implications on value propositions and the creation of RE projects as it is observed that the level of managerial responsibility bifurcates the translation of strategic objectives of RE projects and the relatedness of key decision maker into sustainable value and meaningfulness. These bifurcations indicate the different value chains that executives and senior managers derive from their RE projects and depend on the cultural context of the key decision makers of the project or firm (Hofstede, 1983). These findings suggest that empowering the key decision makers of the project to develop and deploy contextual eco-communal management strategies and initiatives will enhance the sustainable value creation of the project.

5) The impact of knowledge creation on sustainable value is primarily indirect through hastening and effecting transformational change, and market creation. As such, deploying effective transitions engagement & instituting accurate methods to measure the efficacy of knowledge creation is imperative to gauge the performance of RE project.
6) The counter-intuitive market creation's insignificant & negative relationship to sustainable value and meaningfulness is nuanced from what is found in current literature and it may be attributed to a lag in the deployment of sustainable marketing, the greater deployment of interconnected/relational marketing in emerging economies, and the difference between marketed and perceived benefits of RE projects. These findings suggest the need for the development and deployment of a contextualized sustainable market orientation that address the local market needs, and enhance the outcomes of the RE project.
7) The multilevel interactions among business model and technology innovations, ecological modernizations, cutting age management practices, knowledge creation, and disseminations, transition engagements, and marketing orientations all work in the complex environments of social systems that impinge on these phenomena, and these phenomena have implications on the social systems they are embedded in (Hessels & Van Lente, 2008; Hunt, 2011; Luhmann, 1995; Manyika et al., 2013; Zott & Amit, 2010). These dynamic and emergent relationships inform and shape the performance of renewable energy projects in near and long-term horizons.

Hence, it imperative for RE project executives and key stakeholders to develop an integrated and systemic strategy that address the emergent and complex issues associated with the development of RE businesses and projects.

8) It is worth noting that reflective practices have significant relationships with the entire key variables identified in the hypothesized model. We suggest further investigation, and gaining a better understanding of the implications of this variable on practical and perceptual dimensions will help to enhance the performance of RE businesses.

In this model, the predicator variables explain 58% of the variance of the outcome variable sustainable value, 72% of the outcome variable meaningfulness. The variables we have identified and the model we have developed could be utilized to optimize the desired outcomes of RE projects during concept development and/or post deployment.

It will also be valuable to develop optimized scales that capture new concepts associated with emergent thinking in renewable energy innovations and developments that may not be optimally captured by existing scales. From the analysis perspective efforts to capture feed forward, backward and looped relationships may yield fresh insights to better understand the outcome of renewable energy businesses and projects from integrated economical, ecological, social, and technological perspectives.

CHAPTER 6: SECOND QUANTITATIVE STRAND

Introduction

Anchored by extant literature and the findings of our qualitative and quantitative research strands, we further investigated the implications of RE project drivers integrated vision, knowledge creations, and connectedness in representative developed economies (US, Canada, Germany, Japan, UK). The objective of the 2nd quantitative strand is to determine the implications of key management approaches, business and technological innovations, and perceptual variables on the performance of RE projects in the context of developed economies using survey instruments (Achtenhagen et al., 2013; Boons et al., 2013; Richter, 2013; Wang, Jing, Zhang, & Zhao, 2009; Wüstenhagen & Wuebker, 2011). This strand of the research helped us to gain a systemic and integrated understanding of RE businesses in both developing and developed economies.

Our research started with investigating the foundational constructs that anchor the strategic, innovation, and relational dimensions of renewable energy projects. An integrated vision of the RE project prescribes the strategic pathways for creating sustainable value for all stakeholders and providing creative solutions through entrepreneurial actions (Ireland et al., 2009; Milbrath, 1989), which is undergirded by strategic management practices of the key decision maker(s) of the project or the firm. In this context key strategic management practices include the optimization of economical, social, and ecological outcomes (Alfred & Adam, 2009), and strategic niche management concepts that facilitate an optimized project or firm performance over a longer time horizon (Schot & Geels, 2008).

Furthermore, in this strand of the research we investigated the implications of reflective practices on the integrated performance of renewable energy businesses following up its significant relationships (as a control) with meaningfulness and market creation that we observed in the first quantitative strand.

Hypotheses

We started by replicating the SEM that we have developed for emerging economies (EE) presented in Figure 17 with developed economies (DE) data based on what we had reasoned earlier on the difference of entrepreneurial activities and intuitional capabilities in emerging and developed economies. Entrepreneurship is a critical factor for the successes of RE businesses and projects. In turn, entrepreneurship is dependent on institutional capabilities, knowledge base, market structures, and the overall development level of the economy (Acs, Desai, & Hessels, 2008).

Since emerging and developed economies have different institutional capabilities, knowledge base, market structures, economic and social imperatives, we hypothesize that the RE business and project drivers (exogenous variables), mediators, and outcome relationships will be different for emerging and developed economies (Asif & Muneer, 2007; Hall et al., 2010).

> *Hypothesis 1. RE business (project) outcome models for emerging and developing economies will be different controlling for firm size, project customer household income, and project location.*

Hypothesis 1 was supported indicating that RE outcome drivers, mediators, and outcome relationships are different for emerging and developed economies as the kind of entrepreneurship activities, institutional capabilities, energy infrastructures and market

orientations are different between these economies. Table 14 shows the results of invariance test results.

Table 14. RE Outcome Model for Emerging and Developed Economies Invariance Test

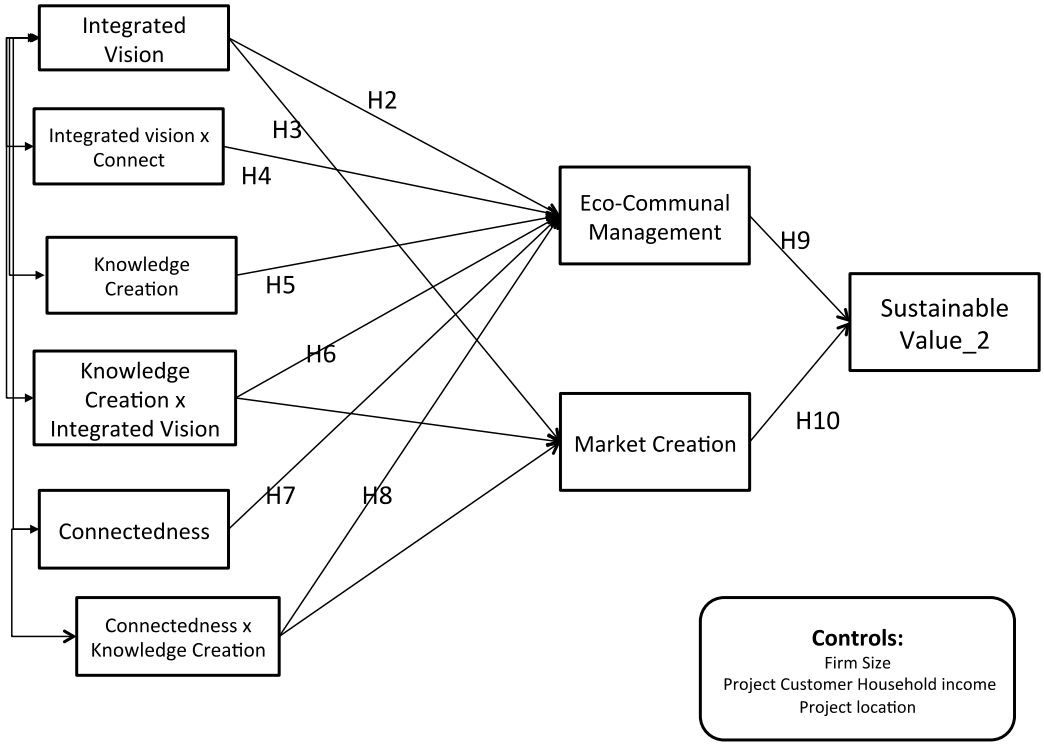
Hypothesis	Invariance Test	$\Delta\chi^2$	Δdf	p	Not invariant?
H1	EE & DE Replc. Not invariant	432.23	47	0.0000	Yes

Furthermore, the replicated model (EE model with DE data) does not fit the data with CMIN/df = 6.88, which is above the recommended threshold (Tabachnick & Fidell, 2007). At the CFA level, the two models were confirming that we are measuring the same attributes in emerging and developing economies.

SEM fit statistics, and results for the replicated model are presented in Table C1, and Figure C1 respectively.

Based on the current literature, our qualitative and first quantitative research strand findings, we have proposed the hypothesized model as presented in Figure 23 below.

Figure 23. Hypothesized Model for the Outcome of RE Businesses (Projects) in Developed Economies



Antecedent and Mediator Relationships

Integrated Vision

Integrated vision, which sets the overarching business strategy, and the rationale of the firm to engage in entrepreneurial action, has a significant and substantial impact on the formulations of management and market strategies of the business or project (Ireland et al., 2009). The management and market creation strategy of the firm, in turn, have significant and substantial implications on the desired outcome of the business (project). In the context of developed economies, RE businesses and projects compete with well-established and connected energy businesses. Hence, articulating and deploying well-

defined and differentiated integrated vision that enhances economic, social, and ecological benefits is imperative for the competitive positioning and success of the business (Wüstenhagen & Menichetti, 2012).

Here, we reason integrated vision provides the framing of the overarching strategic management and defines the perimeters of the markets, which in turn translate the integrated vision, knowledge, capabilities, resources, and relational capacity into the desired outcome, which we have identified as sustainable value (Laszlo, 2008).

It is identified that the type of entrepreneurs and the entrepreneurial environment including the national systems of innovation, market conditions, and available infrastructures are different in emerging and developed economies (Valliere & Peterson, 2009). The impact of integrated vision as the vehicle of translating the drivers of RE project into the desired outcome (sustainable value) will be different, significant and substantial between the two economies.

A clear and well-articulated strategic vision will enable the firm to establish a capable management strategy that enables the RE business or project to differentiate itself from its competitors by creating aggregated value chains that optimize economic, social, and ecological benefits. In the context of developed economies, the formulation and deployment of such integrated strategic vision is imperative for a successful renewable energy business or project that create sustainable value due the highly competitive market structures that are supported by established regulatory framework and significant sunk capital in conventional energy generation and distributions systems (Schoemaker, 1992).

Based on these arguments we hypothesize that integration vision will be positively related with eco-communal management controlling for firm size, project

customer, household income, reflective practices, and project location as stated in Hypothesis 2.

> *Hypothesis 2. Integrated vision will be positively related with eco-communal management controlling for firm size, project customer household income, reflective practices, and project location.*

Furthermore, integrated vision defines the perimeters of the markets that will be served through its entrepreneurial actions by providing creative solutions to challenging energy and related problems and demands. Here, we surmise that the larger scope of integrated vision as it pertains to market creation includes meeting existing needs by providing renewable energy based solutions, which displace current conventional energy solutions, meeting the increasing energy demand, and creating new markets for renewable energy businesses that may assure a change in the socio-technological landscape (Cohen & Winn, 2007). Based on these assertions we hypothesize that integrated vision will have a positive significant and substantial relationship with market creation as stated in Hypothesis 3.

> *Hypothesis 3. Integrated vision will be positively related to market creation controlling for firm size, project customer household income, and project location.*

The Moderating Role of Connectedness

In previous chapters, we have defined connectedness as the relations of key decision maker of the RE business or project with the project itself, staff working on the project, and with the host community of the project (Laszlo et al., 2014; Pretty, 2003). It includes the relatedness of the key decision maker of the project to the project; the projects host community and creating sustainable value through the project

Furthermore, we have defined eco-communal management as a key management strategy, which creates a symbiotic and synergistic partnership among profit, environmental, and societal concerns (Hart & Dowell, 2010). We further articulated its primary objectives to include improving the return on investment, competitive positioning, and creating sustainable value (Laszlo & Zhexembayeva, 2011).

With these background information stated we argue that connectedness will positively moderate the relationship between integrated vision and eco-communal management. When the key decision maker has stronger affinity and relationships with staff of the business, the project host community, and the rationale for engaging in entrepreneurial actions, it strengthens the relationship between integrated vision and eco-communal management, which is a means of translating the overall business strategy of the RE business or project into the desired outcome(s).

Based on these rational, we hypothesize, connectedness will positively moderate the relationship between integrated vision and eco-communal management as stated in Hypothesis 4.

> *Hypothesis 4. Connectedness positively moderates the relationship between integrated vision and eco-communal management controlling for firm size, project customer household income, and project location.*

Knowledge Creation

Knowledge creation refers to knowledge creation about customer needs, the project, technologies, resources, and overarching economic, ecological, and social issues through socialization, externalization, internalization, and combination processes (Nonaka et al., 1994; Yang et al., 2004). In developed economies, knowledge creation plays a major and important role in the functioning of the economy and society at large.

As it pertains to renewable energy businesses and projects, creating multi-disciplined knowledge about customer needs, market structures, technology and business model innovations, and scientific knowledge about the ecological landscape have paramount importance in shaping entrepreneurial engagements, management strategies, product and service offerings of the business.

Based on these reasons, we hypothesize that knowledge creation and the type of knowledge creation (Dewey, 1929; Hessels & Van Lente, 2008) will be positively related with eco-communal managements as presented in Hypothesis 5.

> *Hypothesis 5. Knowledge creation is positively related with eco-communal management controlling for firm size, project customer household income, reflective practices, and project/business location.*

The Moderating Role of Integrated Vision

Integrated vision, which is the foundational strategy for creating sustainable value by the RE business, and which, defines the essence of the firm that includes its entrepreneurial actions has the capacity to moderate the relationship between knowledge creation and eco-communal management. Here we reason integrated vision attenuates the impact of knowledge creation, which encompasses the contextualized multi-dimensional knowledge creation by the RE businesses about customer needs, business model and technology innovations that it deploys in its entrepreneurial actions on the management strategy of the business (eco-communal management).

Based on this premise, we hypothesize, the relationship between knowledge creation and eco-communal management is moderated by integrated vision as stated in Hypothesis 6.

Hypothesis 6. Integrated vision positively moderates the relationship between knowledge creation and eco-communal management controlling for firm size, project customer household income, and project location.

Impact of Connectedness on Eco-communal Management

Connectedness, which is concerned about the relational dynamics of the key decision maker of the RE business with the stakeholders of the business or project that include the business staff, end users, the business/project host community, the ecosphere, and relevant stakeholders (investors, regulators, and the like) has significant impact on the strategic management of the businesses. The relational spheres and embeddedness of the businesses establishes essential attributes of the business culture that impinges on the long-term and day-to-day operations of the businesses (Dhanaraj, Lyles, Steensma, & Tihanyi, 2004).

In the context of developed economies, the relational sphere of the business or project may be articulated in its overarching vision, formal strategic management communications, and its management practices in engaging with its staff, investors, customers, and other stakeholders. Connectedness in concert with the larger cultural context of RE business home office has significant and substantial implications on its strategic management practices.

Based on these premises, we submit that connectedness is positively related with eco-communal management as stated in Hypothesis 7.

Hypothesis 7. Connectedness is positively related with eco-communal management controlling for firm size, project customer household income, and project location.

The Moderating Role of Knowledge Creation

Knowledge creation here includes explicit and tacit knowledge creation. The developed economies of interest for our research are primarily western economies and Japan, where the utilization of tacit knowledge may be more prevalent than in the other economies of interest (Nonaka, Toyama, and Konno, 2005).

For RE businesses, both explicit and tacit knowledge with its socialization, externalization, and internalization dimensions have a significant bearing on eco-communal management. Furthermore, as Inkpen and Tsang (2005) have articulated, the intersection of social capital, knowledge creation, and networks have a significant implication on the competitive position and the success of businesses. Knowledge creation moderates the relationship between connectedness, which enhances internal and external relational spheres, and the key strategic management of the RE business (eco-communal management). Based on these assertions, we argue that knowledge creation positively moderates the relationship between connectedness and eco-communal management as presented in hypothesis 8.

> *Hypothesis 8. Knowledge creation positively moderates the relationship between knowledge creation and eco-communal management controlling for firm size, project customer household income, and project location.*

Mediators and Outcome Relationships

The mediators in the developed economies hypothesized model are eco-communal management and market creation.

Impact of Eco-communal Management's on Sustainable Value 2 (SV2)

Eco-communal management, which we have defined as the key management strategy of the renewable energy businesses (projects) that creates integrated economic,

ecological, and social benefits to all the stakeholders is the primary path way of translating the integrated vision, know-how, resources, and relational capabilities of the RE business into sustainable value (Schaltegger & Wagner, 2011).

In the context of developed economies, we have introduced a revised version of sustainable value that captures the integrated outcome of RE businesses that include economic, environmental, social, cognitive and perceptual benefits of the RE business from the perspective of the key decision maker to reflect the trajectory of moving towards resilience, and flourishing (Laszlo et al., 2014; Winnard, Adcroft, Lee, & Skipp, 2014).

Here sustainable value 2 (SV2) is a second-order factor with three first order variables that contain 12 items.

Based on the premise we have outlined above, we submit that econ-communal management has a positive significant and substantial relationship as stated in Hypothesis 9 below.

> *Hypothesis 9. Eco-communal management is positively related to sustainable value 2 (SV2) controlling for firm size, project customer household income, and project location.*

Impact of Market Creation on Sustainable Value 2 (SV2)

Market creation, which is a framed by the integrated vision of the RE business and it is an essential part of product/service offerings, opportunity sensing, value proposition & delivery, and monetization has a significant impact on sustainable value created by the businesses (Schaltegger & Wagner, 2011).

In the context of developed economies, sustainable market orientation is instrumental in differentiating the RE business's integrated and symbiotic value creation

in multiple dimensions that include economic, ecological, and social benefits to key stakeholders (Crittenden, Crittenden, Ferrell, Ferrell, & Pinney, 2011).

Insight of the above-mentioned reasons, we hypothesize, market creation will be positively related to the integrated desired outcome of the RE business or project (SV2).

Hypothesis 10. Market creation is positively related to sustainable value 2 (SV2) controlling for firm size, project customer household income, and project location.

Research Methods

Measures

All variables used for the research in developed economies employed Likert scales as we have done in emerging economies with the exception of the moderator managerial responsibility and the controls firm size, project customer's household income, reflective practices, and project location.

The construction table, which contains 47-items is presented in Table C2.

Integrated Vision (IVN)

We measured integrated vision with two first-order factors and a total of 4 items ($\alpha = .82$) adapted from the works of Carroll et al. (2005).

Knowledge Creation (KC)

Knowledge creation was measured with four first-order factors and a total of 13 items ($\alpha = 0.94$) adapted from Schulze & Hoegl (2006, 2008).

Connectedness (Connect)

We used two first-order factors with a total of six items ($\alpha = .93$) from van Bel et al. (2009).

Eco-communal Management (EcoMng)

Transition engagement was measured with two items (α = .82) adapted from Bono and Anderson (2005) and Kayworth and Leidner (2002).

Transitions Engagements (TransEng)

We used two items (α = .873) to measure transition engagement adapted from the works of Judge et al. (1999).

Market Creation (MKC)

Market creation was measured using five items (α = .78) adapted from the works of Jain and Kaur (2004) were used to measure market creation.

Disruptive Innovation (DINNOV)

Disruptive innovation (α = .88) was measured using three item adapted from the works of Govindarajan and Kopalle (2006)

Sustainable Value (SV2)

We used three first-order factors with a total of 12 items (α = .94) from Zhu et al. (2008) and meaningfulness items adapted from the works of May et al. (2004).

Controls

We utilized three controls in this research:

1. Firm size, which is expressed by the number of people the firms have employed. We used firm size as a control because of the thematic different entrepreneurial strategies that established and start-up renewable energy businesses tend to deploy (Hockerts, & Wüstenhagen, 2010).
2. Project customer household income assess the before tax income (in US $) of RE project customers (Whitmarsh & O'Neill, 2010). We utilized household

income as a control because of its multilevel relationships with energy consumption, GDP growth, income generation, and environmental implications associated increased energy consumption (Fang, 2011).

3. Project location is utilized to account for the regional difference in the applications of renewable energy businesses and projects. These differences include market conditions, entrepreneurial climate, regulatory policies, and financing instruments, and environmental selections, which impacts on RE business outcomes (Reiche & Bechberger, 2004).

Instrument Development and Testing

To ensure the reliability, validity, and appropriateness of the survey instruments, we conducted a pilot test by administering the survey instrument to 40 key decision makers engaged in renewable energy businesses in developed economies. Based on their feedback, and our experience in conducting research in emerging economies, we optimized the instrument items without changing their meaning in order to increase readability, clarity, and reduce the estimated time required to complete the survey (Cooper & Schindler, 2006; Giles, 2002).

Data and Samples

Data were gathered from 222 key decision makers of renewable energy businesses and projects primarily in five developed economies (US, Canada, Germany Japan, the UK) and a few responses from France and Norway. These key decision makers were identified through the personal network and business relationships of the researchers.

Forty-six percent (45.5% to be exact) of the respondents were senior executives (CEO, COO, CFO, and CTO), 54% were senior manager/managers with titles of the project director and program manager.

Data Screening

We started with 222 complete survey responses without missing data and data were adequate for further analysis.

Analysis

We conducted exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) with and without a common latent factor, which was followed by structural equation modeling (SEM) as part of our overall analyses. The hypothesized model was tested using a two-step procedure following Preacher et al.'s (2007) and Shrout and Bolger's (2002) recommendations. We used structural equation modeling in AMOS (version 23) with bootstrapping to measure direct and indirect effects.

Results

Exploratory Factor Analysis (EFA)

We submitted the 47-item scales to EFA and several statistics indicated the data were adequate and appropriate for further analysis.

First, we the Kaiser-Meyer-Olkin (KMO) statistic was 0.921. Second, Bartlett's Test of Sphericity was significant with $\chi 2 = 21{,}708$, $df = 5253$, and $p < 0.000$, indicating sufficient inter-correlations. Third, all commonalities were above 0.40 further confirming that each item shared some common variance with other items (Hair et al., 2010). Fourth, all Measures of Sampling Adequacy (MSAs) across the diagonal of the anti-image matrix were above 0.70, indicating that the data are appropriate for factoring. The sixteen-factor

solution explained 66.165% of the variance in the model, and the eight constructs with their associated 47 items are shown in Table 15.

Table 15. Survey Instrument Items

Constructs	2nd Order Factor	1st Order Factor(s)	No. of Items	Total No. of Items per construct
Integrated vision (IVN)	Yes	Integrated Development (SD: sd1, sd2)	2	4
		Autonomy in Social Services (ASC: asc1, asc3)	2	
Knowledge creation (KC)	Yes	Socialization (SCN: scn2, scn3)	2	13
		Internalization (ITRN: itrn1, itrn2, itrn3)	3	
		Externalization (Extrn: extrn1, extrn2, extrn3, extrn4)	4	
		Combination (Cmbn: cmbn1, cmbn2, cmbn3, cmbn 4)	4	
Connectedness (Connect)	Yes	Relationship Salience (RS: rs1, rs2, rs3)	3	6
		Shared Understanding (SU: su1, su2, su3)	3	
Eco-communal management (EcoMng)	No	Transformational Leadership (TL: tl3, tl4)	2	2
Transitions engagements (TranEng)	No	Open to experiences (OTE: ote1, ote2)	2	2
Disruptive Innovation (DIINOV)	No	Dinnov1, DInnov2, DInnov3	3	3
Market creation (MKC)	Yes	Percived infulence of green marketing & willingness to pay (IGP: igp2, igp6)	2	5
		Percieved concern for the environment (PCE: pce1, pce2, pce3)	3	
Sustainable value 2 (SV2)	Yes	Economic (ECP: ecp3, ecp4, ecp5)	3	12
		Environment (ENP: enp2, enp3, enp4, enp5	4	
		Social/Congnitive?Meanigfulness (Meaning: m1, m2, m3, m4, m5)	5	

Measurement Model

The confirmatory factors analysis of the measurement model yielded good model fit statistics with χ^2 = 1802.69 df (degree of freedom) = 977, CFI = .900, and RMSEA = .062 (Hair et al., 2010) as shown in Table 16 indicating the validity of the factor structure.

Table 16. CFA Model Fit Statistics

	DE CFA SM_2
χ^2	1802.69
df	977
p	0.0000
CMIN/df	1.845
CFI	0.900
TLI	0.889
RMSEA	0.062
SRMR	0.09
PCLOSE	0.00

Table 17 shows the mean, standard deviation and bivariate correlations.

Table 17. Means, Standard Deviations, and Bivariate Correlations

	Variable	M	SD	1	2	3	4	5	6	7	8
1	Sustinable Value (SV2)	3.88	1.05	(.94)							
2	Knowledge Creation (KC)	3.61	0.77	.72**	(.94)						
3	Integrated Vision (IVN)	3.42	0.72	.73**	.89**	(.82)					
4	Connectedness (Connect)	5.09	1.20	.64**	.95**	.86**	(.93)				
5	Eco-Communal Management (EcoComMng)	3.50	0.89	.87**	.77**	.76**	.67**	(.82)			
6	Transition Engagement (TransEng)	3.01	1.05	.45**	.49**	.46**	.55**	.25**	(.87)		
7	Market Creation (MKC)	2.64	0.59	.55**	.70**	.78**	.70**	.51**	.54**	(.78)	
8	Disruptive Innovation (DINNOV)	4.35	1.37	.37**	.49**	44**	.47**	.37**	.52**	.53**	(.87)

In Table 18, we have presented evidence that the CFA meets all validity and reliability requirements indicating that the model fits the data well. Composite reliability for all the constructs was greater than 0.7 and the average variance extracted (AVE) meeting the requirement for convergent validity. The maximum shared variances (MSV) are less than AVE, and the average shared variances (ASV) are less than AVE meeting discriminate validity requirements (Fornell & Larcker, 1981). Reliability requirements are met with both Cronbach's alpha and composite reliability for each construct being greater than 0.7.

Table 18. CFA Validity & Reliability

Convergent Validity		Discriminate		Reliability	
CR > .7		MSV < AVE		α > .7	
CR > AVE		ASV < AVE		CR . >7	
	Cronbach's α	CR	AVE	MSV	ASV
Sustinable Value (SV2)	0.935	0.875	0.705	0.639	0.337
Knowledge Creation (KC)	0.939	0.957	0.849	0.814	0.462
Integrated Vision (IVN)	0.822	0.922	0.856	0.671	0.424
Connectedness (Connect)	0.931	0.909	0.833	0.814	0.421
Eco-Communal Management (EcoComMng)	0.819	0.819	0.693	0.639	0.329
Transition Engagement (TransEng)	0.873	0.874	0.776	0.254	0.183
Market Creation (MKC)	0.782	0.827	0.547	0.482	0.306
Disruptive Innovation (DINNOV)	0.880	0.904	0.758	0.231	0.183

The effects of common method bias were checked by comparing CFA results with and without common latent factor (CLF) following Gaskin's (2012) recommendations, and there was no difference with CFA results with and without CLF indicating that common method bias does not have significant and substantial effect on the data collected.

Structural Equation Modeling (SEM) Results

The hypothesized model tested as shown in Figure 23 fits the data well with model fit statistics $\chi^2 = 12.96$ df = 9, CMIN/df = 1.43, CFI = .999, TLI = .991, RMSEA =

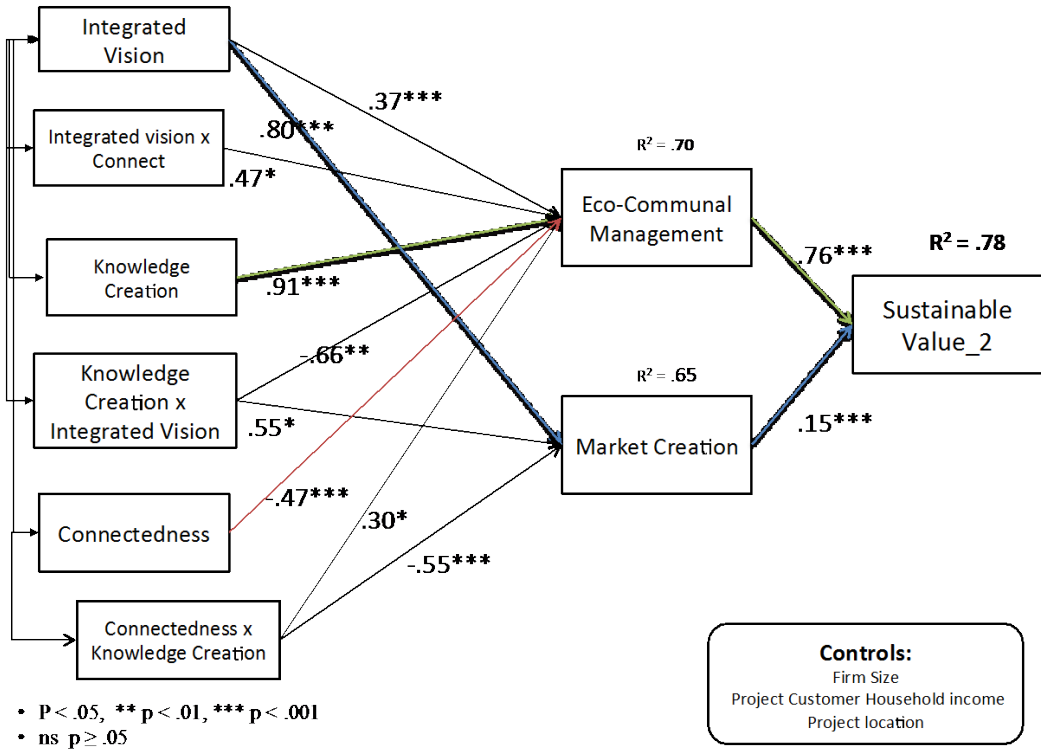
.044, and p greater than .05 (Hu & Bentler, 1999; Marsh et al., 2004; Tabachnick & Fidell, 2007). A summary of key model fit statistics is shown in Table 19.

Table 19. Final SEM Key Model Fit Statistics

	SEM Model SM_2_V3
χ^2	12.88
df	9
p	0.1681
CMIN/df	1.431
CFI	0.999
TLI	0.991
RMSEA	0.044
SRMR	0.013
PCLOSE	0.517

As shown in Figure 24, all antecedents have substantial and significant impacts on mediators with three significant interactions, and significant and substantial impacts of mediators on outcome.

Figure 24. SEM Results for RE Outcome In Developed Economies

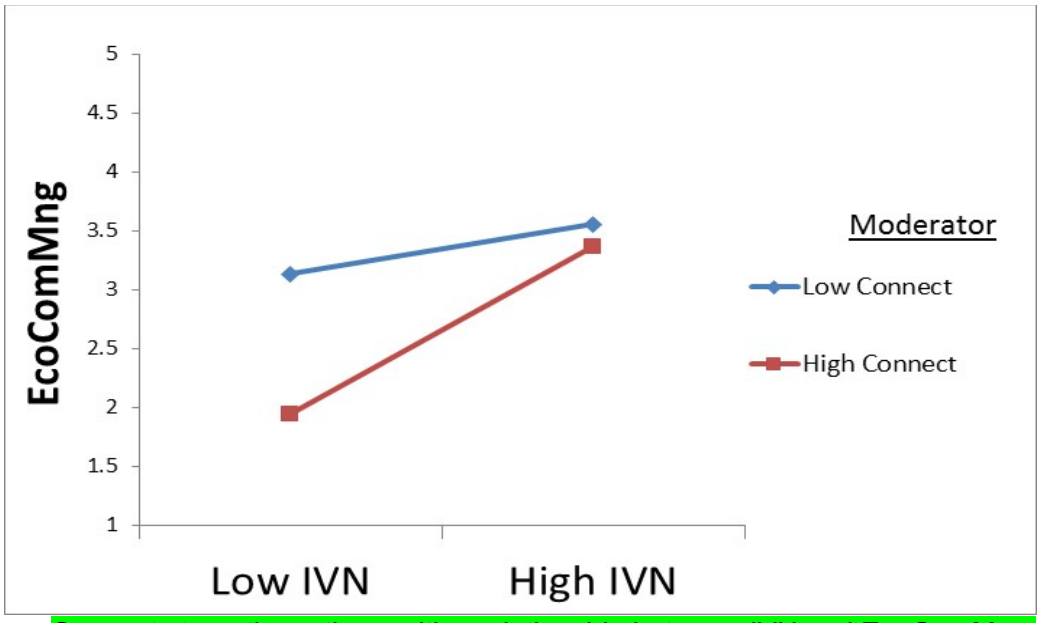


Hypotheses Test Results

As we have hypothesized, Hypothesis 2 is supported ($\beta = 0.37$, $p < 0.001$) indicating that integrated vision has significant and substantial positive impact on eco-communal management. Similarly, Hypothesis 3 is supported, where, integrated vision has a strong positive impact on market creation with $\beta = 0.80$, and $p < 0.001$, which is much stronger than what we have observed in emerging economies ($\beta = 0.19$, $p < 0.05$) in the 2nd strand of our mixed method research.

As it pertains to Hypothesis 4, it is supported with connectedness positively moderating the positive relationship between integrated vision and eco-communal management ($\beta = .47$, $p < 0.05$) as graphically illustrated in Figure 25.

Figure 25. Moderating Impact of Connectedness (IVN => EcoComMng)



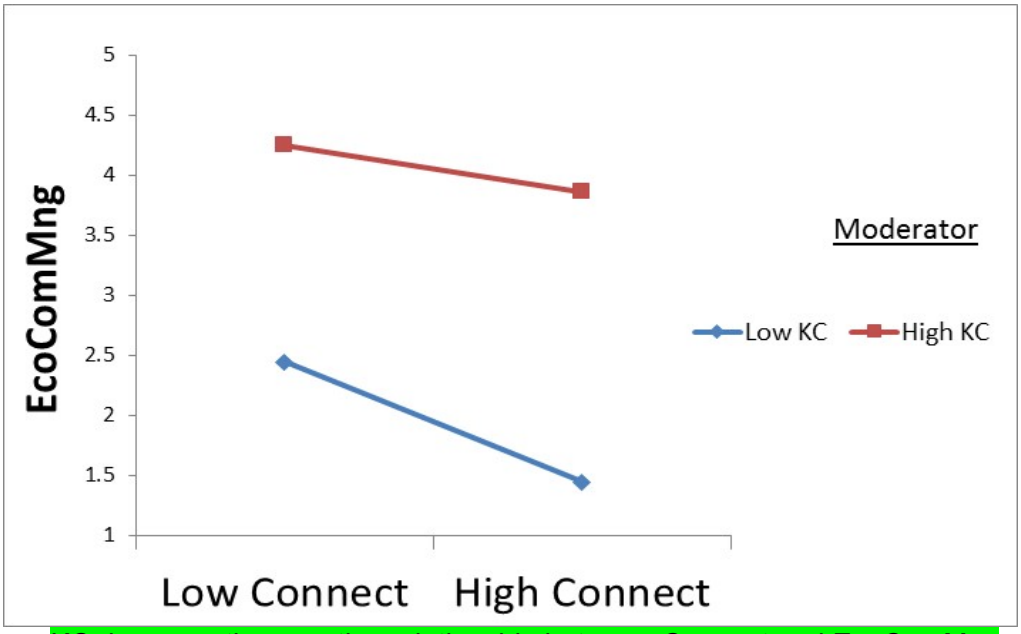
Connect strengthens the positive relationship between IVN and EcoComMng.

As we have predicted Hypothesis 5 is supported with knowledge creation having a strong and positive relationship with eco-communal management as evidenced by $\beta = 0.91$, and $p < 0.001$. This relationship is the strongest positive antecedent to mediator relationship in the context of developed economies.

Contrary to our prediction Hypothesis 6 is not supported, where integrated vision negatively moderates the impact knowledge creation on eco-communal management ($\beta = -0.66$, $p < 0.01$). Furthermore, Hypothesis 7 the postulates a positive relationship between the exogenous variable connectedness and eco-communal management (mediator) is supported with $\beta = -0.47$, and $p < 0.001$, which is different from the positive relationship ($\beta = 0.44$, $p < 0.001$) we observed for emerging economies.

Hypothesis 8, which measures the moderating effects of knowledge creation on the relationship between connectedness and eco-communal management is supported with $\beta = 0.30$, and $p < 0.05$ confirming the positive moderation on the negative relationship as depicted in Figure 26.

Figure 26. The Moderating Impact of Knowledge Creation on Connectedness & Eco-communal Management



KC dampens the negative relationship between Connect and EcoComMng

As we have predicted Hypotheses 9, and 10 are supported with $\beta = 0.76$, $p < 0.001$, and $\beta = 0.15$, $p < 0.001$, respectively confirming that both mediators eco-communal management and market creation have significant and substantial positive impacts.

We have presented a summary of hypotheses test results in developed economies in Table 20. As summarized in Table 20, seven out of nine hypotheses were supported.

Table 20. Hypotheses Test Results of RE Business Outcome in DE

Hypothesis	Path	β	ρ	Supported?
H2	IVN -> EcoComMng	0.37	***	Yes
H3	IVN -> MKC	0.80	***	Yes
H4	IVN x Connect -> EcoComMng	0.47	*	Yes
H5	KC -> EcoComMng	0.91	***	Yes
H6	KC x IVN -> EcoComMng	-0.66	**	No
H7	Connect -> EcoComMng	-0.47	***	No
H8	Connect x KC -> EcoComMng	0.30	*	Yes
H9	EcoComMng -> SV2	0.76	***	Yes
H10	MKC -> SV2	0.15	***	Yes

The predictor variables explain 78% of the variance in the outcome variable. Furthermore, the antecedents explain 70%, and 65% of the variance in the mediators' eco-communal management and market creation respectively.

Controls

As it pertains to controls, firm size has significant relationships with eco-communal management and sustainable value (SV2). See Table C3 for details.

Alternative Model

Technological and business model innovations play major roles in the functioning of developed economies. Technological innovations are especially heavily utilized to optimize the cost of power generation from renewables, which has made considerable advances to achieve cost parity for winds power generation in recent years.

Disruptive business model and technology innovations have significant & substantial implications on the outcomes of renewable energy projects. Disruptive business model innovations re-configure business opportunity sensing, value proposition and co-creation, and delivery in a rapidly changing business and technology landscape

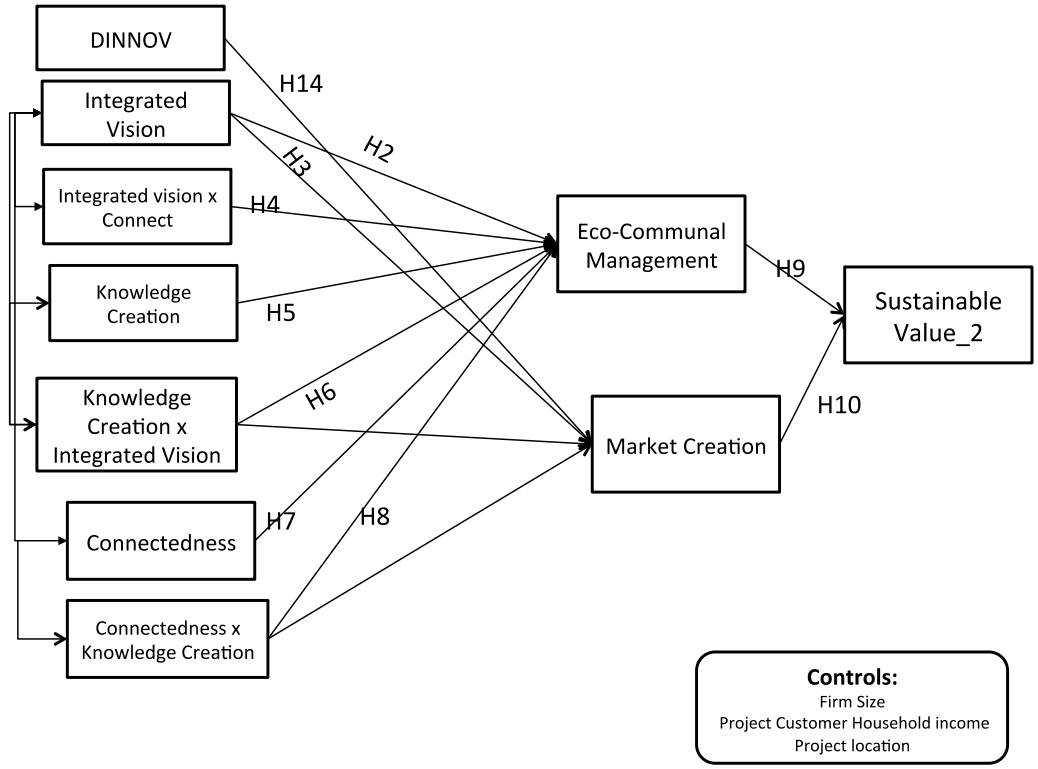
(Hart & Christensen, 2002; Massa & Tucci, 2013). Multisided business models in conjunction with multipurpose platforms and increasing Web-enabled capabilities are hastening changes in techno-economic-paradigms (Bughin, Chui, & Manyika, 2010), and market orientations, which have significant implications on the desired outcome of RE project (Viswanathan, Seth, Gau, & Chaturvedi, 2009).

Furthermore, disruptive innovations seem to attenuate the impacts of environmental selection on the genesis and diffusion of innovations, which are enabled by the workings of embedded institutional, and market structures (Luhmann, 1995; Nelson & Winter, 1977; Smits, Kuhlmann, & Shapira, 2010).

In the context of developed economies, sustaining innovations play a more prevalent role than disruptive innovations. However, we predict that disruptive innovations that include both technology, and business model innovations play an appreciable role in changing socio-technical paradigms, which have implication on the outcome of RE business and projects (Boons et al., 2013; Hall et al., 2010).

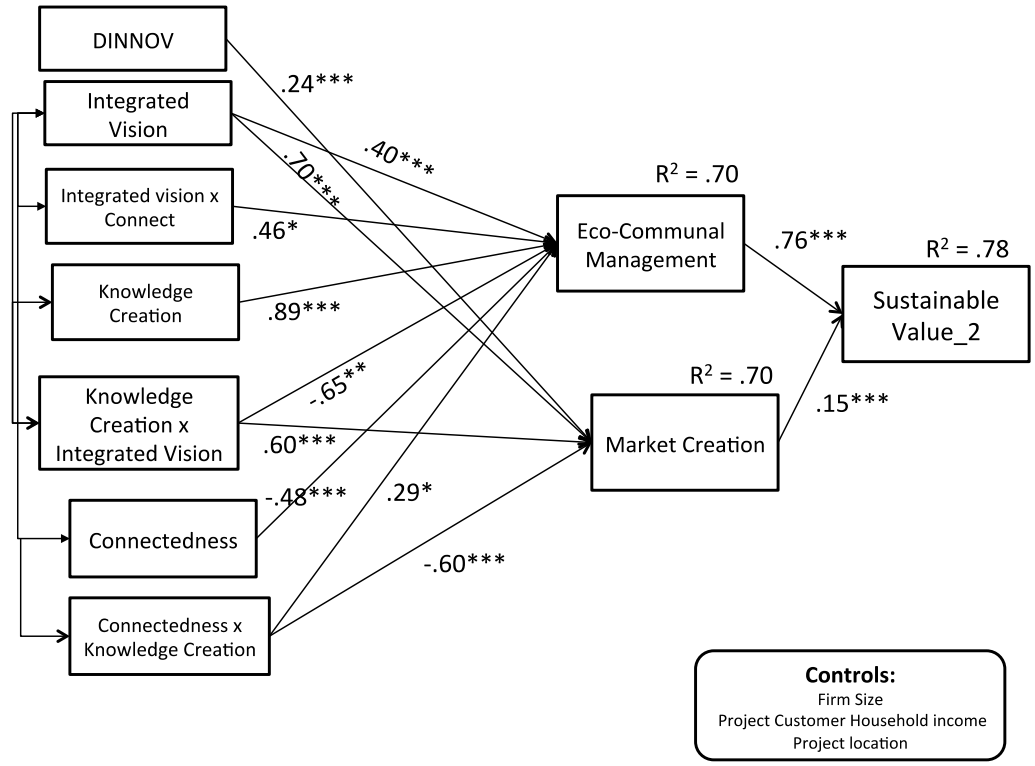
Based on these frameworks, we developed the alternative model and the associated hypotheses as shown in Figure 27.

Figure 27. Alternative Model for the Outcome of RE Businesses in Developed Economies



As shown in the SEM results in Figure 28, the alternative model has equivalent exogenous to mediator and mediator to outcome results to the primary model we have in Figure 24, and additional significant and substantial implication of disruptive innovation on market creation ($\beta = 0.24$, $p < 0.001$). However, its impact on eco-communal management was insignificant.

Figure 28. Alternative Model SEM Results



The alternative model fits the data well with CMIN/df = 1.73, $p > 0.05$, and with all fitness parameters meeting recommended thresholds as shown in Table 21.

However, the alternative model is not as precise and as elegant as the primary model that we have developed for the performance of RE businesses (projects) in developed economies, but it illustrates the impact of disruptive innovations on market creation, which is a critical factor for sustainable entrepreneurship.

Table 21. Model Fit for Alterative Model

	SEM Model SM_2_V3 + DiNNOV
χ^2	19.08
df	11
p	0.0597
CMIN/df	1.734
CFI	0.998
TLI	0.982
RMSEA	0.058
SRMR	0.014
PCLOSE	0.342

A summary of hypotheses test results is presented in Table 22, which is similar to the primary model's results.

Table 22. Alternative Model Hypotheses Test Results Summary

Hypothesis	Path	β	p	Supported?
H2	IVN -> EcoComMng	0.40	***	Yes
H3	IVN -> MKC	0.70	***	Yes
H4	IVN x Connect -> EcoComMng	0.46	*	Yes
H5	KC -> EcoComMng	0.89	***	Yes
H6	KC x IVN -> EcoComMng	-0.65	**	No
H7	Connect -> EcoComMng	-0.48	***	No
H8	Connect x KC -> EcoComMng	0.29	*	Yes
H9	EcoComMng -> SV2	0.76	***	Yes
H10	MKC -> SV2	0.15	***	Yes
H14	DINNOV -> MKC	0.24	***	Yes

The alternative model we have developed is different from the primary model for the outcome of RE businesses in developed and emerging economies indicating the difference in relationships and implications that the key business drivers have on the business outcome (SV2) as indicated in Tables 23 and 24 respectively.

Table 23. Comparison of DE Primary and Alternative Models

	InvarianceTest	$\Delta\chi^2$	Δdf	p	Invariant?
DE & Alt DE	DE PM & DE Alt	6.2	2	0.0450	No

Table 24. Comparison of DE Primary and EE Models

	InvarianceTest	$\Delta\chi^2$	Δdf	p	Invariant?
DE PM & EE Models	DE PM & EE	29.63	13	0.0050	No

Discussion of Results

In the third strand of our mixed method research, we have constructed one integrated outcome measure (SV2), which combines the economic, ecological, and cognitive and perceptive implications of RE businesses from the perspectives of the key decision maker of the business of interest (the unit of analysis). In doing so, we are able to measure the flourishing attributes of the business in creating sustainable value for all the stakeholders (Achtenhagen et al., 2013; Laszlo et al., 2014).

In developed economies the primary path for creating sustainable value is underpinned by knowledge creation and through eco-communal management, which is the key management strategy of the business deployed to enhance the outcome of the business, improve its competitive positioning and meet market demands for integrated economic, ecological, and social benefits (Hart & Dowell, 2010; Schaltegger & Wagner, 2011). Knowledge creation, which includes technological and business model innovations, opportunity sensing, value creation, and socio-ecological knowledge shapes the management strategy of the business, which in turn has significant and substantial implications on the desired business outcome (Hitt, Ireland, Sirmon, & Trahms, 2011).

Furthermore, knowledge creation is instrumental in ameliorating the negative impact of connectedness on eco-communal management. This negative impact, which is different from what we observed in emerging economies, may be attributed to cultural orientations, which emphasize individual achievements in contrast to the higher emphasis

on relationships in emerging economies where our participants have RE experiences (Walumbwa, Lawler, & Avolio, 2007; Wiersema & Bantel, 1992).

Integrated vision's significant and substantial impacts on both eco-communal management and market creation demonstrate the primacy of developing and implementing sound integrated visions to achieve the desired business outcome. Hence, the entrepreneurial engagements of the RE business in the context of developed economies needs both sound integrated strategic management and sustainable marketing orientation, which simultaneously create economic, ecological, and social benefits (Gibbs, 2006).

The moderating effects on integrated vision on knowledge creation and eco-communal management are interesting and confounding at the same time. While integrated strategic vision has a positive direct impact on eco-communal management, its moderation on knowledge creation's impact on eco-communal management is negative, dampening the positive relationship. This impact may be associated with restrictive integrated vision that curtails knowledge-based strategic management innovations, which attempts to create symbiotic and synergistic relationships among creating profit, social and ecological benefits (Möller & Svahn, 2003).

The impact of connectedness on eco-communal management in the context of developed economies is negative contrary what we observed for emerging economies, and its impact on market creation is insignificant. These findings indicate the implications of not fully integrating the impacts of the relational sphere on the outcome of RE businesses. However, the positive impact of connectedness is observed in its capacity in strengthening the positive relationship between integrated vision and eco-

communal management, which contributes towards creating sustainable value (Corner, 2009; Laszlo et al., 2012; Sussan & Johnson, 2003).

Eco-communal management and market creation, which we have identified as mediators, which translate RE business drivers (integrated vision, knowledge creation, connectedness) into sustainable value (SV2), have positive significant, and substantial impacts on RE business outcome. These results suggest that sound strategic management that enhances economic returns, environmental, social benefits to all the stakeholders augmented by sustainable marketing orientation delivers the desired outcome of the businesses.

Key Findings

The primary path for value creation for RE businesses in developed economies is undergirded by knowledge creation and translated into the desired outcome by eco-communal management. Here, knowledge creation includes entrepreneurial, and tacit knowledge, opportunity sensing, value creation, and socio-ecological knowledge, which are adaptive and complex. Innovative strategic management based on emergent and systemic knowledge creation improves the competitive positioning of the business and creates symbiotic and synergistic relations among return on investment, environmental and social benefits (Armitage et al., 2008; Hall et al., 2010).

Integrated vision has significant and substantial implication on market creation, which results in market creation's positive impact on sustainable value (SV2). Hence, it is imperative for RE businesses to develop and implement appropriate sustainable marketing orientations that are congruent with the DNA and business rationale of its entrepreneurial engagement including the socio-ecological landscape (Kumar, Jones,

Venkatesan, & Leone, 2011). The unexpected integrated visions dampening impact on the relationship between knowledge creation and eco-communal management may be associated with strategic vision rigidity and focus on sustaining innovations. Hence, the incorporation of disruptive technology, businesses model, and strategic management innovations may enhance the outcome of the business (Currie, 1999).

The direct negative impact of connectedness on eco-communal management may be attributed as an artifact of the cultures in the social systems, where there is more emphasis on the individual, property rights, and stratified management structures. The adaption of more distributed management, and appropriate relational knowledge may alleviate theses conditions (Eckersley, 2006).

Transition engagement, which has significant and substantial relationships in emerging economies, did not have a significant impact in developed economies. This variance may be associated with the stickiness and large sunk capital of energy businesses in developed economies. These conditions present more challenging business environment to RE businesses in developed economies and require the implementation of appropriate transition engagement or transition management to address the integrated economic, ecological and social challenges (Meadowcroft, 2009).

Comparison of RE Business Outcomes in Emeging, and Developed Economies

In the previous chapter, we have shown that the relationship dynamics for business drivers, mediators, and outcomes are different for emerging and developed economies. At the model level, the two models are not invariant with a Chi-square difference ($\Delta\chi^2$) of 29.63, degree of freedom difference (Δdf) of 13, and significance

value (p) = 0.005 (Table 24). Comparing the two models path-by-path, we see the following general trends, and we make the associated recommendations.

RE Business Initial Conditions and Intermediaries Relationships

RE businesses (projects) in developed economies have stronger business initial conditions (Integrated vision, knowledge creation, connectedness) and (eco-communal management, market creation) relationships than RE business in emerging economies. The strongest positive relationship is between knowledge creation and eco-communal management (β = 0.91***)[1] in developed economies, whereas it is between knowledge creation and market creation in emerging economies (β = 0.55***). Here, the comparison of the two models suggests that the outcome of renewable energy businesses in emerging economies may be enhanced by creating appropriate knowledge about eco-communal management to optimize the strategic management of the businesses, which in turn yields improved business outcome (Machlup, 2014). It is also observed from the comparison of the two models, RE businesses in emerging economies may benefit by enhancing the linkage between integrated vision of the businesses and the associated market creation, where this relationship is stronger for developed economies (β = 0.80***) than for emerging economies (β = 0.19*). Enhancing this linkage will require developing national innovation systems, which support sustainable entrepreneurship, and the associated educational system, business culture, and culture in the larger social system (Hoskisson, Eden, Lau, & Wright, 2000).

- [1] P < .05, ** p < .01, *** p < .001
- ns p ≥ .05

Furthermore, our research findings suggest, enhancing transition engagement, which has time dependent efficacy in terms of its depth in reconfiguring business practices in the development and delivery of products or services, duration of commercial engagement (discrete vs. continuous), and altering customers behavior will result in improved RE business outcome, and transition into a low-carbon social system (Rifkin, 2009: 224-253).

For developed economies, establishing a positive and significant relationship between knowledge, and market creation, which we have observed in emerging economies ($\beta = 0.55^{***}$), is expected to improve the outcome of RE businesses (Chen, Cheng, & Hwang, 2005). The type of knowledge created, need to capture the full value proposition of RE businesses, and enable it to augment or replace incumbent energy businesses. Corollary changing the negative relationship between connectedness and eco-communal management to positive as it is for emerging economies ($\beta = 0.44^{***}$) is expected to enhance the performance of RE businesses potential to create sustainable value through the main value path mediator (Hart & Milstein, 2003; Schaltegger & Wagner, 2011). Doing that will require the creation of enhanced relational spheres, caring environment, and businesses culture, which may be attained through transformational leadership, and engaging in mindfulness and reflective practices (Laszlo et al., 2014).

Intermediaries and Outcome Relationships

For intermediaries, and outcome relationships in the context of emerging economies are the strongest for eco-communal management and meaningfulness ($\beta = 0.93^{***}$) followed by eco-communal management and sustainable value (SV1). For both developed and emerging economies, the strongest impact is from eco-communal

management to sustainable value. RE businesses in developed economies may further enhance the impact of their strategic management by adapting some of the eco-communal management practices, which are strongly guided by relational spheres to improve the outcome of their businesses (Pavlovich & Krahnke, 2012).

On the other hand, emerging economies can adapt appropriate enabler marketing orientations and transition engagement to optimize the performance of their business by adapting some of the marketing orientations in developed economies, which positively contribute to creating sustainable value.

CHAPTER 7: EXPORTATION

Implications of Reflective Practices

Reflective practices help us to pose and ponder, gain deeper insights, develop caring relationships and connections (Laszlo et al., 2014) As Jordi (2010) has identified, reflective practice is a learning process, which connects our experiential knowledge with the conceptual dimensions of our consciousness.

From a biological/medical perspective engagement in repeated reflective practices and mindfulness allows the practitioner to benefit from increased neural connection, and reduced stress levels, which increases creativity and transformational leadership qualities (Bishop, 2002; Boyatzis et al., 2012; Davis & Hayes, 2011). It helps the practitioner to transition to the high energy, and positive emotions quadrant (Q4) quickly and stay in this state for longer times as illustrated in Figure 29.

These conditions enhance the overall well-being and business decision-making capacity of the key decision maker of the business, which will positively impact the outcome of the business.

The Moderating Role of Reflective Practices

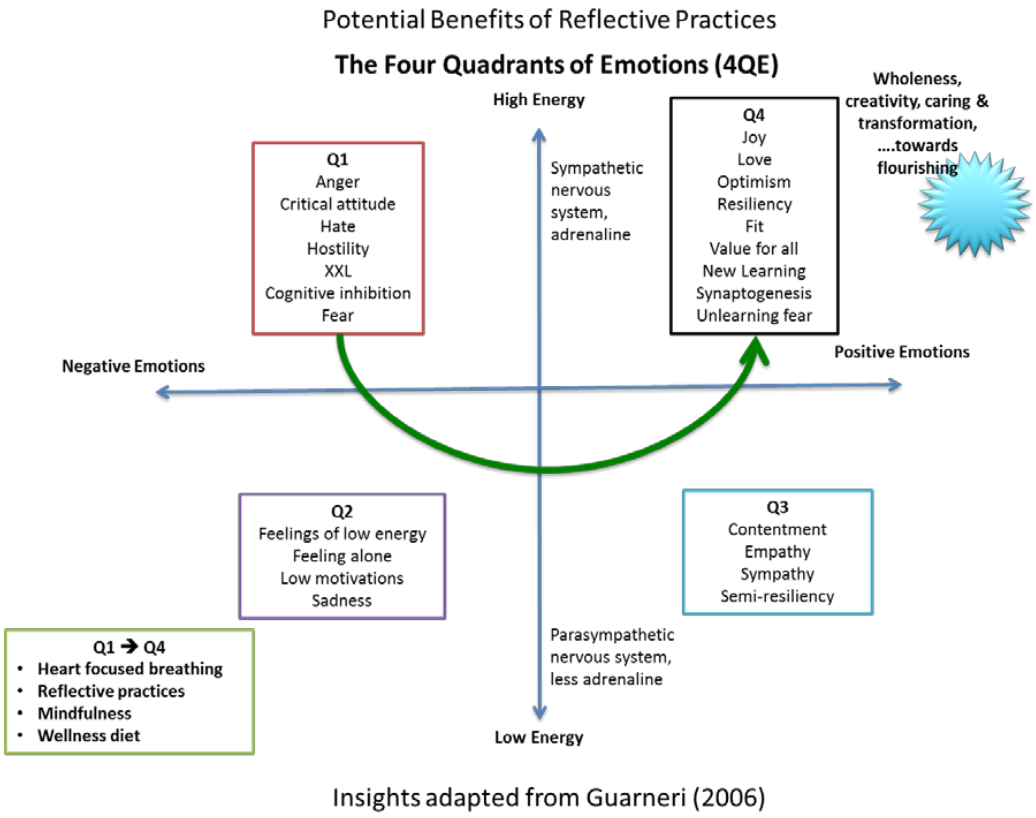
We propose that reflective practices help key decision makers of RE businesses or projects to be thoughtful, creative and caring executive/manager who makes sound decision that enhances the creation of sustainable value (SV2) of the business or project.

Based on these rational, we propose the following hypotheses:

Hypothesis 1. The extent of reflective practice moderate the positive relationship between eco-communal management, and sustainable value 2 (SV2) in such a way that the relationship strength increases with increased reflective practices engagement controlling for firm size, project customers household income, and project location.

Hypothesis 2. The extent of reflective practice moderate the positive relationship between market creation, and sustainable value 2 (SV2) in such a way that the relationship strength increases with increased reflective practices engagement controlling for firm size, project customers household income, and project location

Figure 29. Potential Benefits of Reflective Practices



Managerial Authority (Profile)

Managerial responsibility refers to the authority or the position of the key decision maker of the RE project (unit of analysis). In this chapter, as in Chapter Five, managerial authority has two categories executives and senior managers.

The Moderating Role of Managerial Responsibility (Profile)

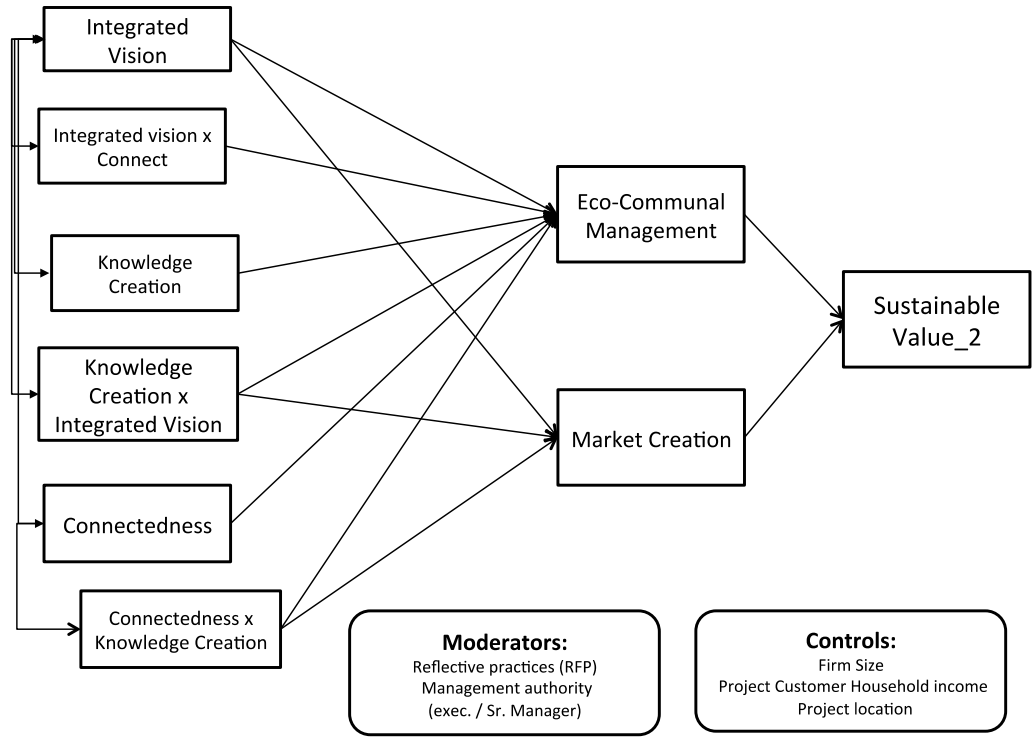
In order to compare the implications of managerial authority on the outcome of RE businesses in emerging (Chapter Six), and developed economies, we will test the moderation impact of management authority on the relationship between eco-communal management and sustainable value for emerging and developed economies.

We argue the degree of influence, the cultural context, and power distance relationships in developed, and emerging economies are different. Hence, we expect the moderating implications of managerial authority on the relationship between eco-communal management and sustainable value to be different (Carpenter et al., 2004; Hambrick & Mason, 1984; Hofstede, 1983).

> *Hypothesis 3. Managerial authority will moderate the relationship between the mediator (eco-communal management) and the outcome in a way that is different for emerging and developed economies.*

The hypothesized model is presented in Figure 30.

Figure 30. Hypothesized Model for Reflective Practices Moderation



Research Method

We utilized the research method and data sample we have described in Chapter Six.

Data and Samples

We utilized the same data in Chapter Six, which were gathered from 222 key decision makers of renewable energy businesses and projects primarily in five developed economies (US, Canada, Germany Japan, the UK) and a few responses from France and Norway. These key decision makers were identified through the personal network and business relationships of the researchers.

Forty-six percent (45.5% to be exact) of the respondents were senior executives (CEO, COO, CFO, and CTO), 54% were senior manager/managers with titles of project director and program manager.

Measurement Model

We used the same measurement model we developed in Chapter Six, with the addition of checking for configural and metric invariance tests to ensure that the same constructs were measured across the four different groups; high and low reflective practices, executive and senior managers (Gaskin, 2012).

Configural and Metric Invariance

Multi-group CFA test yielded acceptable CFA model fit statistics and at least one non-significant item for each construct indicating that our measurement model has achieved configural and metric invariance, which allows us to proceed with SEM multi-group moderation (see Table D1, Table D2, and Table D3).

SEM Results

SEM model fits statistics as shown in Table 25 indicates that the model fits the data well (See Appendix D3 & D4 for further moderation test results).

Table 25. Model Fit Statistics for Moderation with Reflective Practices and Managerial Authority in DE

	SEM Model SM_V2_3_MGM
χ^2	66.00
df	45
p	0.0223
CMIN/df	1.467
CFI	0.998
TLI	0.982
RMSEA	0.027
SRMR	0.013
PCLOSE	0.999

Hypotheses Test Results

As we have predicted Hypothesis 1 is supported. Moderation by reflective practices increased the impact of eco-communal management on sustainable value 2 (SV2) from $\beta = 0.70$, $p < 0.001$ for low reflective practices engagement (at least once a week) to $\beta = 0.874$, $p < 0.001$ for high reflective practice engagement (at least once a day). This initial quantitative finding supports the qualitative assertion of Laszlo et al. (2014) , Boyatzis et al. (2012) and Guarneri (2006).

Reflective practices moderation implication on market creation and sustainable value (SV2) is different from what we have hypothesized. Hence, Hypothesis 2 is not supported as the impact of market creation on sustainable value decreased with increasing reflective practice engagement going from $\beta = 0.22$, $p < 0.001$ for low reflective practices to $\beta = 0.01$, $p < 0.001$ for high reflective practices as presented in Table 25. This condition may be associated with the kind of marketing orientation that is utilized, or it may be a tendency of people who are engaged in reflective practices not be swayed by market creation.

Table 26. Moderation Hypotheses Test Results in DE

		Low RFP		High RFP		
Hypothesis		**β**	**P**	**β**	**P**	**Supported?**
H1	EcoComMng -> SV2	0.700	***	0.874	***	Yes
H2	MKC -> SV2	0.221	***	0.011	ns	No

In both cases, the findings are initial quantitative findings in seven developed economies, and with a sample size of 222. Further research with large sample size across emerging and developing countries will be helpful to gain a clearer understanding.

As it pertains to hypothesis three, it is supported. Managerial authority effectively moderates the relationship between eco-communal management and sustainable value in emerging economies ($\beta = 091$, $p < 0.001$ for executives, and $\beta = 0.79$, $p < 0.001$ for senior managers), whereas there is no moderation by managerial authority in developed economies. These conditions are congruent with the power distance difference between emerging and developing economies (Hofstede, 1983). In this Chapter, we have investigated the implications of reflective practice on sustainable value creation. Our initial research findings provide quantitative support to the qualitative research findings by Laszlo et al. (2014)and others. Furthermore, we have identified different impacts of reflective practices on the relationships between eco-communal management and sustainable value and market creation and sustainable value that need further investigation to gain a better understanding and deploy it accentuate the outcome of renewable energy businesses. Moderation test results in detail are presented in Table D4 & D5 in Appendix D.

CHAPTER 8: INTEGRATION AND INTERPRETATION

In our research we have taken an integrative approach to gain a better understanding on factors that impinge on the outcome of RE businesses, and to what extent these factors impact or explain the outcome of renewable energy businesses and projects in developing, emerging and developed economies. The energy and communication construct shapes the trajectory of civilization impinging on the mental model we create about our surroundings, the language we use in our day-to-day activities, and ourselves (Rifkin, 2009). In this mixed method research, we have investigated the multi-dimensional attributes for the outcome of RE businesses and project that are becoming an important part of the energy mix to meet increasing energy demand and ameliorate the environmental implications of high carbon based energy resources (United Nations, 2015).

We employed a quantitative priority mixed method exploratory sequential research design (qual ➔ QUAN ➔ QUAN) because of the plural and practice-oriented theoretical frameworks and data collection methodology (survey instrument) that best fits our overall research objectives (Creswell, 2013; Crotty, 1998)).

We surmise that this quantitative priority sequential mixed method research (with integration at interpretation has helped us to gain a better understanding of the multivariate and complex relationships among the key constructs that have significant and substantial implications on the performance of RE projects across three economies. This, in turn, has led us to the development of a synthesized, systemic, and integrated method/model to evaluate the aggregate performance of RE projects in the context of developing, emerging, and developed economies.

We started our research with a qualitative research conducting semi-structured grounded theory based (Glaser & Strauss, 1967) interviews with 25 key decision makers of renewable energy projects across seventeen developing economies. In conducting the structured interview we explored how and to what extent does innovation, business strategy, policy and regulatory framework, job creation, cost, security (economic & political), culture, climate change, health impacts, deforestation, customer value of service, and capacity development affect the performance of renewable energy projects.

The findings of our qualitative research and extant literature on renewable energy informed us that seven factors that include emergent integrated vision (Ireland et al., 2009; Milbrath, 1989), business model and technology innovations (knowledge creation and its applications) (Baden-Fuller & Haefliger, 2013; Bohnsack et al., 2014) creative management practices that include eco-communal management and transition engagements (Boyatzis, 1982; Hall & Vredenburg, 2012; Hart & Dowell, 2010) and relational dimensions deployed or connectedness (Sosik, 2005; van Bel et al., 2009) affect the desired integrated outcome of renewable energy projects (Achtenhagen et al., 2013; Laszlo et al., 2014). Our 1st strand quantitative research supports the findings of our qualitative research, which ties together integrated vision, eco-communal management, and connectedness, where the predicator variables explained 58% and 72% of the variance of the outcome variables. In the context of developed economies, the predicator variables explained 78% of the variance in the outcome variable, while the same key variables are present across the three economies, the dynamics of their relationship changes across the economic landscape.

Furthermore, our research highlights the multilevel interactions among business model and technology innovations, ecological modernizations, and innovative management practices that are emergent and embedded in complex environments of the social systems (Hessels & Van Lente, 2008; Hunt, 2011; Luhmann, 1995; Manyika et al., 2013; Zott & Amit, 2010). These dynamic and emergent relationships inform and shape the outcome of renewable energy projects in near and long-term horizons.

Key findings of our research suggest well developed and deployed eco-communal management practice is the best way to translate the value proposition of RE business into sustainable value. Our research further suggests the level of managerial authority bifurcates the translation of strategic objectives of RE projects and the relatedness of the key decision maker into sustainable value through its eco-communal management practices in the context of emerging economies. However, this phenomenon was absent in developed economies. This difference in emerging and developed economies may be attributed to the difference in power distance and the underlying cultural context of management and authority (Bandura, 2002; Hofstede, 1985).

The impact of knowledge creation changes across the three economies. In the context of emerging economies, the impact of knowledge creation on sustainable value is primarily indirect through hastening and effecting transformational change, hence deploying effective transitions engagement and instituting accurate methods to measure the efficacy of knowledge creation is imperative. For developed economies knowledge creation has the strongest impact on eco-communal management indicating that strategic management practices are anchored by it (Von Krogh, Nonaka, & Aben, 2001).

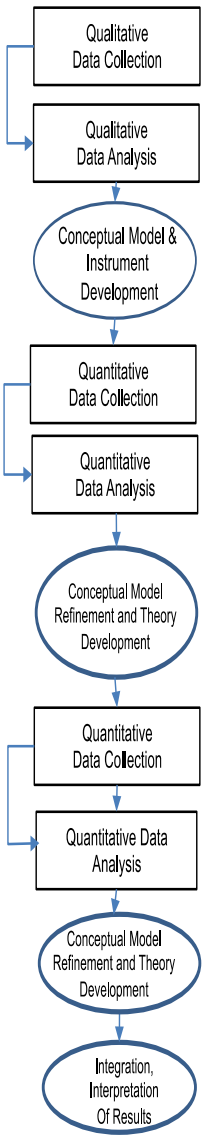
Knowledge creation includes entrepreneurial, and tacit knowledge, opportunity sensing, value creation, and socio-ecological knowledge, which are adaptive and complex. Innovative strategic management based on emergent, and systemic knowledge creation improves the competitive positioning of the business, and creates symbiotic and synergistic relations among return on investment, environmental and social benefits (Armitage et al., 2008; Hall et al., 2010).

Integrated vision has significant and substantial implication on market creation that results in market creating significant impact on sustainable value. Hence, it is imperative for RE businesses to develop and implement appropriate sustainable marketing orientations that are congruent with the DNA and business rational of its entrepreneurial engagement including the socio-ecological landscape (Kumar et al., 2011).

Transition engagement, which has significant and substantial relationships in emerging economies, did not have significant impact in developed economies. This variance may be associated with the stickiness and large sunk capital of energy businesses in developed economies, which may have created active inertia to system wide change in the energy sector (Carpenter et al., 2004; Kemp et al., 2007).
Our research participants had RE experiences in developing, emerging, and developed economies that have different economic activities in the past decade (2005-2015) as it is presented in Table E1 (Kharas, 2010; Pasquali, 2015).

A summary of our mixed method research is presented in Figure 31.

Figure 31. Summary of Research Design & Findings



Goal	Research Questions	Procedure	Key Findings
Study 1: Outcome of RE Projects/Business in Developing Counties	What factors impact or explain the outcome of RE projects/ businesses in developing countries?	• In-depth semi-structured interviews • Unit of analysis: key project/business decision maker n = 25 • Direct & axial coding • Thematic analysis	1. Our research data has revealed that the performance of renewable energy systems cannot be viewed or determined in isolation (contextual reduction) from the social system of the host community 2. The outcome of renewable energy projects is significantly influenced or explained by eco-communal management, transitions engagements, and connectedness 3. The importance of affordability is nuanced from current literatures in our findings
Study 2: Outcome of RE Projects/ Businesses in Emerging Economies	How & to what extent do knowledge creation, connectedness, integrated vision, eco-communal management, transitions engagements, market creation impact the outcome of RE projects/businesses in emerging economies?	• Examination of existing scales • Survey testing (Q-sort, think aloud, pre-testing, pilot testing) Web based survey n = 204 • Data screening • Factor Analysis • Discriminant validation	1. Eco-communal management mediates the relationship between integrated vision & sustainable value controlling for firm size, customer income, & reflective practices 2. Transition engagement mediates the relationship between knowledge creation and meaningfulness controlling for firm size, customer income, & reflective practices 3. Market creation mediates (fully) the relationships between knowledge creation and meaningfulness 4. Our research further suggests level of managerial responsibility differentiate the translation of strategic objectives of RE projects and the relatedness of key decision maker into sustainable value through its eco-communal management practices
Study 3: Moderating Impacts of Reflective Practices/Outcome of Re in Developed Economies	1) How & to what extent do transition engagement, connectedness impact RE project outcome? Is the same in emerging & developed economies? 2) How & to what extent do managerial competence & governance impact RE outcome? 3) What is the implication of reflective practices on the outcome of RE projects/ businesses?	• Examination of existing scales • Survey instrument testing Web based survey n = 222 • Data screening • Factor Analysis • Validity tests • Invariance test • Joint analysis	1. Primary impact path KC -> EcoComMng -> SV2 2. IVN has strong positive impact on MKC 3. Integrated vision higher impact on market creation results in positive contribution of MKC on SV2 4. Connect's direct negative impact on EcoComMang a. May be attributed to emphasis on individual performance 5. Reflective practice moderating impacts a. Eco-communal management -> SV2 Increased management insight (caring rel., insight, learning processes) b. Market creation -> SV2 (-ive moderation) c. IVN -> MKC (+ive moderation 6. Managerial profile/authority does not the rel. between eco-communal management/market creation & SV2 for DE

Renewable energy businesses are embedded in the community, and its outcome cannot be determined in a contextual reduction from the social system of the host

community and its surroundings (Boons et al., 2013; Luhmann, 1995). The deployment of renewable energy projects and growth of renewable energy businesses introduces change in the socio-technical and socio-ecological landscape that hasten change in the underlying entrepreneurial engagements, knowledge creation, economic, political, and policy formulation structures, which could bring about system-wide changes (Cooperrider & Whitney, 2005; van der Schoor & Scholtens, 2015).

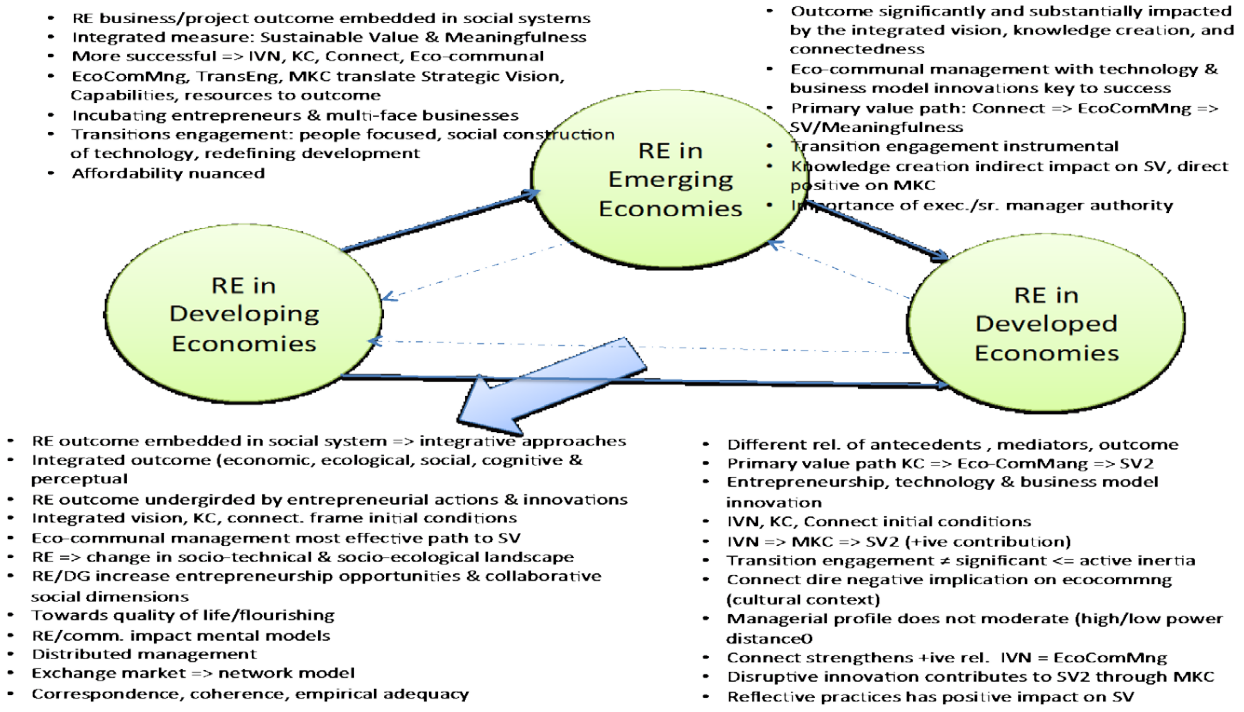
Hence, the recommended approach to better understand the dynamics and outcome of RE business is through integrative approaches.

RE, information and communication technologies (ICT), and its applications change the conception, language, and mental model of its users, which may have wider implications on RE businesses host communities, and regions. From entrepreneurial perspectives, RE in the form of distributed power generation provides the underpinning structures for increased entrepreneurial opportunities, creation of multi-face businesses, continuous (network) business engagements, and collaborative social environments (Cohen & Winn, 2007; Rifkin, 2009).

In this research we have demonstrated the correspondence, and coherence, and empirical adequacy of the key RE businesses outcome drivers across three economies.

We have illustrated the key findings of the three strands of our mixed method research, and the overarching (integrated) findings in Figure 32.

Figure 32. Integration Of The Three Research Strands



Academic Implications

Our research makes the following theoretical contributions:

1. To our knowledge, this is the first research that combines the high impact applications of renewable energy projects in developing, emerging, and developed economies with cognitive, and perceptual performance drivers to develop a systemic and integrative renewable energy business outcome measures, and the associated predictor variables. The findings of this research may be utilized to develop effective project strategy and management practices to enhance value proposition and the creation of the RE business or project of interest (Hart & Milstein, 2003; Laszlo, 2008). The high impact applications of RE businesses include increased entrepreneurial opportunities, increased employment, improved energy access, increased energy security, and reduction in greenhouse gases (Rifkin, 2009; Scheer, 2013; Wei, Patadia, & Kammen, 2010). The cognitive and perceptual dimensions from the perspectives of key RE businesses decision makers include the meaningfulness, and the value of their work (May et al., 2004).
2. We have adapted sustainable value as a measure for the outcome of renewable energy business across developing, emerging, and developed economies, and shown correspondence, coherence, and empirical adequacy of this measure in the three economies. Sustainable value is defined here as the co-created integrated economic, ecological, social benefits, to all the stakeholders. As Laszlo and Cooperrider (2007) have articulated, it is a strategic response to the dynamics of the market that has necessitated the creation of this single and

unified value that is strongly correlated with the capacity to do well for business and do good in the world.

3. We have discovered a theory ("Relational Theory of Innovation for Business and Socio-Ecological Benefits"), which expands the Theory of Innovation (Nelson & Winter, 1977; Schumpeter, 1934). This theory captures the wider implications of RE in bringing transformational changes on socio-technical and socio-ecological landscapes of a society (Geels & Schot, 2007; Prahalad & Hart, 2002). The foundational premise of this theory is eco-communal management. Eco-communal management takes integrated vision, knowledge creation, and connectedness, which are the initial conditions of RE businesses and creates sustainable value (the desired outcome of the business). Eco-communal management is defined here as a strategic management innovation for renewable energy businesses, which creates a symbiotic and synergistic partnership among profit, environmental, and societal concerns (Hart & Dowell, 2010), and activate transformative change that leads towards flourishing (Laszlo et al., 2014; Marks & Shah, 2004). Eco-communal management contains some similar concepts articulated by Casado Caneque and Hart (2015) in their book titled *Base of the Pyramid 3.0*. These concepts include the importance of embedding sustainable businesses in larger business ecosystems, cross-sectorial partnerships with people, planet, and profit focused development.

Eco-communal management is deployed to improve the return on the project investment and the competitive positioning of the project by co-creating profit,

environmental, and social values (Laszlo & Zhexembayeva, 2011). It is driven by relational business model innovations, and it is proactive in introducing disruptive innovations (Hall & Vredenburg, 2012), utilizes project life cycle management and project stewardship to optimize value creation and create new markets. Profit, social and environmental values are designed-in in the business model not bolted-on to it (Laszlo et al., 2012). As such project performance is improved by maximized asset utilization and enhanced project operations (Santacana et al., 2010).

Mangers deploy distributed management, and holistic approaches, which yield the most sustainable value to all the stakeholders including the ecosphere. It is not merely a tool to gain market advantage; it takes RE businesses initial conditions, and creates the desired outcomes (Baregheh et al., 2009). It increases entrepreneurial opportunities, creation of multi-face businesses, continuous (network) business engagements, and collaborative social environments (Cohen & Winn, 2007; Rifkin, 2009). Its efficacy in creating sustainable value across developing, emerging, and developed economies is demonstrated in our research.

4. We have developed high accuracy integrative and systemic models for the performance RE business and projects that capture strategic, management innovations (business model, technological, ecological) relational spheres, and perceptual and cognitive implications. In these models, the predictor variables explain 58 to 72% of the variance in the outcome variable(s). RE businesses based on the business or project location can tailor their strategic management, knowledge creation, transition engagement, and marketing orientation to maximize the desired outcome of the business.

Academician may utilize our findings to further develop a rigorous theoretical framework and predictive tool for the multi-dimensional outcome of RE projects and its complex implications.

5. We have shown initial quantitative support (the first to our knowledge) for qualitative research findings that associate reflective practices and mindfulness with creating sustainable value.

Implications for Practitioners

We have identified effective business and management strategies to enhance RE business value proposition, creation, and delivery while creating symbiotic and synergetic relationships among return on investment, social and ecological benefits.

In the context of developing countries, RE business need to strengthen their relationships with the businesses host community, deploy ICT enabled business models, and technology innovations to expand their markets and increase the sustainable value they create. One of the enabling approaches is modular system configuration. Modular system configuration is a systems design practice that employs the concept of loosely coupled system to minimize disturbances/degradation across interfaces, while allowing robust scaling-up or down capabilities (Folke, Colding, & Berkes, 2003; Schilling, 2000).

Our research indicates emergent modular & distributed systems configurations are correlated with more successful RE engagement experiences in the context of developing economies. These phenomena are observed in emergent power plant and distribution architectures, financial models, flexible small enterprises, and stakeholders' engagements. Total energy cost, and expenditure substitution, "pay as you go, as much as you want", and payment using bit coins [digital money] have shown promising results in

making energy services accessible, significantly increasing payment rates, and changing customers financial behavior (Armbrust et al., 2010; Brugmann & Prahalad, 2007).

In the context of emerging economies, success in jointly constructed with all the stakeholders. As such increased stakeholders participation and deploying contextualized sustainable marketing orientations may capture the strong relationships between knowledge creation and market creation we have observed in our research. We expect this strong positive relationship will make positive contributions to the creation of sustainable value by RE businesses. Furthermore, RE business active participation in the wider impacts of transition engagement that includes long-term relationship with their customers, other stakeholders, and reconfiguration of business practice to reflect the shorter supply chain associated with distrusted renewable energy will increase the multi-dimensional outcome of these businesses.

As it pertains to RE firms doing business in developed economies the transition from utility-side business model to customer-side business model will have substantial and significant implications. Establishing positive and significant relationship between knowledge, and market creation, which evident in our research for RE businesses in emerging economies may increase the sustainable value created by these business concern (Chen et al., 2005). The type of knowledge created, need to capture the full value proposition of RE businesses, and enable it to augment or replace incumbent energy businesses (Schaltegger & Wagner, 2011).

Furthermore, our research findings on reflective practices suggest the performance of RE businesses in developed economies can be improved by the creation of enhanced relational spheres, caring environment, and businesses culture, which may be

attained through transformational leadership, and engaging in mindfulness and reflective practices (Laszlo et al., 2014).

Practitioners such as entrepreneurs, project developers, investors, regulators, and stakeholders may use the models we have developed to predict the outcome of the project during concepts initiation or at different stages of the project to optimize and prioritize strategies and resources by identifying the optimum leverage factors. The primary value path for emerging economies is connectedness, which is the relational sphere of the firm to eco-communal management to sustainable value, whereas, for developed economies it starts from knowledge creation to eco-communal management to sustainable value.

Furthermore, We reason our research findings will help key decision makers and stakeholder to gain a better understanding of the system-wide implication of the RE project that will help them to develop proactive approaches, which may lead to pathways towards creating symbiotic and synergetic relations among relevant economic, social, and ecological developments. These interventions may encompass new approaches such as re-orientations of businesses, innovations, and education towards that promote creativity, contextualized solutions development, and entrepreneurship for sustainable, and flourishing living. A few of these integrative approaches may include social-ecological resilience, adaptive socio-technical innovations, and inclusion of indigenous experiential know-hows.

Implications for Future Research

The findings of our research may provide theoretical and analytical frameworks for further systems and complexity theory-based research in disruptive innovations in management, business model, and technology innovations in the RE sector (Alfred &

Adam, 2009; Loorbach, 2010; Mingers & White, 2010). These innovations may include distributed management & co-creation, transitions management, multisided and multiplatform business model development, distributed generation, and re-configuration of business, institutional, and governance structures (Kemp, Schot, & Hoogma, 1998; Schot & Geels, 2008). Corollary, further development of Relational Theory of Innovation for Business and Socio-Ecological benefits to strengthen its internal and external validity will be helpful to fully develop the theory and to increase its fitness.

Future research work that may advance better understanding on the performance of renewable energy businesses may include times-series study to investigate the embedded complexity, and feedback loops associated with renewable energy systems in changing the socio-technical and socio-ecological landscape.

Furthermore, conducting a focused study on the implications of RE businesses and disruptive innovations in the base of the pyramid segment may yield new insights. Such research work may lead to a generalizable model for the performance of renewable energy businesses across a wide spectrum of the economy, while accounting for the implication of disruptive innovations in the areas of multisided business models, multi-purpose platforms, Cloud-based pay-as-you-go services, and innovations from the base of the pyramid that may enter other markets with highly efficient cost structures (Bughin et al., 2010; Hart & Christensen, 2002).

Duplicating the research we conducted in the RE sector in other business sectors will help to test the transferability, and generalizability of our findings and possibility benefits other businesses from the insights gained from our research.

With regards to reflective practice, further quantitative or mixed method research will be essential to validity our initial findings, and fill the quantitative research gap in support of reflective practices implication in enhancing business outcomes.

Limitations

Our target research respondents are key decision makers of RE projects. As such our research findings may not be applicable to other business sectors.

We utilized self-reported data for our research, which may include variance between how the research participants responded to the interview or survey and what they actually do in managing renewable energy businesses. However, we have used social desirability items to gauge its impacts. Language and cultural difference of the research participants may have some limitations on the research outcome. However, we have used project location as a control to minimize its impact on the research outcome.

Other limitation of this study may be the structural embedded complexity of renewable energy projects performance in the social system (Luhmann, 1995), and interconnected complexity, and coupling of the different parameters of a metric that measure the performance renewable energy businesses and projects

While common method bias may be a concern in statistically based research, we mitigated this concern by conducting common method bias test (with CLF & without CLF) to ensure the adequacy of the data for SEM analysis (Richardson, Simmering, & Sturman, 2009).

As it pertains to the theory we have discovered, there are limitations concerning internal and external validity.

Following Weick's (1995) requirement for developing theory, the theory is contextualized across three economies specifying the type of variables and the relationships among the variables that are used, concepts are defined, clarified, and their relational dynamics established. Furthermore, It is instrumental in formulating relevant hypotheses from three research strands, and empirical generalization is achieved for the relationships among the four business drivers (integrated vision, knowledge creation, connectedness, and sustainable value).

Viewing it from Christensen's (2006) threshold for theorizing, it meets descriptive theory requirements, and partially fulfills the requirements of normative theory. We have gone through the process of observation, classification, and defining the relationships embodied in eco-communal management. We have further identified causality, and "what actions managers ought to take to get the results they need". As Christensen has stated "value of a theory is assessed by its predictive power, which is why this article asserts that normative theory" (Christensen, 2006: 43). As Christensen has stated internal validity requires unambiguous conclusion, and ruling out alternative rationales for the casual relationships between initial conditions and outcomes.

Furthermore, external validity requires testing the causal relationship in different contexts. There is more work to be done to increase both the internal and external validity of our theoretical contribution. Hence, we submit we are contributing to the expansion of the theory of innovation at this time and further work needs to be carried on to fully develop the theory (Relational Theory of Innovation for Business and Socio-Ecological Benefits).

APPENDIX

Appendix A: Qualitative Strand: Interview Protocol for Project Developers

Step 1: Introduction and Explanation

Introduction (Interviewer): "Hello (name). Thank you for taking the time to meet with me in person or via audio-conference today. Your participation in the interview is kindly appreciated. Before getting started, there are a couple of things I would like to cover".

Purpose and Format for the Interview (Interviewer): "As you know, the topic of our conversation is the performance of renewable energy projects.

Confidentiality (Interviewer): "Everything you share in this interview will be kept in strictest confidence, and your comments will be transcribed anonymously – omitting your name, anyone else you refer to in this interview, as well as the name of your current institution and/or past institutions. Your interview responses will be included in all the other interviews I conduct".

Audio Taping (Interviewer): "To help me capture your responses accurately and without being overly distracting by taking notes, I would like to record our conversation with your permission. Again, your responses will be kept confidential. If at any time, you are uncomfortable with this interview, please let me know and I will turn the recorder off".

"Any questions before we begin?"

Step 2: Opening Icebreaker Question

Interviewer: "Great, before we start talking about the performance of renewable energy projects that you have been the key decision maker, I'd like to learn a little about you. Would you give me a brief bio about yourself?

Probes:

- Family
- Current work information
- Education
- Past work information
- Hobbies
- Who is your hero?
- What motivates you?
- What is your leadership style?
- What are your aspirations?

Step 3: Experiential Questions about the performance of renewable projects

Interviewer:

Question #1: Tell me about your experience when you were working on what you consider to be the most successful renewable energy project development and operation. Please describe the project in detail from beginning to end.

Tell me more!

Probes:

- How did this project start?
- Who funded this project and what was the inspiration?
- What was the exit strategy for this project?
- What was considered to be a success for this project in the beginning?
- How was the project structured? Describe specifically?
- Who worked for you on the project and what were their roles?
- How were working relationships handled among the team members?
- How was your relationship with [chief engineer/technology development/key customer/regulators/host community?
- What was the business strategy of the project?
- How did business strategy affect the project? Would you give specific examples?
- How did innovation affect the project? Would you give me examples?
- How did regulations affect the project? Would you give me examples?
- What was the impact of security on this project? Would give me specific examples?
- What was the impact of project size/modularity on the project? Give me a specific example?
- What was the impact of affordability on the project? Would you give me a specific example?
- How was your relationship with key customers? Would give me specific examples?
- What did you enjoy most working on this project? Be specific?
- What frustrated you most about this project? Be specific?
- Is this the way it went with other projects?
- Is there anything more you want to share with me about your experience on this project?

Question # 2 Tell me about your experience working on the most frustrating RE project.

Tell me more!

Probes:

- How did this project start?
- Who funded this project and what was the inspiration?
- What was the exit strategy for this project?
- What was considered to be a success for this project in the beginning?
- How was the project structured? Describe specifically
- Who worked for you on the project and what were there roles?
- Who worked with you on the project?
- How were working relationships handled among the team members?
- How was your relationship with [chief engineer/project manager/key customer/regulators/key community members?
- What was the business strategy of the project?
- How did business strategy affect the project? Would you give specific examples?
- How did innovation affect the project? Would you give me examples?
- How did regulations affect the project? Would give me examples?
- What was the impact of security on the project? Would give me specific examples?
- What was the impact of project size/modularity on the project? Give me a specific example?
- What was the impact of affordability on the project? Would you give me a specific example?
- How is your relationship with key customers? Would you give me a specific example?
- What did you enjoy most working on this project? Be specific?
- What frustrated you about the project? Be specific?
- Is this the way it went with other project?
- Is there anything more you want to share with me about your experience on this project?

Question # 3: Tell me about your most memorable RE project?

Tell me more?

Probes:

- What makes this project memorable?
- How did this project start?
- Who funded this project and what was the inspiration?
- What was the exit strategy for this project?
- What was considered to be a success for this project in the beginning?
- How was the project structured? Describe specifically
- Who worked for you on the project and what were there roles?

- Who worked with you on the project?
- How were working relationships handled among the team members?
- How was your relationship with [founder/chief engineer/project manager/key customer?
- What was the business strategy of the project?
- How did business strategy affect the project? Would you give specific examples?
- How did innovation affect the project? Would you give me examples?
- How did regulations affect the project? Would give me examples?
- What was the impact of security on the project? Would give me specific examples?
- What was the impact of project size/modularity on the project? Give me a specific example?
- What was the impact of affordability on the project? Would you give me a specific example?
- How is your relationship with key customers? Would you give me a specific example?
- What did you enjoy most working on this project? Be specific?
- What frustrated you about the project? Be specific?
- Is this the way it went with other projects?
- Is there anything more you want to share with me about your experience on this project?
- Is there any more you want to share with me about this or other projects?

Step 4: Closing

Interviewer:

"Thanks very much for that! "I've had a wonderful time conducting the interview. We've certainly covered a lot of ground, and I have found it so helpful. On the off chance that I have missed anything, would it be possible to contact you again to meet or video conference if needed to fill in a gap or two? That would be helpful. Thank you again for your help and time."

Is there anything that we didn't cover that you would like to add before we leave?

Thank you!

Appendix B: Quantitative Research 1

Table B1. Items used in the Survey Instrument

Integrated Vision	
mc1	The communities can enact fair laws
mc2	I am confident that the community can create adequate resources to develop new jobs
mc3	The community can present itself in ways that increase tourism while maintaining the host community's unique character
sd2	Can greatly improve infrastructure accessibility
sd3	Can assist in preserving green space
asc1	Can greatly improve the quality of education
asc2	Can greatly improve access to energy services
Knowledge Creation	
scn2	Spent a lot of time in personal interaction aside from organized meetings with other people in the company discussing suggestions, ideas, or solutions
scn3	Spent a lot of time in intense discussions about suggestions, ideas, or solutions in face-to-face meetings with other staff in the company.
itr1	Spent a lot of time in experimenting, developing a sense for the feasibility of our thoughts regarding the functionality of the technology.
itr2	Spent a lot of time in trial-and-error, developing a sense for the feasibility of our thoughts regarding project customer needs.
itr4	Spent a lot of time systematically testing our theoretical knowledge about customer needs
extrn2	Spent a lot of time interviewing competent people about ideas or solutions with regard to relevant technologies
extrn3	Spent a lot of time interviewing competent people about ideas or solutions with regard to customer needs.
Connectedness	
rs1	I often feel together or on the same page with my social network
rs2	Aside from our contact, I often feel "together" with people in my social network
rs3	I feel that people in my social network often think of me
su1	I feel that I have a lot in common with people in my social network
su2	I feel that I am on the same wavelength with people in my social network
su3	I feel that people in my social network share my interest and ideas

Eco-communal Management	
tl1	I communicated my values & beliefs about the projects and its impacts on the community and environment
tl2	I articulated a compelling vision for the future for RE projects
rl2	I experimented with concepts and ideas for new projects and business strategies
rl3	I exerted considerable influence in the project teams
Transition Engagements	
ote1	I have little interest in speculating on the possibilities of project innovations
ote2	I have little interest in speculating about the performance of the projects
ote3	I am keenly interested & excited about RE innovations
Market Creation	
pce1	Host communities are aware of environmental issues/problems
pce2	People of the country are aware of laws that regulate or minimize pollution
Sustainable Value	
ecp1	Fuel cost reduction
ecp2	Energy consumption cost reduction
ecp3	Waste water cost reduction
ecp4	Waste discharge fee reduction
enp2	Waste water reduction
enp3	Solid waste reduction
enp4	Hazardous materials use reduction
enp5	Frequency of environmental accidents reduction
Meaningfulness	
m1	My work is very important to me
m2	My daily job activities are meaningful to me
m3	My work is worthwhile
m4	My job activities are significant to me
m5	My work adds value

Table B2. Construction Table (Quant 1)

Constructs/Dimensions	Definitions	Items	Source
Eco-Communal Management	**People and ecosphere focused management.** Eco-communal management is an innovative management approach that mediates the relationship between the integrated vision of a renewable energy project or a firm, and the desired outcome as expressed in sustainable value and meaningfulness of the firm or the RE project (Laszlo, Brown, Robson, Saillant, & Sherman, 2014)	**Transformational leadership** Leadership using charisma, intellectual stimulation, and individualized consideration. 1. I communicated my values & beliefs about the projects and its impacts on the community and environment. 2. I articulated a compelling vision for the future for RE projects. **Leader role** The extent that managers exhibited leadership roles. 1. I experimented with concepts and ideas for new projects and business strategies. 2. I exerted considerable influence in the project teams	Bono, Joyce E. (2005), "The Advice and Influence Networks of Transformational Leaders", Journal of Applied Psychology, 90, 1306-1314 1 (not at all) to 5 (frequently, if not always). Kayworth, Timothy R., and Dorothy E. Leidner (2002), "Leadership Effectiveness in Global Virtual Teams", Journal of Management Information Systems, 18, 7-40. Scale is from Almost Never (1) to Almost Always (5)
Transition Engagements	Transition engagement is defined as engagement in hasting and effecting transformational change (Kemp, et al., 2007; Elzen, et al., 2004; Escobar, 2011). Folkman, Lazarus, Gruen, and DeLongis (1986) define coping as "the person's cognitive and behavioral efforts to manage (reduce, minimize, or tolerate) the internal and external demands of the person-environment transaction that is appraised as taxing or exceeding the person's re- sources" (p. 572). Generally associated with intelligence, perceptiveness, creativity, imagination, tolerance, culturedness, and inquisitiveness (Goldberg, 1992).	**Openness to experiences** 1. I have little interest in speculating on the possibilities of project innovations 2. I have little interest in speculating about the performance of the projects 3. I am keenly interested & excited about RE innovations	Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. Research policy, 36(3), 399-417. Judge, Timothy (1999), "Managerial Coping with Organizational Change: A Dispositional Perspective", Journal of Applied Psychology, 84, 107-122 5-point scale ranging from 1 (strongly disagree) to 5' (strongly agree).

Table B3. Common Method Bias Test Results

Standardized Regression Weights: (WO CLF)				Standardized Regression Weights: (W CLF)				Δ
			Estimate				Estimate	
SCN	<—	KC	0.955	SCN	<—	KC	0.9691	-0.0141
EXTRN	<—	KC	0.9012	EXTRN	<—	KC	0.9629	-0.0617
ITR	<—	KC	0.8786	ITR	<—	KC	0.8108	0.0678
MC	<—	CVN	0.8002	MC	<—	CVN	0.6922	0.108
SD	<—	CVN	0.8812	SD	<—	CVN	0.931	-0.0498
ASC	<—	CVN	0.9068	ASC	<—	CVN	0.9115	-0.0047
ECP	<—	SV	0.9824	ECP	<—	SV	0.9588	0.0236
ENP	<—	SV	0.9665	ENP	<—	SV	0.9892	-0.0227
RS	<—	Connect	0.856	RS	<—	Connect	0.8153	0.0407
SU	<—	Connect	0.8578	SU	<—	Connect	0.8209	0.0369
TL	<—	EcoMng	0.9101	TL	<—	EcoMng	0.8856	0.0245
LR	<—	EcoMng	0.7055	LR	<—	EcoMng	0.6678	0.0377
scn2	<—	SCN	0.7142	scn2	<—	SCN	0.6792	0.035
scn3	<—	SCN	0.7658	scn3	<—	SCN	0.6948	0.071
extrn2	<—	EXTRN	0.9024	extrn2	<—	EXTRN	0.8152	0.0872
extrn3	<—	EXTRN	0.7957	extrn3	<—	EXTRN	0.8342	-0.0385
itr1	<—	ITR	0.8465	itr1	<—	ITR	0.6712	0.1753
itr2	<—	ITR	0.7878	itr2	<—	ITR	0.7263	0.0615
itr4	<—	ITR	0.8645	itr4	<—	ITR	0.7166	0.1479
mc3	<—	MC	0.7262	mc3	<—	MC	0.7176	0.0086
mc1	<—	MC	0.765	mc1	<—	MC	0.5027	0.2623
mc2	<—	MC	0.8773	mc2	<—	MC	0.6851	0.1922
sd2	<—	SD	0.8938	sd2	<—	SD	0.7868	0.107
sd3	<—	SD	0.8348	sd3	<—	SD	0.8978	-0.063
asc1	<—	ASC	0.9087	asc1	<—	ASC	0.7776	0.1311
asc2	<—	ASC	0.775	asc2	<—	ASC	0.8369	-0.0619
ecp1	<—	ECP	0.8312	ecp1	<—	ECP	0.7059	0.1253
ecp2	<—	ECP	0.8607	ecp2	<—	ECP	0.7531	0.1076
ecp3	<—	ECP	0.8116	ecp3	<—	ECP	0.7673	0.0443
ecp4	<—	ECP	0.7588	ecp4	<—	ECP	0.751	0.0078
enp2	<—	ENP	0.831	enp2	<—	ENP	0.7901	0.0409
enp3	<—	ENP	0.816	enp3	<—	ENP	0.8017	0.0143
enp4	<—	ENP	0.806	enp4	<—	ENP	0.7475	0.0585
enp5	<—	ENP	0.7885	enp5	<—	ENP	0.7168	0.0717
m1	<—	Meaningfulness	0.8631	m1	<—	Meaningfulness	0.6889	0.1742
m2	<—	Meaningfulness	0.9077	m2	<—	Meaningfulness	0.7791	0.1286
m3	<—	Meaningfulness	0.8743	m3	<—	Meaningfulness	0.8103	0.064
m4	<—	Meaningfulness	0.8662	m4	<—	Meaningfulness	0.8766	-0.0104
m5	<—	Meaningfulness	0.8529	m5	<—	Meaningfulness	0.8483	0.0046
pce1	<—	MKC	0.7571	pce1	<—	MKC	0.8537	-0.0966
pce2	<—	MKC	0.9048	pce2	<—	MKC	0.6923	0.2125
rs1	<—	RS	0.8823	rs1	<—	RS	0.7127	0.1696
rs2	<—	RS	0.9354	rs2	<—	RS	0.8226	0.1128
rs3	<—	RS	0.8629	rs3	<—	RS	0.8245	0.0384
su1	<—	SU	0.8559	su1	<—	SU	0.5752	0.2807
su2	<—	SU	0.9079	su2	<—	SU	0.6668	0.2411
tl1	<—	TL	0.8806	tl1	<—	TL	0.7177	0.1629
tl2	<—	TL	0.9038	tl2	<—	TL	0.8269	0.0769
tl3	<—	TL	0.828	tl3	<—	TL	0.8475	-0.0195
lr2	<—	LR	0.8088	lr2	<—	LR	0.8046	0.0042
lr3	<—	LR	0.8574	lr3	<—	LR	0.7739	0.0835
ote1	<—	TransEng	0.9253	ote1	<—	TransEng	0.7858	0.1395
ote2	<—	TransEng	0.8696	ote2	<—	TransEng	0.9064	-0.0368
ote3	<—	TransEng	0.502	ote3	<—	TransEng	0.4251	0.0769
su3	<—	SU	0.8233	su3	<—	SU	0.7949	0.0284

Table B4. Configural Invariance (CFA)

	EE_CFA_Inv
χ^2	7245.25
df	4030
p	0.0000
CMIN/df	1.800
CFI	0.860
TLI	0.840
RMSEA	0.04
SRMR	0.07
PCLOSE	1.00

Table B5. Metric Invariance

			Executives		Sr. Managers		
			Estimate	P	Estimate	P	z-score
EXTRN	<—	KC	1.031	0.000	1.238	0.000	0.872
ITR	<—	KC	0.992	0.000	1.323	0.000	1.275
SD	<—	CVN	1.015	0.000	1.658	0.000	1.9701**
ASC	<—	CVN	1.035	0.000	1.852	0.000	2.3509**
ENP	<—	SV	0.862	0.000	0.978	0.000	0.805
SU	<—	Connect	1.019	0.000	0.946	0.000	-0.391
LR	<—	EcoMng	0.670	0.000	0.685	0.000	0.089
scn3	<—	SCN	0.853	0.000	1.217	0.000	1.573
extrn3	<—	EXTRN	0.911	0.000	0.835	0.000	-0.581
itr2	<—	ITR	0.876	0.000	0.889	0.000	0.100
itr4	<—	ITR	0.980	0.000	1.096	0.000	0.821
mc3	<—	MC	0.879	0.000	0.824	0.000	-0.339
mc2	<—	MC	0.974	0.000	1.097	0.000	0.700
sd3	<—	SD	0.972	0.000	0.977	0.000	0.036
asc2	<—	ASC	0.865	0.000	0.879	0.000	0.098
ecp2	<—	ECP	0.888	0.000	0.969	0.000	0.753
ecp3	<—	ECP	0.849	0.000	0.951	0.000	0.673
ecp4	<—	ECP	0.831	0.000	0.821	0.000	-0.071
enp3	<—	ENP	0.928	0.000	0.960	0.000	0.237
enp4	<—	ENP	0.879	0.000	0.985	0.000	0.697
enp5	<—	ENP	0.861	0.000	1.039	0.000	1.137
m2	<—	Meaningfulness	0.972	0.000	1.042	0.000	0.705
m3	<—	Meaningfulness	1.016	0.000	0.910	0.000	-0.878
m4	<—	Meaningfulness	0.941	0.000	0.801	0.000	-1.251
m5	<—	Meaningfulness	1.013	0.000	0.847	0.000	-1.185
pce2	<—	MKC	0.953	0.000	1.500	0.000	1.6983*
rs2	<—	RS	0.955	0.000	1.048	0.000	0.922
rs3	<—	RS	0.948	0.000	0.903	0.000	-0.407
su2	<—	SU	0.953	0.000	0.835	0.000	-1.136
tl2	<—	TL	0.930	0.000	0.897	0.000	-0.303
tl3	<—	TL	0.857	0.000	0.806	0.000	-0.422
lr3	<—	LR	1.098	0.000	1.097	0.000	-0.001
ote2	<—	TransEng	0.879	0.000	0.941	0.000	0.479
ote3	<—	TransEng	0.436	0.000	0.386	0.000	-0.450
su3	<—	SU	0.809	0.000	0.792	0.000	-0.153

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table B6. Impacts of Controls

			Estimate	S.E.	C.R.	P	Label
TransEng	<—	KC	0.6911	0.1073	6.438	***	par_1
TransEng	<—	KC_X_CVN	0.2666	0.1119	2.3827	0.0172	par_2
EcoMng	<—	CVN	0.8256	0.1342	6.1519	***	par_3
MKC	<—	Connect	-0.3911	0.1628	-2.4023	0.0163	par_8
TransEng	<—	CVN_X_Connect	-0.2496	0.105	-2.3782	0.0174	par_10
MKC	<—	KC	0.7546	0.1875	4.0245	***	par_11
EcoMng	<—	Connect	0.3708	0.0559	6.6366	***	par_22
MKC	<—	CVN	0.496	0.2457	2.0187	0.0435	par_23
MKC	<—	FS	0.0229	0.0984	0.2329	0.8158	par_24
TransEng	<—	FS	0.0991	0.1057	0.9378	0.3483	par_25
EcoMng	<—	FS	0.0001	0.0537	0.0026	0.9979	par_26
MKC	<—	PCHI	-0.0004	0.0258	-0.0159	0.9873	par_27
TransEng	<—	PCHI	0.0125	0.0282	0.4443	0.6568	par_28
EcoMng	<—	PCHI	0.01	0.0141	0.7112	0.4769	par_29
MKC	<---	RFP	-0.3125	0.1009	-3.0969	0.002	par_34
TransEng	<—	RFP	0.0108	0.1093	0.0986	0.9215	par_35
EcoMng	<---	RFP	-0.115	0.055	-2.0898	0.0366	par_36
MKC	<—	PRL	-0.0006	0.1256	-0.005	0.996	par_39
TransEng	<—	PRL	0.0691	0.1358	0.5084	0.6111	par_40
EcoMng	<—	PRL	0.0859	0.0673	1.2759	0.202	par_41
SV	<—	EcoMng	1.0015	0.0626	15.99	***	par_4
Meaningfulness	<—	EcoMng	1.0876	0.0488	22.296	***	par_5
SV	<—	TransEng	-0.1819	0.0438	-4.1554	***	par_6
Meaningfulness	<—	TransEng	-0.1428	0.0337	-4.237	***	par_7
Meaningfulness	<—	MKC	-0.0961	0.0375	-2.5621	0.0104	par_9
SV	<---	FS	0.1393	0.0717	1.942	0.0521	par_30
Meaningfulness	<—	FS	0.054	0.0549	0.9836	0.3253	par_31
SV	<—	PCHI	0.0081	0.0189	0.4288	0.6681	par_32
Meaningfulness	<—	PCHI	-0.0134	0.0145	-0.924	0.3555	par_33
SV	<—	RFP	0.0257	0.0729	0.3522	0.7247	par_37
Meaningfulness	<—	RFP	0.1469	0.0572	2.5697	0.0102	par_38
SV	<—	PRL	0.0766	0.0906	0.8453	0.3979	par_42
Meaningfulness	<—	PRL	-0.0212	0.0694	-0.3051	0.7603	par_43

Appendix C: Quantitative Research 2

Table C1. Replicated Model (EE Model with DE Data)

χ^2	474.74
df	69
p	0.0000
CMIN/df	6.88
CFI	0.931
TLI	0.727
RMSEA	0.116
SRMR	0.05
PCLOSE	0.00

Figure C1. SEM Results of Replicated Model

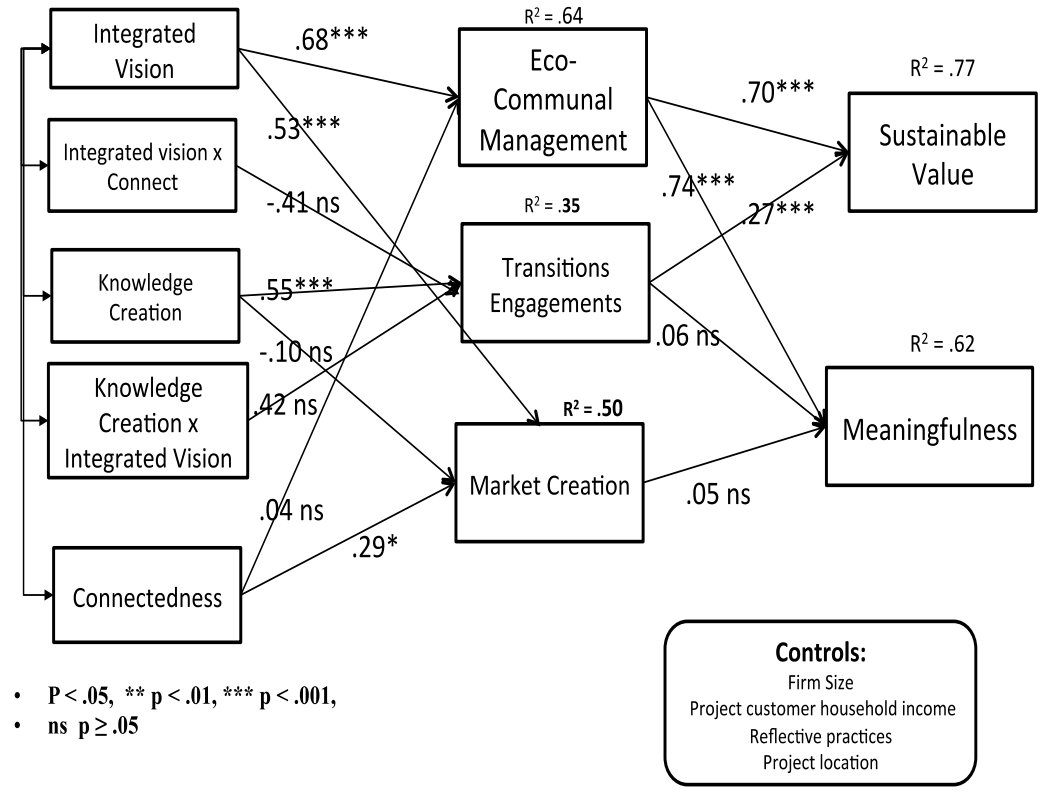


Table C2. Construction Table

Constructs/Dimensions	Definitions	Items	Source
Eco-Communal Management Transformational leadership	**People and ecosphere focused management.** Leadership using charisma, intellectual stimulation, and individualized consideration.	**Transformational leadership** 3. Reexamines critical assumptions about RE projects to question whether they are appropriate. 4. Spends time teaching and coaching other manger about RE	Bono, Joyce E. (2005), " The Advice and Influence Networks of Transformational Leaders", Journal of Applied Psychology, 90, 1306-1314 1 (not at all) to 5 (frequently, if not always). **Used scale: strongly disagree (1)/strongly agree(5)**
Transitions Engagement Openness to experiences	Transition engagement is defined as engagement in hasting and effecting transformational change (Kemp, et al., 2007, Elzen, et al., 2004, Escobar, 2011).	**Openness to experiences** 1. I have little interest in speculating on the possibilities of RE projects innovations 2. I have little interest in speculating on the performance of RE projects 3. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement	Kemp, R., Parto, S., & Gibson, R. B. (2005). Governance for sustainable development: moving from theory to practice. International Journal of Sustainable Development, 8(1), 12-30. Escobar, A. (2011). Encountering development: The making and unmaking of the Third World. Princeton University Press. Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. Research policy, 36(3), 399-417. Judge, Timothy (1999), "Managerial Coping with Organizational Change: A Dispositional Perspective", Journal of Applied Psychology, 84, 107-122 5-point scale ranging from 1 (strongly disagree) to 5' (strongly agree).
Connectedness / Social Connectedness Relationship salience Shared understandings	A short-term experience of belonging and relatedness, based on quantitative and qualitative social appraisals, and relationship salience The connectedness among work roles, thus reflecting the degree to which job performance depends on reciprocal interaction with others to accomplish work goals. Relationship salience involves experiences such as the sense of being in touch, presence-in-absence, and experiential outcomes of "social snackin	**Relationship salience** 1. Even when we are not in each others' company, I often feel "together" with people in my social network that include stakeholders of my company, the host community, and RE industry somehow 2. Aside from our contact, I often feel "together" with people in my RE social network somehow. 3. I feel that people in my social network of RE projects often think of me. 4. I often think of people in my RE social network. **Shared understandings** 1. I feel I have a lot in common with people in my RE social network. 2. I feel on the same wavelength with people in my RE social network.	Dierdorff, Erich C., and Frederick P. Morgeson (2007), "Consensus in Work Role Requirements: The Influence of Discrete Occupational Context on Role Expectations", Journal of Applied Psychology, 92, 1228-1241. 5-point importance scale Schultz, P.W. (2002). Inclusion with Nature: The Psychology of Human-Nature Relations. Psychology of Sustainable Development. Kluwer Academic Publishers, Boston, MA pp. 67-68.

Table C3. SEM Results for Controls

			Estimate	S.E.	C.R.	P	Label
MKC	<—	PRL	0.0116	0.0161	0.7235	0.4694	par_3
EcoComMng	<—	PRL	-0.0222	0.023	-0.9673	0.3334	par_4
MKC	<—	FS	0.0129	0.0326	0.3963	0.6919	par_6
EcoComMng	<---	FS	0.1053	0.0463	2.274	0.023	par_7
MKC	<—	PCHI	-0.0045	0.0154	-0.2953	0.7678	par_9
EcoComMng	<—	PCHI	-0.0199	0.0221	-0.9014	0.3674	par_10
EcoComMng	<—	IVN	0.4621	0.1041	4.4389	***	par_13
MKC	<—	IVN	0.6537	0.0376	17.3755	***	par_14
EcoComMng	<—	IVN_X_Connect	0.2503	0.1248	2.0063	0.0448	par_15
EcoComMng	<—	KC	1.0575	0.1648	6.4168	***	par_16
EcoComMng	<—	KC_X_IVN	-0.3451	0.1163	-2.9673	0.003	par_17
EcoComMng	<—	Connect	-0.3472	0.0932	-3.7235	***	par_18
EcoComMng	<—	Connect_X_KC	0.1529	0.0606	2.525	0.0116	par_19
MKC	<—	Connect_X_KC	-0.1849	0.0391	-4.7305	***	par_20
MKC	<—	KC_X_IVN	0.1897	0.0406	4.6698	***	par_57
SV2	<—	EcoComMng	0.9031	0.0454	19.9122	***	par_1
SV2	<—	PRL	-0.0292	0.0229	-1.2783	0.2011	par_5
SV2	<---	FS	0.1217	0.0469	2.596	0.0094	par_8
SV2	<—	PCHI	0.0045	0.0213	0.2089	0.8346	par_11
SV2	<—	MKC	0.261	0.066	3.9554	***	par_12

Appendix D: Model Fit for Alternative Model

Table D1. CFA Model Fit Statistics for Configural Invariance Test

	DE CFA SM_2
χ^2	9548.977
df	4885
p	0.0000
CMIN/df	1.955
CFI	0.818
TLI	0.799
RMSEA	0.039
SRMR	0.09
PCLOSE	1.00

Table D2. Metrical Invariance Test Results

			HighRFP		LowRFP		
			Estimate	P	Estimate	P	z-score
CMBN	<---	KC	0.887	0.000	0.961	0.000	0.419
ENP	<---	SV	0.666	0.000	0.981	0.000	2.0068**
SU	<---	Connect	1.037	0.000	0.886	0.000	-0.987
EXTRN	<---	KC	0.940	0.000	1.163	0.000	1.211
ITR	<---	KC	0.648	0.000	1.001	0.000	1.9645**
ASC	<---	IVN	1.231	0.000	0.886	0.000	-1.270
Meaningful ness	<---	SV	0.439	0.000	0.683	0.000	1.7993*
ecp3	<---	ECP	0.928	0.000	0.983	0.000	0.467
ecp5	<---	ECP	0.870	0.000	0.942	0.000	0.560
enp3	<---	ENP	1.112	0.000	1.116	0.000	0.027
enp2	<---	ENP	1.039	0.000	1.056	0.000	0.096
enp5	<---	ENP	0.991	0.000	0.906	0.000	-0.500
m2	<---	Meaningulness	0.931	0.000	0.944	0.000	0.115
m3	<---	Meaningulness	1.010	0.000	0.880	0.000	-1.097
m1	<---	Meaningulness	1.080	0.000	1.039	0.000	-0.276
m5	<---	Meaningulness	0.893	0.000	1.057	0.000	1.382
pce1	<---	MKC	1.738	0.000	0.726	0.000	-2.3729**
igp6	<---	IGP	0.928	0.000	0.590	0.000	-1.468
cmbn1	<---	CMBN	0.966	0.000	1.067	0.000	0.670
rs2	<---	RS	1.029	0.000	1.041	0.000	0.120
rs3	<---	RS	0.879	0.000	0.776	0.000	-0.857
su2	<---	SU	0.944	0.000	1.104	0.000	1.318
su3	<---	SU	1.035	0.000	1.131	0.000	0.773
tl4	<---	EcoComMng	1.046	0.000	1.113	0.000	0.333
cmbn3	<---	CMBN	0.888	0.000	0.721	0.000	-1.090
cmbn4	<---	CMBN	1.028	0.000	0.996	0.000	-0.196
scn3	<---	SCN	0.924	0.000	0.760	0.000	-1.113
extrn2	<---	EXTRN	0.894	0.000	0.816	0.000	-0.614
extrn3	<---	EXTRN	0.918	0.000	0.786	0.000	-0.944
extrn4	<---	EXTRN	1.078	0.000	0.756	0.000	-2.3046**
itr2	<---	ITR	1.096	0.000	0.957	0.000	-0.673
itr4	<---	ITR	1.114	0.000	0.888	0.000	-1.017
DInnov2	<---	DINNOV	1.178	0.000	0.699	0.000	-2.2029**
DInnov3	<---	DINNOV	1.364	0.000	0.682	0.000	-2.1681**
ote2	<---	TransEng	0.977	0.000	1.051	0.000	0.439
sd2	<---	SD	0.839	0.000	1.018	0.000	1.086
asc3	<---	ASC	0.991	0.000	0.743	0.000	-1.434
pce3	<---	MKC	0.979	0.000	0.530	0.000	-1.428
pce2	<---	MKC	1.812	0.000	0.617	0.000	-2.6963***

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table D3. Metrical Invariance Test Results

			Exec		Sr Managers		
			Estimate	P	Estimate	P	z-score
CMBN	<—	KC	1.060	0.000	0.906	0.000	-0.942
ENP	<—	SV	0.927	0.000	0.853	0.000	-0.427
SU	<—	Connect	1.029	0.000	1.050	0.000	0.128
EXTRN	<—	KC	0.953	0.000	1.110	0.000	0.979
ITR	<—	KC	0.713	0.000	0.936	0.000	1.388
ASC	<—	IVN	0.757	0.000	1.079	0.000	1.8425*
Meaningful ness	<—	SV	0.828	0.000	0.566	0.000	-1.7589*
ecp3	<—	ECP	0.918	0.000	1.001	0.000	0.765
ecp5	<—	ECP	0.855	0.000	0.985	0.000	1.099
enp3	<—	ENP	1.043	0.000	1.148	0.000	0.754
enp2	<—	ENP	1.099	0.000	0.989	0.000	-0.794
enp5	<—	ENP	0.911	0.000	1.000	0.000	0.640
m2	<—	Meaningulness	1.058	0.000	0.942	0.000	-0.949
m3	<—	Meaningulness	0.960	0.000	0.934	0.000	-0.222
m1	<—	Meaningulness	1.099	0.000	1.023	0.000	-0.523
m5	<—	Meaningulness	0.983	0.000	1.043	0.000	0.514
pce1	<—	MKC	1.199	0.000	1.278	0.000	0.280
igp6	<—	IGP	0.704	0.000	0.728	0.000	0.119
cmbn1	<—	CMBN	0.968	0.000	0.982	0.000	0.105
rs2	<—	RS	1.047	0.000	1.116	0.000	0.638
rs3	<—	RS	0.899	0.000	0.853	0.000	-0.389
su2	<—	SU	1.120	0.000	0.952	0.000	-1.479
su3	<—	SU	1.107	0.000	1.022	0.000	-0.725
tl4	<—	EcoComMng	0.995	0.000	1.054	0.000	0.375
cmbn3	<—	CMBN	0.887	0.000	0.778	0.000	-0.803
cmbn4	<—	CMBN	0.823	0.000	1.100	0.000	1.9521*
scn3	<—	SCN	0.817	0.000	0.887	0.000	0.501
extrn2	<—	EXTRN	0.859	0.000	0.878	0.000	0.151
extrn3	<—	EXTRN	0.790	0.000	0.910	0.000	0.866
extrn4	<—	EXTRN	0.817	0.000	0.907	0.000	0.667
itr2	<—	ITR	1.096	0.000	0.871	0.000	-0.955
itr4	<—	ITR	1.194	0.000	0.877	0.000	-1.414
DInnov2	<—	DINNOV	1.128	0.000	0.800	0.000	-1.9573*
DInnov3	<—	DINNOV	1.189	0.000	0.837	0.000	-1.540
ote2	<—	TransEng	0.920	0.000	0.968	0.000	0.307
sd2	<—	SD	1.017	0.000	0.881	0.000	-0.884
asc3	<—	ASC	1.270	0.000	0.742	0.000	-2.1736**
pce3	<—	MKC	0.702	0.000	0.995	0.000	1.183
pce2	<—	MKC	1.030	0.000	1.267	0.000	0.879

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table D4. Moderation Test Results (Reflective Practices)

			HighRFP1		LowRFP1		
			Estimate	P	Estimate	P	z-score
MKC	<—	PRL	0.035	0.351	-0.001	0.971	-0.849
EcoComMng	<—	PRL	0.002	0.966	-0.034	0.224	-0.638
MKC	<—	FS	-0.077	0.275	-0.005	0.908	0.887
EcoComMng	<—	FS	0.076	0.466	0.120	0.041	0.370
MKC	<—	PCHI	-0.027	0.378	0.018	0.358	1.236
EcoComMng	<—	PCHI	0.082	0.043	-0.075	0.008	-3.1812***
EcoComMng	<—	IVN	0.330	0.066	0.488	0.000	0.696
MKC	<---	IVN	0.819	0.000	0.606	0.000	-2.3973**
EcoComMng	<—	IVN_X_Connect	0.260	0.112	-0.034	0.874	-1.086
EcoComMng	<—	KC	0.994	0.000	1.047	0.000	0.142
EcoComMng	<—	KC_X_IVN	-0.235	0.146	-0.147	0.483	0.333
EcoComMng	<—	Connect	-0.281	0.070	-0.360	0.006	-0.389
EcoComMng	<—	Connect_X_KC	0.042	0.613	0.225	0.013	1.502
MKC	<—	Connect_X_KC	-0.185	0.004	-0.143	0.006	0.500
MKC	<—	KC_X_IVN	0.239	0.000	0.195	0.000	-0.495
SV	<---	EcoComMng	1.136	0.000	0.813	0.000	-2.9818***
SV	<—	PRL	-0.056	0.209	-0.006	0.842	0.950
SV	<—	FS	0.080	0.372	0.048	0.422	-0.291
SV	<—	PCHI	0.028	0.440	0.003	0.916	-0.543
SV	<---	MKC	0.018	0.851	0.401	0.000	2.8374***

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Table D5. Moderation Test Results (Managerial Authority)

			Exec		Sr Managers		
			Estimate	P	Estimate	P	z-score
MKC	<---	PRL	0.022	0.383	0.015	0.454	-0.192
EcoComMng	<---	PRL	-0.013	0.682	-0.026	0.428	-0.270
MKC	<---	FS	-0.068	0.187	0.066	0.100	2.0528**
EcoComMng	<---	FS	0.111	0.098	0.090	0.153	-0.224
MKC	<---	PCHI	0.010	0.707	-0.012	0.513	-0.686
EcoComMng	<---	PCHI	0.001	0.988	-0.030	0.303	-0.675
EcoComMng	<---	IVN	0.288	0.027	0.593	0.000	1.435
MKC	<---	IVN	0.706	0.000	0.626	0.000	-1.070
EcoComMng	<---	IVN_X_Connect	0.118	0.392	0.408	0.110	0.998
EcoComMng	<---	KC	1.242	0.000	0.855	0.001	-1.165
EcoComMng	<---	KC_X_IVN	-0.204	0.106	-0.541	0.029	-1.214
EcoComMng	<---	Connect	-0.407	0.000	-0.249	0.114	0.825
EcoComMng	<---	Connect_X_KC	0.088	0.215	0.223	0.038	1.055
MKC	<---	Connect_X_KC	-0.171	0.001	-0.249	0.000	-0.976
MKC	<---	KC_X_IVN	0.152	0.005	0.262	0.000	1.329
SV	<---	EcoComMng	0.909	0.000	0.889	0.000	-0.222
SV	<---	PRL	0.014	0.688	-0.057	0.070	-1.530
SV	<---	FS	0.130	0.065	0.117	0.061	-0.131
SV	<---	PCHI	0.024	0.471	-0.007	0.807	-0.714
SV	<---	MKC	0.242	0.008	0.269	0.005	0.202

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Appendix E: GDP Growth (2005-2015) for RE Business Locations

Table E1. GDP Growth of Research Business/Project Location for 2005 – 2015

(Source: Global Finance, Nov. 2015)

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Avg. % of GDP Change
Qatar	**26.2**	**18.0**	**17.7**	**12.0**	**16.7**	**13.0**	**6.1**	**6.5**	**6.5**	**7.7**	**13.0**
Turkmenistan	11.0	11.1	14.7	6.1	9.2	14.7	11.1	10.2	10.1	11.5	11.0
Ethiopia	11.5	11.8	11.2	10.0	10.6	11.4	8.8	9.7	8.2	8.5	10.2
China	12.7	14.2	9.6	9.2	10.4	9.3	7.7	7.7	7.4	7.1	9.5
Nigeria	8.8	9.6	8.6	9.6	10.6	4.9	4.3	5.4	7.0	7.3	7.6
Rwanda	9.2	7.6	11.2	6.2	6.3	7.5	8.8	4.7	6.0	6.7	7.4
Ghana	6.1	6.5	8.4	4.0	8.0	15.0	8.8	7.1	4.5	4.7	7.3
India	9.3	9.8	3.9	8.5	10.3	6.6	4.7	5.0	5.6	6.4	7.0
Tanzania	6.7	7.1	7.4	6.0	7.0	6.4	6.9	7.0	7.2	7.0	6.9
Uganda	7.0	8.1	10.4	4.1	6.2	6.2	2.8	5.8	5.9	6.3	6.3
Indonesia	5.5	6.3	6.0	4.6	6.2	6.5	6.3	5.8	5.2	5.5	5.8
Philippines	5.2	6.6	4.2	1.1	7.6	3.7	6.8	7.2	6.2	6.3	5.5
Kenya	5.6	8.0	-0.4	2.6	8.6	7.6	4.6	4.6	5.3	6.2	5.3
Malaysia	5.6	6.3	4.8	-1.5	7.4	5.2	5.6	4.7	5.9	5.2	4.9
Botswana	8.0	8.7	3.9	-7.8	8.6	6.2	4.3	5.9	4.4	4.2	4.6
Mali	5.3	4.3	5.0	4.5	5.8	2.7	0.0	1.7	5.9	4.8	4.0
Chile	5.8	5.2	3.2	-1.0	5.7	5.8	5.5	4.2	2.0	3.3	4.0
Argentina	8.4	8.0	3.1	0.1	9.1	8.6	0.9	2.9	-1.7	-1.5	3.8
United Arab Emirates	9.8	3.2	3.2	-5.2	1.6	4.9	4.7	5.2	4.3	4.5	3.6
Brazil	4.0	6.1	5.2	-0.3	7.5	2.7	1.0	2.5	0.3	1.4	3.0
South Africa	5.6	5.5	3.6	-1.5	3.1	3.6	2.5	1.9	1.4	2.3	2.8
Canada	2.6	2.0	1.2	-2.7	3.4	2.5	1.7	2.0	2.3	2.4	1.7
United States	2.7	1.8	-0.3	-2.8	2.5	1.6	2.3	2.2	2.2	3.1	1.5
Germany	3.9	3.4	0.8	-5.1	3.9	3.4	0.9	0.5	1.4	1.5	1.5
Norway	2.3	2.7	0.1	-1.6	0.5	1.3	2.9	0.6	1.8	1.9	1.2
United Kingdom	2.8	3.4	-0.8	-5.2	1.7	1.1	0.3	1.7	3.2	2.7	1.1
France	2.4	2.4	0.2	-2.9	2.0	2.1	0.3	0.3	0.4	1.0	0.8
Japan	1.7	2.2	-1.0	-5.5	4.7	-0.5	1.5	1.5	0.9	0.8	0.6

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