Accepted Manuscript

Barriers and motivators to the adoption of energy savings measures for SMEs: The case of the ClimateSmart Business Cluster Program

Cristyn Meath, Dr. Martina Linnenluecke, PhD, Andrew Griffiths, PhD, Professor

Please cite this article as: Meath C, Linnenluecke M, Griffiths A, Barriers and motivators to the adoption of energy savings measures for SMEs: The case of the ClimateSmart Business Cluster Program, *Journal of Cleaner Production* (2015), doi: 10.1016/j.jclepro.2015.08.085.

	Motivating factors	Barriers
Financial		
Compliance-driven		
Environmental		
Management / Organisational characteristics		
Premises		
Staff		

100% 75% 50% 25% 0% 25% 50% 75% 100%
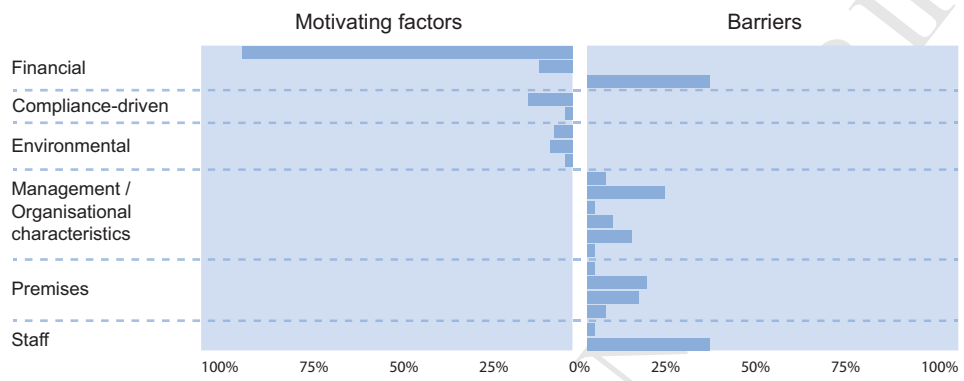
Author group and affiliation details for Editorial Reference: JCLP_JCLEPRO-D-14-00567

Barriers and motivators to the adoption of energy savings measures for SMEs: The case of the ClimateSmart Business Cluster Program

Cristyn Meath
Dr Martina Linnenluecke
Professor Andrew Griffiths

UQ Business School, The University of Queensland

Corresponding author: Cristyn Meath

Barriers and motivators to the adoption of energy savings measures for SMEs: The case of the ClimateSmart Business Cluster Program

Legislation targeting business carbon emissions typically excludes the significant portion of the economy comprised of small- and medium-sized enterprises (SMEs). As an alternative many governments have developed voluntary programs to assist SMEs to reduce emissions and increase their energy efficiency. To maximise benefits associated with such programs, this paper seeks to provide insights into key factors contributing to the design of successful voluntary energy efficiency programs for SMEs. This is achieved by comprehensively analysing the factors that impacted the uptake of energy savings measures by 202 SMEs which participated in the ClimateSmart Business Cluster Program (commencing in 2009). Expanding on previous research that has mostly focus on identifying inhibiting factors (barriers) to the uptake of energy savings measures, this paper offers a comprehensive assessment of barriers and motivating factors (motivators). A unique finding of this research is that SMEs experienced many different barriers and motivators while participating in the program, inferring great complexity to achieving the critical aim of reducing carbon emissions. Based on these findings, this paper argues that voluntary government energy efficiency programs should be flexibly designed and implemented to accommodate the many and various barriers. Motivating factors should be emphasised and barriers identified upfront so that the program can be tailored to the often idiosyncratic needs of SMEs.

1. Introduction

The importance of small- and medium-sized enterprises (SMEs) in reducing carbon emissions is reflected by figures for electricity consumption, with SMEs purchasing about 40% of total electricity sold in Australia (Australian Bureau of Statistics, 2010). The vast majority of businesses in Australia are SMEs and represent a very heterogeneous group based on factors relating to energy use and the management of efficiency efforts (DECC 2009). Although SMEs employ fewer than 200 staff (Australian Bureau of Statistics, 2012) they account for more than 96% of all businesses and nearly half of all industry employment in Australia. As such, they play a significant role in the economy. Despite this, only large companies have been targeted by energy efficiency and carbon legislation in Australia, including the Energy Efficiency Opportunities (EEO) Program, the National Greenhouse and Emissions Reporting Scheme (NGERS), and the Carbon Pricing Mechanism.[1]

Legislation is one means of improving energy efficiency among the business community; another is for SMEs to engage in voluntary actions aimed at reducing energy consumption. However, the uptake of such measures has been limited by organizations (Weber 1997) and particularly SMEs (DECC 2009). This is consistent with the low rates of implementation of environmental measures in general by SMEs (Hillary 2004), even though there is evidence that benefits accrue to businesses which successfully implement voluntary energy reduction measures (Revell and Blackburn 2007). Possible reasons include the lack of stringent policy pressures (DECC 2009), a lack of SME resources and capabilities (Loucks et al. 2010), lack of information (DECC 2009), and low levels of awareness and understanding of environmental issues and their opportunities among SME owners and managers (Loucks et al. 2010).

---

[1] The Carbon Pricing Mechanism and EEO Legislation were repealed in 2014 under the Abbott government and are likely to be replaced by a Direct Action Plan.

Despite their significant combined energy use, the SME sector does not fall under the legislative requirements of the Australian Federal Government to reduce greenhouse gas emissions. As an alternative many Australian State Governments are attempting to promote voluntary action to improve energy efficiency by SMEs through participation in voluntary government programs.[2]

Achieving success in such programs can provide a number of benefits; 1) the programs achieve their underlying goals (i.e. reducing greenhouse gas emissions and the future severity of climate change), 2) an additional and key benefit is the continued action by participating businesses to improve energy efficiency following the program, and 3) success of participants is more likely to attract other businesses to participate in government programs or pursue energy efficiency improvements independently.

This paper analyses the outcomes of one such program, the Queensland Government's ClimateSmart Business Cluster Program, and its effectiveness in encouraging SMEs to implement energy savings measures, and sustainability measures more broadly. Specifically, this paper assesses the motivating factors (hereafter referred as motivators) and barriers that impacted the uptake of energy savings measures by the 202 SMEs which participated in the program, spanning a diverse range of SMEs across sectors. The objective of this paper is to provide insights into key factors contributing to the design of a successful voluntary SME energy efficiency program, and to contribute to the small but emerging body of literature on SME engagement in voluntary energy efficiency actions and programs.

The paper is structured as follows; first, we provide an overview of existing contributions that engage with policy design of voluntary energy efficiency programs for business. Given this literature is sparse, we also look for potentially relevant learnings in

---

[2] Other programs include the "Carbon Compass" and "Grow me the Money" programs by the Victorian Employers' Chamber of Commerce and Industry and the "Energy Efficiency for Small Business and Sustainability Advantage" program by the New South Wales Government.

3

research on SME adoption of innovation more generally. Overall, the literature supports the argument that SMEs encounter significant barriers to successfully implementing energy efficiency or sustainability measures because they do not have the organisational resources to do so (compared to larger firms) – resulting in fewer SMEs taking up such measures. Even though these findings provide important insights into possible barriers, they do not offer insights into the factors that motivate SMEs to adopt energy saving measures. Extant research also offers few insights on how to design successful SME energy efficiency programs.

Expanding on these previous studies, this paper comprehensively assesses both the barriers to, and motivators for, adopting energy savings measures that were experienced by SMEs that participated in the Queensland Government's ClimateSmart Business Cluster Program. The analysis is based on over 350 pages of reporting on the outcomes of the program. The program commenced in 2009 with the aim to deliver financial savings to SMEs by implementing sustainability measures, particularly energy efficiency measures. It should be noted that the title 'Cluster' does not imply that the SMEs formed clusters as referred to in innovation literature, but rather that the program was administered to many smaller and more manageable groups of SMEs, and not to all SMEs in general. The paper discusses the implications of the findings for policy-makers and outlines recommendations and pathways for future research.

2. Literature

Since the 1980s, several studies have looked at the barriers that prevent businesses from adopting energy efficiency or environmental measures, yet often without focusing on a particular business size or sustainability initiative/program (e.g., Venmans, 2014; Cagno et al., 2013; DeCanio, 1993; Hirst and Brown, 1990; Hirst et al., 1982; Weber, 1997). In the broader sustainability and environmental field, researchers have recently identified SMEs as a separate category of the debate, with distinguishable characteristics to large businesses. For

instance, studies have found that the size of a business has a significant effect on the adoption of environmental practices (including voluntary ones), with larger businesses more likely to be proactive due to greater resource availability (Aragón-Correa et al., 2008; Buysse and Verbeke, 2003; Russo and Fouts, 1997; Sharma, 2000).

Although researchers now recognise SMEs as a distinct group, there has been little work to date that specifically considers voluntary SME programs that aim to foster the uptake of energy efficiency measures. Exceptions include studies on SME initiatives in Canada (Côté et al., 2006), Germany (Fleiter et al., 2012), Sweden (Thollander et al., 2007), and Italy (Trianni and Cagno, 2012). These studies investigate SME take-up of energy efficiency measures, but acknowledge that there is little empirical work on designing effective SME sustainability programs, especially for diverse SMEs across industries. The findings predominantly support the premise that the unique characteristics of SMEs (especially the lack of investment capacity) limit the widespread adoption of energy efficiency measures and thus the success of assistance programs.

2.1. Factors influencing the adoption of energy efficiency measures within SMEs

Several of the above-cited studies on SME involvement in voluntary energy efficiency programs report that lack of capital is the main barrier to adopting energy efficiency measures (Fleiter et al. 2012, Trianni and Cagno 2012). Fleiter et al. (2012) studied German SMEs and concluded that lack of capital was the only statistically significant barrier. However, the authors also acknowledged that their small sample size may have impacted these results. Trianni and Cagno (2012) argued that the major barriers to adopting energy efficiency measures related to a lack of investment capital and insufficient information. Killick (2009) suggested that renting premises might be an issue. For example, SMEs which rent their premises may not be allowed to make changes to the building and may not have access to energy consumption data because energy costs form part of the rent for the premise.

5

Other authors have suggested that SMEs generally place low importance on improving their environmental performance. Thollander et al. (2007) identified barriers for 47 SMEs that participated in Project Highland, a Swedish program which provided low-cost energy audits to SMEs in the manufacturing sector. The study found that SMEs tend to prioritise other capital investments over energy efficiency measures, and that energy audits (providing SMEs with strategic information on their energy usage and energy reduction options) are only partially successful in providing SMEs with sufficient information to successfully adopt energy saving measures. The authors argue that more specific information is needed to encourage SMEs to implement energy saving measures and to overcome issues such as lack of technical skills or poor information quality regarding energy efficiency opportunities.

Overall, the existing literature on SME involvement in voluntary energy efficiency programs has largely focused on demonstrating the barriers to adopting energy efficiency measures. The literature concludes that the key barriers experienced by SMEs are lack of capital, absence of information, and prioritisation of more pressing business issues. This study contributes to existing findings by comprehensively assessing both the barriers **and** motivators experienced by SMEs participating in a voluntary energy efficiency program. It shows that SMEs might face multiple barriers over the course of a program, meaning that companies may possibly face several constraints. Other studies have identified individual barriers to the uptake of energy efficiency measures; however, it is not certain whether overcoming individual barriers alone will help SMEs to successfully implement energy efficiency measures (Chai and Yeo, 2012). This study identifies a comprehensive range of barriers and motivators to establish the key determinants of successful voluntary energy efficiency program design, to ultimately increase SME uptake of sustainability measures.

2.2. Factors influencing the adoption of innovation within SMEs

We also scan the research on SMEs and innovation, in order to provide further insights into the factors influencing SME uptake of energy efficiency measures. The innovation literature suggests that similarities exist between the implementation of energy efficiency measures and other organisational changes, such as e-commerce, information and communication technology (ICT), and environmental management systems. Several studies have found that SMEs tend to adopt these initiatives less frequently than large businesses (Côté et al., 2006). A study of SMEs in Europe, the UK, and the US suggested that SMEs are less engaged in ICT and e-business than large businesses (Taylor and Murphy, 2004). This is supported by Abbott et al. (2006), who reported that SMEs adopt technically innovative practices at a lower rate than large businesses. In other words, the literature suggests that SME status and resource availability are important factors when it comes to implementing intra-organisational change, which is consistent with the small body of literature on SME adoption of energy efficiency measures. These lessons from the adoption of other forms of new technology therefore seem relevant to understand SME adoption of energy efficiency measures.

Several researchers distinguish internal and external factors that influence SME adoption of technological innovations (McKeiver and Gadenne, 2005; Walker et al., 2008). However, it is the internal factors that seem to be most important (Taylor and Murphy, 2004). This aligns with research by Hillary (2004), who found that internal barriers initially play a more significant role in impeding progress towards adopting environmental management systems. Taylor and Murphy (2004) studied success factors in SME adoption of ICT systems, and found that influencing internal factors included owner motivation, experience and management skills, expertise in managing growth, access to resources (money, technology and people), innovation, a competitive advantage and flexibility, close contact with

7

customers, a focus on profits rather than sales, and strong demand and operating in a growth market. Their findings re-emphasise that a lack of organisational resources has a crucial impact on SMEs adopting any new measures or innovations.

Overall, there seems to be an overlap in the literature on SME adoption of energy efficiency measures and SME implementation of organisational change, more broadly. Both literatures find that SME resource endowments (or the lack thereof) help explain the success or failure of the uptake of new technologies. Nonetheless, there appears to be some contradictory evidence in the literature—some studies suggest that SMEs possess attributes, such as adaptive organisational learning potential, that can lead to the successful uptake of innovative measures (Deakins and Freel, 1998). This finding may assist our understanding of SME adoption of energy efficiency measures and we suggest that it warrants further investigation of motivating factors. In particular, future insights are needed into barriers **and** motivators and how they affect SMEs as they pursue energy efficiency measures (Revell and Blackburn, 2007; Weber, 1997).

3. The ClimateSmart Business Cluster Program

In order to identify factors that contribute to the design of a successful voluntary SME energy efficiency program, we analyse the barriers and motivators that 202 SMEs encountered during their participation in the ClimateSmart Business Cluster program. We analyse the final reports of the program outcomes, detailed further below. The voluntary program (later renamed Business Efficiency Cluster Program) was initiated by the Queensland Government in 2009 and aimed to help SMEs adopt energy saving measures. The program also sought to assist participating businesses progress to "ecoBiz Partner" status. EcoBiz Partners were recognised for their efforts to reduce energy, water, or waste consumption and for helping to reduce Queensland's world-leading per capita CO_2 emissions (The Australian, 2012).

8

The program involved forming business clusters (or peer groups) so that SMEs could undertake the sustainability program in small groups with the help of a leader, generally a business sustainability consultant. The consultant worked with each SME for a period of six or twelve months. Over four rounds and three and a half years, more than 70 clusters completed the program, involving more than 700 businesses. The businesses in each cluster were preferably linked by industry, geographical location, or supply chain and predominantly sourced through the networks of the cluster leader. The cluster leader visited each business to assess opportunities for implementing sustainability measures and provided recommendations that included approximate payback period calculations. The recommendations included measures such as behavioural change, technology upgrade, or improved maintenance of technical equipment.

Participating SMEs were also provided with networking opportunities through workshops facilitated by the cluster leader. Initially, clusters were required to hold one workshop; however, in 2011 this was increased to two workshops, in response to feedback from participating businesses. This request reflected the challenges faced by SMEs in implementing sustainability recommendations. The workshops helped participating businesses overcome the aforementioned barriers to implementation and also provided opportunities to build closer business relationships.

4. Methodology

The Queensland Government granted the researchers access to government data generated for the purposes of administering and measuring the success of the program. The researchers had access to data on program outcomes in the form of cluster reports completed by the cluster leaders. These reports captured information on the progress of 202 participating SMEs from across 18 clusters in Rounds 1 to 5 of the program, which ran from 2009 to 2011. For the purpose of this analysis, businesses such as franchises, which may be associated with

larger businesses were considered to be SMEs. Each of the 18 reports consisted of approximately 20 pages of information predominantly in template form, resulting in about 350 pages of information for final analysis. The reports listed each participating SME's industry category, described what the SME hoped to achieve from participating in the cluster and whether or not it had implemented any energy savings measures, and assessed how successful the SME's involvement in the program had been. The cluster leaders also described any general issues they had observed throughout the program, providing further insights into the motivating factors and barriers experienced by SMEs.

We used a case study methodology to analyse the data, focusing on content analysis of archival data (Eisenhardt, 1989; Kitazawa and Sarkis, 2000). We analysed the textual data provided in each of the 18 cluster leader reports, in order to extract information on the motivators and barriers experienced by SMEs participating in the program. Researchers have different options for analysing report data: (1) searching the text for an ex ante list of items and scrutinising the text for their presence, (2) thematic content analysis (where the whole text is analysed), (3) focusing on characteristics of the actual text, such as readability, and (4) linguistic analysis (Beattie et al., 2004). We used qualitative content analysis to compile a list of all factors mentioned as influencing the uptake of energy savings measures, and subsequently grouped these factors into motivating factors and barriers, and into different themes (e.g., financially-related motivators, marketing-related motivators, and so on).

This qualitative analysis was an iterative process. We independently coded the cluster leader reports by searching for information on barriers (i.e., reasons why SMEs did or could not implement measures to reduce their energy consumption) and motivators (i.e., reasons why SMEs implemented measures to reduce their energy consumption). The categories created during this coding allowed us to identify the dimensions underpinning the responses and to group responses along these dimensions according to similarity. We discussed and

10

cross-checked our findings to resolve instances of disagreement. We also extracted descriptive information on business types and whether or not a SME implemented any energy saving measures, which we report in the section below.

5. Results

The businesses analysed in the case study represented a variety of industries, including, but not limited to, manufacturing, retail, and hospitality. The SMEs were located across the state of Queensland in Australia, in cities including Brisbane and Cairns and regional areas along the east coast and inland. The participating businesses represented micro, small, and medium-sized businesses, with respectively 0-4, 5-19, and 20-199 staff, based on the Australian Bureau of Statistics classification by staffing levels (ABS, 2012). The composition of the sample of SMEs in our case study is detailed in Table 1. The data reflect a broad variety of SMEs and operating conditions.

TABLE 1 ABOUT HERE

Overall, more than 80% of participating businesses were reported by the cluster leaders to have implemented intra-organisational changes due to their involvement in the ClimateSmart Business Cluster program (see also Table 2). The reported energy efficiency measures included both technological and behavioural changes, such as replacing inefficient equipment, servicing existing equipment, reducing the amount of equipment used, and using equipment more efficiently. To illustrate, businesses reported upgrading old, inefficient commercial fridges to new energy efficient fridges; fixing seals on commercial fridges or freezers; servicing commercial fridges, freezers, and air-conditioners; changing inefficient 50W halogen downlights to efficient LED downlights; removing rarely-used fridges; changing temperature settings on air-conditioners and fridges to ensure efficient running; and

11

implementing new shut-down procedures at the end of each day to ensure all computers, lighting, and other equipment are switched off overnight.

TABLE 2 ABOUT HERE

5.1 Motivating Factors

Table 3 reports the factors that motivated SMEs to adopt energy efficiency measures, as detailed in the cluster leader reports. Of the 202 SMEs we analysed, 108 experienced a total of 134 motivating factors to engage in energy savings measures across seven categories, which we identified through the textual analysis. We grouped these categories into three overarching themes: financial, environmental, and compliance-driven. *Financial factors* include the desire to save money, *environmental factors* include the desire to become more sustainable or carbon neutral, and *compliance factors* include the desire to achieve a NABERS rating. The National Australian Built Environment Rating System (NABERS) measures the environmental performance of a premise and can be required by building owners. It is important to note that different businesses experienced different motivators and also different combinations of motivators. For example, one of the participating SMEs was the owner of a small food outlet and wanted to create a more environmentally sustainable business, as well as save money and learn best practice operation for the industry in which he operated. However, in the same cluster and in close geographic location, a café manager only wanted to save money because of poor business trading conditions.

TABLE 3 ABOUT HERE

12

5.2 Barriers

Table 4 summarises the barriers to adopting energy efficiency measures, also as detailed in the cluster leader reports (i.e., why businesses did or could not implement measures to reduce their energy consumption). Overall, 43 businesses reported 66 barriers across 13 categories, which we identified in our analysis and also grouped into overarching themes. *Financial factors* are an important barrier for SMEs; however, there were many other barriers under the themes of *management, organisational characteristics, premises*, and *staff*. It is important to note that different businesses experienced different barriers, and different combinations of barriers. Barriers are often idiosyncratic to the particular situation of the business (e.g., its staff, premises, organisational characteristics, and financial situation). For example, there were several retail outlets within one cluster and in a similar geographic area. The first shop reported tight trading conditions (a *financial factor)* as limiting their ability to invest capital in energy efficiency measures; the second shop reported both *financial factors* and *premise factors* as barriers; the third shop reported a *management/organisational factor* (other business priorities) and also a *premise factor* as barriers, and the fourth shop reported a *management/organisational factor* (the SME was waiting for head office to make decisions on the options provided by the cluster leader). It is evident that each business experiences a unique combination of barriers, even though operating in the same industry and the same geographic location.

TABLE 4 ABOUT HERE

In addition to the barriers presented in Table 4, there may also have been barriers due to a lack of information. Even though the individual SMEs did not specifically report information as barriers, some of the cluster leaders included comments in their final report, suggesting that a lack of information may have indeed been a barrier. For instance, cluster

leaders said they received many requests for further information relating to specific products and suppliers, and how to use or change-over to new products. Questions included, "How and where do I buy LEDs?" or "How do I change a halogen downlight to a LED downlight?" Lack of information and knowledge means that SMEs are often forced to rely on external contractors for advice and to undertake the work, contributing to the cost of making changes and creating potential *financial* barriers.

Cluster leaders and program staff responded to SME requests for more specific product information by displaying relevant items at workshops—a more hands-on approach to overcoming information shortages. In one instance, a cluster leader held a workshop at the local Bunnings store (a major Australian hardware chain) so participants could directly access relevant products and prices. A lack of information has implications for energy efficiency program design—if a lack of knowledge and information can be identified at the start of the program, information can be immediately channelled into the program.

It should be noted our research is based on SMEs with a pro-innovation bias, because they agreed to be part of a sustainability program, and may not reflect the broader SME business community. This limitation should be kept in mind when reading the recommendations in the following section.

6. Discussion

There is a clear difference in what motivates SMEs to become more energy efficient and what limits their ability to do so. Nearly twice as many motivators (134) were identified as barriers (66) and several businesses experienced multiple barriers. While much of the extant literature generally supports the argument that SMEs encounter significant barriers to successfully implementing energy efficiency or sustainability measures (due to their lower organisational resource endowments compared to larger firms), new insights gained from our case study analysis reveal the importance of motivating factors, which to date have been

14

underrepresented in the literature. The large number of motivators suggests that SME owners are considering the positive outcomes and not just limiting factors. Some SMEs potentially have an idealistic desire to change their business operations by taking part in the program.

It must be noted that there are seven categories of motivators, the most important being financial interest; and 13 categories of much more diverse barriers. Therefore, the overall impact of multiple barriers appears to be a critical factor inhibiting SMEs from successfully adopting energy efficiency measures. While the cluster leader reports do not provide sufficient data to analyse barriers along a time-line, they do support the notion that many SMEs encountered a combination of barriers across a period of time, which provides key insights into the nature of managing such barriers. This finding infers great complexity to the adoption of energy efficiency measures and we therefore suggest that not only are individual solutions to individual barriers required, but also a comprehensive solution that is flexible enough to meet the vast range of barriers along the transition to energy efficiency.

Two themes consistently emerge regarding the current state of research in the field: (1) that motivating factors have been neglected in favour of barriers, and (2) that the focus has been only one or few key barriers, rather than multiple barriers or multiple motivating factors (Fleiter et al., 2012; Thollander et al., 2007; Trianni and Cagno, 2012). A few exceptions to these points are recent work by Venmans (2014) which identifies motivators as well as barriers to energy efficiency measure uptake, although motivators and barriers were pre-selected to be discussed in interviews reflecting differences in Methodology with this study. Another study by Cagno and Trianni (2014) highlights a broad range of barriers to the adoption of energy efficiency measures in SMEs, yet the study does not acknowledge the existence of multiple barriers per organization as a key area on which to focus efforts. As with many studies in this area of research, both Venmans' (2014) and Cagno and Trianni's (2014) contributions are limited by the small case study size of 16 and 15 organizations

respectively. Despite the small sample size, and the fact the organizations were not participating in a voluntary energy efficiency program the research does provide further support for the variety of barriers found in this study and insights into motivating factors. Sardianou's 2008 study recognises that there are a broad range of barriers to energy efficiency (not specifically for SMEs); however, that paper focuses policy and management direction on only a few barriers; namely lack of financial incentives, limited knowledge dissemination, and under-investment in human capital. And finally work by Chai and Yeo's (2012) paper which offers one of the few frameworks relating to SME adoption of energy efficiency measures. This framework assists with the identification of multiple barriers, but the authors acknowledge that it was not designed to be applied across industries or business types. Therefore it is too specific to provide a general framework.

Other research, based on a small number of businesses, considers whether tools or checklists can help SMEs become more energy efficient. This research makes only a few high-level suggestions; for instance, that incentives and other support programs should be timely and appropriate for SMEs (Côté et al., 2006). Again, these recommendations only address one or a few individual barriers; for example, that SMEs can overcome cost barriers by creating financing options (Fleiter et al., 2012).

To date, the literature has not attempted to comprehensively diagnose the situations of the SMEs that choose to participate in energy efficiency programs, in order to determine the best strategy for their future success. However, several authors have argued that such an approach is essential. For instance, Weick (1984) emphasises the importance of building on positive experiences and providing recognition to increase the likelihood of future success. This approach aims to break down existing large barriers into several small problems, with each small success building momentum to deal with future problems (see also OECD, 2002). These 'small wins' can generate systemic change on a larger scale (Dunphy et al., 2007).

16

7. Recommendations and Implications

We propose the framework shown in Figure 1 as tool for improving the take-up rates of energy efficiency measures in SME energy efficiency programs, based on our findings. The model is based on an adaptive management approach and recognises that it is important to investigate both barriers and motivators in order to gain a comprehensive picture of the factors that enable and inhibit the uptake of energy savings measures. The framework includes regular reviews to recognise success and identify progress. Energy efficiency measures may be thought of as one-off implementations of technology or behaviour change, but their success usually only occurs over time.

Energy efficiency programs, such as the ClimateSmart Business Cluster Program, often encourage SMEs to continually improve their energy efficiency; likewise, our proposed framework includes continued identification and implementation of energy savings or sustainability measures. The framework draws on the principles of small wins, discussed above. This allows sustainability programs to be managed adaptively, helping program managers cope with uncertainty about methods or future conditions (Lopez-Gamero et al., 2011; Michael and Kim, 2005). Small and adaptive steps benefit program management, organisational change, and rates of adoption of energy efficiency innovations (de Villiers et al., 2011; Dunphy et al., 2007; OECD, 2002).

FIGURE 1 ABOUT HERE

The findings of Hardie and Newell (2011) support the argument that it is important to recognise motivators and barriers for each individual firm. These authors noted that there is such a broad range of differences within businesses in a single industry that it is almost impossible to deliver a successful "one size fits all" program. Trianni and Cagno (2012) also argue that small, medium, and medium to large enterprises all experience different barriers to

adopting energy efficiency measures. Their research reveals that it should be avoided to bundle enterprises with different characteristics. Instead energy efficiency programs should accommodate differences between businesses.

Consultants and energy efficiency program designers have a complex task in addressing such a broad variety of potential barriers. The motivators and barriers identified should be acknowledged or addressed where possible in the design and implementation of an energy efficiency program. Understanding the barriers and motivators upfront will help to identify and promptly address issues as they arise during the implementation of the program, making efficient use of program resources and maximising program outcomes. Knowing what motivated an SME to become more energy efficient the first place can help overcome barriers, because this information can be used to keep SMEs on track for their goals.

Another benefit of paying close attention to barriers and motivators during the design and implementation phase of an energy efficiency or sustainability program is that this approach will reveal changes to motivators and barriers over time (Taylor and Murphy, 2004). These changes might include shifts in legislation, technology, prices, and consumer or supply chain conditions. Ideally, energy efficiency and sustainability programs should be designed to avoid the barriers that are relevant to participants and maximise the benefits of their motivators. For example, understanding the premise agreement, decision-making process, and capital investment capacity of the business at the beginning of the program would allow potential barriers to be identified early on. Program efforts and resources can then be directed to the strategies that are likely to succeed within these boundaries, allowing important items to be confirmed at the beginning of the program, such getting company management or building owners to agree on inputs or on acceptable returns on investment.

The ClimateSmart Business Cluster program followed many of the steps outlined in Figure 1 by providing support in the form of a consultant who assisted the participating

18

businesses over a period of six to twelve months. However, the SMEs continued to experience barriers because the consultants were not able to overcome firm-specific financial and organisational barriers. Also, program time and resources can be wasted when all relevant barriers are not identified early; these barriers include business decision-making processes, available investment capital, acceptable return on investment for capital expenditure, and the amount of time available for participating in the program.

The framework presented in Figure 1 will not solve all obstacles, especially those relating to premise issues which rely on an external stakeholder who may choose not to be involved in the program nor permit changes to be made to the premise. However, raising potential motivators and barriers with participating businesses early and continually throughout the program helps targeting specific areas to achieve the best outcomes for adopting energy efficiency measures.

8. Pathways for Future Research and Concluding Remarks

The current study opens many pathways for further research. Further insights are needed into the tools that can assist SMEs develop innovative approaches to energy efficiency. For instance, what would an adaptive policy approach look like when designing and implementing energy efficiency or sustainability programs to ensure that problems are identified early and strategies are modified appropriately? Further research could also assess the effectiveness of financing options for SMEs, such as government grants, bill financing, and leasing.

Our analysis of 202 SMEs identified their key motivators as saving money and meeting industry environmental requirements. Their barriers were the cost of implementation, management and organizational limitations, staff engagement, and issues related to leasing premises. We therefore suggest that further research could be conducted into how these factors related to each other in order to better understand what prevents business from, and

19

motivates them to participate in energy efficiency programs. This should help to avoid some obstacles, and manage any remaining barriers with the assistance of knowledge about motivating factors. Our paper contributes to the literature by identifying some of the motivators for, and barriers to, SMEs adopting energy efficiency measures. This is the first paper to emphasise that energy efficiency programs must address a wide variety of barriers, and detect them early. We hope that this research improves the outcomes of energy efficiency and sustainability programs and supports SMEs to adopt such measures, by helping to identify and manage their barriers and motivating factors.

REFERENCES

Abbott, C., Jeong, K., Allen, S. 2006. The economic motivation for innovation in small construction companies. Constr. Innov. 6(3), 187-196.

Australian Bureau of Statistics. 2010. Energy, Water and Environment Management, 2008-09. Australian Government, Canberra, Australia.

Australian Bureau of Statistics. 2012. Counts of Australian Businesses, including Entries and Exits, Jan 2007 to Jun 2011. Australian Government, Canberra, Australia.

Aragón-Correa, J.A., Hurtado-Torres, N., Sharma, S., García-Morales, V.J. 2008. Environmental strategy and performance in small firms: a resource-based perspective. J. Environ. Manage. 86(1), 88-103.

Beattie, V., McInnes, B., Fearnley, S. 2004. A methodology for analysing and evaluating narratives in annual reports: a comprehensive descriptive profile and metrics for disclosure quality attributes. Accounting Forum 28(3), 205-236.

Buysse, K., Verbeke, A. 2003. Proactive environmental strategies: a stakeholder management perspective. Strat. Manage. J. 24(5), 453-470.

Cagno, E.,Worrell, E., Trianni, A., Pugliese, G., 2013. A novel approach for barriers to industrial energy efficiency. Renew. Sustain. Energy Rev. 19, 290e308.

Cagno, E. and A. Trianni (2014). "Evaluating the barriers to specific industrial energy efficiency measures: an exploratory study in small and medium-sized enterprises." Journal of Cleaner Production 82: 70-83.

Chai, K.-H., Yeo, C. 2012. Overcoming energy efficiency barriers through systems approach – A conceptual framework. Energ. Policy 46, 460-472.

Côté, R., Booth, A., Louis, B. 2006. Eco-efficiency and SMEs in Nova Scotia, Canada. J. Clean. Prod. 14(6-7), 542-550.

de Villiers, C., Naiker, V., van Staden, C.J. 2011. The effect of board characteristics on firm environmental performance. J. Manage. 37(6), 1636-1663.

Deakins, D., Freel, M. 1998. Entrepreneurial learning and the growth process in SMEs. The Learning Organization 5(3), 144-155.

DeCanio, S.J. 1993. Barriers within firms to energy-efficient investments. Energ. Policy 21(9), 906-914.

DECC (Department of Energy and Climate Change). 2009. Engaging SMEs to improve their Energy Efficiency A Market Appraisal (Electricity and Gas). Department of Energy and Climate Change, United Kingdom.

Dunphy, D., Griffiths, A., Benn, S. 2007. Organizational Change for Corporate Sustainability: A Guide for Leaders and Change Agents of the Future. Routledge, London, UK.

Eisenhardt, K.M. 1989. Building theories from case study research. Acad. Manage. Rev. 14(4), 532-550.

Fleiter, T., Schleich, J., Ravivanpong, P. 2012. Adoption of energy-efficiency measures in SMEs - an empirical analysis based on energy audit data from Germany. Energ. Policy 51, 863-875.

Hardie, M., Newell, G. 2011. Factors influencing technical innovation in construction SMEs: an Australian perspective. Engineering, Construction and Architectural Management 18(6), 618-636.

Hillary, R. 2004. Environmental management systems and the smaller enterprise. J. Clean. Prod. 12(6), 561-569.

Hirst, E., Brown, M. 1990. Closing the efficiency gap - barriers to the efficient use of energy. Resour. Conserv. Recy. 3(4), 267-281.

Hirst, E., Fulkerson, W., Carlsmith, R., Wilbanks, T. 1982. Improving energy efficiency - the effectiveness of government action. Energ. Policy 10(2), 131-142.

Killick, W. 2009. Engagement of Small-to Medium-sized Enterprises in Energy Efficiency in Australia: A Review of the Facilitative Walkthrough Approach. Murdoch University. Faculty of Minerals and Energy.

Kitazawa, S., Sarkis, J. 2000. The relationship between ISO 14001 and continuous source reduction programs. Int. J. Oper. Prod. Man. 20(2), 225-248.

Lopez-Gamero, M.D., Molina-Azorin, J.F., Claver-Cortes, E. 2011. Environmental uncertainty and environmental management perception: a multiple case study. J. Bus. Res. 64(4), 427-435.

Loucks, E.S., Martens, M.L., Cho, C.H. 2010. Engaging small- and medium-sized businesses in sustainability. Sustainability Accounting, Management and Policy Journal 1(2), 178-200.

McKeiver, C., Gadenne, D. 2005. Environmental management systems in small and medium businesses. Int. Small Bus. J. 23(5), 513-537.

Michael, S.C., Kim, S.M. 2005. The organizational ecology of retailing: a historical perspective. J. Retailing, 81(2). 113-123.

OECD. 2002. OECD Small and Medium Enterprise Outlook 2002. OECD Publishing.

Revell, A., Blackburn, R. 2007. The business case for sustainability? An examination of small firms in the UK's construction and restaurant sectors. Bus. Strat. Environ. 16(6), 404-420.

Russo, M.V., Fouts, P.A. 1997. A resource-based perspective on corporate environmental performance and profitability. Acad. Manage. J. 40(3), 534-559.

Sardianou, E. 2008. Barriers to industrial energy efficiency investments in Greece. J. Clean. Prod. 16(13), 1416-1423.

Sharma, S. 2000. Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy. Acad. Manage. J. 43(4), 681-697.

Taylor, M., Murphy, A. 2004. SMEs and the take-up of e-business. Urban Geogr. 25(4), 315-331.

The Australian. 2012. Queensland is leading the nation in reducing greenhouse gas emissions, but is still the highest polluter per capita, a new report shows. The Australian Newspaper: AAP.

Thollander, P., Danestig, M., Rohdin, P. 2007. Energy policies for increased industrial energy efficiency: evaluation of a local energy programme for manufacturing SMEs. Energ. Policy 35(11), 5774-5783.

Trianni, A., Cagno, E. 2012. Dealing with barriers to energy efficiency and SMEs: some empirical evidences. Energ. 37(1), 494-504.

Venmans, F. (2014). "Triggers and barriers to energy efficiency measures in the ceramic, cement and lime sectors." Journal of Cleaner Production 69: 133-142.

Walker, B., Redmond, J., Sheridan, L., Wang, C., Goeft, U. 2008. Small and medium enterprises and the environment: barriers, drivers, innovation and best practice. A review of the literature. Small & Medium Enterprise Research Centre.

Weber, L. 1997. Some reflections on barriers to the efficient use of energy. Energ. Policy 25(10), 833-835.

Weick, K. E. (1984). "Small wins: Redefining the scale of social problems." American Psychologist 39(1): 40-49.

Table 1

Composition of SMEs in the Case Study

Industry Category	Number of businesses in case study	Percentage of total businesses in case study	Percentage of total businesses in Australian economy at June 2011
A Agriculture, Forestry and Fishing	0	0%	9.3%
B Mining	0	0%	0.4%
C Manufacturing	21	10%	4.2%
D Electricity, Gas, Water and Waste Services	0	0%	0.3%
E Construction	11	5%	16.5%
F Wholesale Trade	5	3%	3.7%
G Retail Trade	53	26%	6.7%
H Accommodation and Food Services	42	21%	3.8%
I Transport, Postal and Warehousing	2	1%	6.2%
J Information Media and Telecommunications	0	0%	0.9%
K Financial and Insurance Services	2	1%	7.7%
L Rental, Hiring and Real Estate Services	2	1%	10.6%
M Professional, Scientific and Technical Services	19	9%	11.8%
N Administrative and Support Services	2	1%	3.9%
O Public Administration and Safety	0	0%	0.4%
P Education and Training	1	1%	1.2%
Q Health Care and Social Assistance	23	11%	4.7%
R Arts and Recreation Services	9	5%	1.3%
S Other Services & Unknown	10	5%	6.4%
Total	202	100%	100.0%

Table 2

Number of Businesses to Implement Energy Efficiency Changes

Industry Category	Number of businesses in case study	Number of businesses implementing changes[1]	Percentage of businesses implementing changes[1]
A Agriculture, Forestry and Fishing	0	0	0%
B Mining	0	0	0%
C Manufacturing	21	16	76%
D Electricity, Gas, Water and Waste Services	0	0	0%
E Construction	11	9	82%
F Wholesale Trade	5	5	100%
G Retail Trade	53	44	83%
H Accommodation and Food Services	42	36	86%
I Transport, Postal and Warehousing	2	2	100%
J Information Media and Telecommunications	0	0	0%
K Financial and Insurance Services	2	2	100%
L Rental, Hiring and Real Estate Services	2	2	100%
M Professional, Scientific and Technical Services	19	17	90%
N Administrative and Support Services	2	2	100%
O Public Administration and Safety	0	0	0%
P Education and Training	1	0	0%
Q Health Care and Social Assistance	23	19	83%
R Arts and Recreation Services	9	8	89%
S Other Services & Unknown	10	6	60%
Total	202	168	83%

[1] includes behavioural changes

Table 3

Motivating Factors

| Motivators / Drivers	Number of times recorded in the Final Report for each cluster	Percentage of respondents to experience motivator / driver[1]	Theme
Financial interests – reduce energy costs, potentially access funding or become an ecoBiz Partner, reduce Economic Regulation Authority (ERA) licensing fees	96	89%	Financial 98%
Marketing – obtain market advantage by promoting environmental achievements	10	9%	
Meet environmental quality standards for industry / NABERS Rating / Environmental Management Plan	13	12%	Compliance-driven 14%
Learn about best practice for the business type	2	2%	
Lower the carbon footprint of the business / reduce carbon emissions	5	5%	Environmental 13%
Reduce impact on the environment	6	6%	
Become a more sustainable organisation	2	2%	
Total	134	Does not add up to 100% as some businesses experienced multiple motivators	

[1] Out of 108 businesses which experienced a total of 134 motivating factors

Table 4

Barriers

Barriers	Number of times recorded in the Final Report for each cluster	Percentage of respondents to experience barrier[1]	Theme
Cost prohibitive (even if ROI in less than 24 months)	14	33%	Financial 33%
Waiting for access to funds through organisational process	2	5%	Management / Organisational characteristics 49%
Lack of time / staff commitments in other areas (OH&S)	9	21%	
Waiting for head office to drive and fund changes	1	2%	
Intention of selling business	3	7%	
General low morale of businesses, for example tough economic times	5	12%	
Change in management	1	2%	
Renting premises - unable to control temperature of air-conditioner (multiple retail outlets in one building)	1	2%	Premises 37%
Renting premises – unable to make physical changes to premise	7	16%	
Renting premises - unable to obtain information from landlords controlling electricity accounts (electricity on-sell arrangements)	6	14%	
Owning or renting premises - waiting for large scale refurbishment / renovation	2	5%	
Lack of "sustainability champion" / skilled staff member responsible for driving changes	1	2%	Staff 35%
Lack of staff engagement or negative attitude from staff towards changes	14	33%	
Total	66	Does not add up to 100% as some SMEs experienced multiple barriers	

[1] Out of 43 businesses which reported 66 barriers

Figure 1

Improving the adoption of energy efficiency measures in small- and medium-sized enterprise (SME) energy efficiency programs
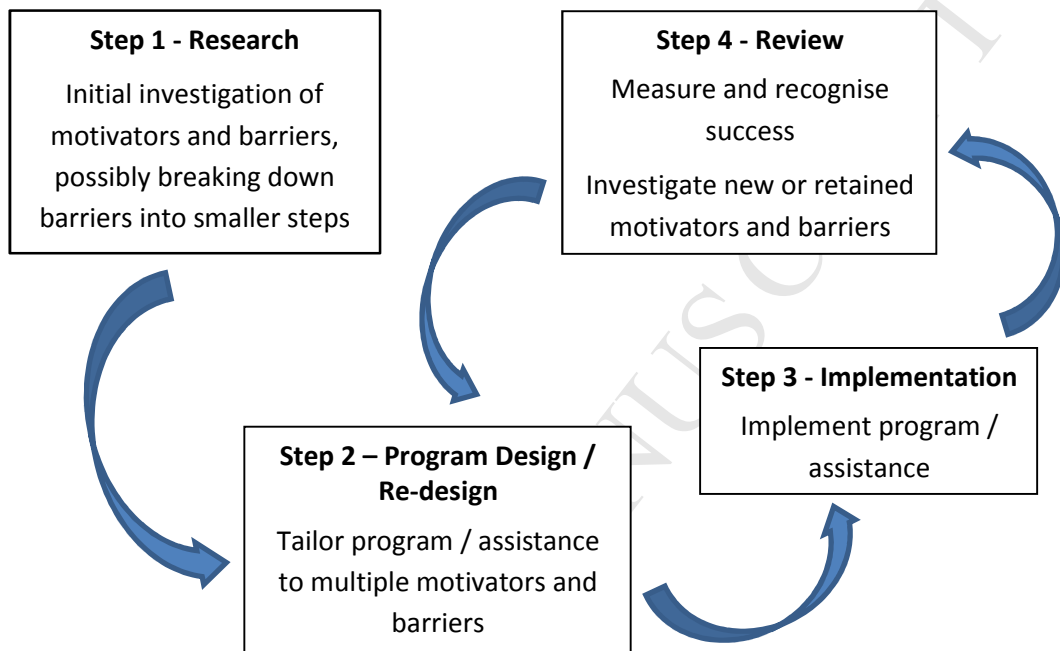
Research Highlights

Analyses motivators and barriers impacting the uptake of energy savings measures by SMEs.

SMEs experienced a large variety of barriers and motivators.

Identifies factors for the successful design of a voluntary SME energy efficiency program.

Proposes allowing for flexibility in the design and implementation of such programs.

Recommends identifying motivators and barriers upfront to tailor voluntary programs to SME needs.