

10. Conclusion

This thesis set out to contribute new perspectives on the dynamics of institutional change in order to provide important contributions to the academic literature. In terms of practice, the aim has been to provide insights into the actions that policymakers and other stakeholders can take to accelerate the adoption of effective energy management practices in organisations.

Chapter 2 outlined the reasons why energy efficiency is an urgent economic, social and environmental issue. Chapters 3 and 4 then examined the academic energy efficiency literature to identify what is known about ‘the energy efficiency gap’ and the role that energy management practices can play in resolving it. From the review of the energy efficiency literature, the primary research question examined in this thesis emerged. That is:

How and why do energy management practices change?

This question has been supported by three secondary research questions.

1. How do corporate personnel with responsibility for energy efficiency improvement influence the development and adoption of energy management practices?
2. How do different stakeholders influence change?
3. What are the triggers that precipitate change in energy management practices?

Chapter 5 outlined the theoretical framework for the thesis by reviewing the institutional theory and institutional entrepreneurship literatures. It was argued that institutional theory provides an appropriate theoretical framework to meet the research aims. Review of these literatures informed the model developed for the analysis which incorporates four central characteristics. The model:

- supports multi-level analysis
- exposes the skills and strategies of individual ‘institutional entrepreneurs’
- accounts for the interactions between multiple stakeholders as they influence

institutional change, and

- supports analysis of the dynamic process of changing practices over time.

Chapter 6 then described the research design in detail including the reasons for and features of the embedded, single-case study design, the sources of data and the analysis techniques applied in the research.

The case study of changing energy management practices in Australia 2006–2012 was presented in Chapters 7 and 8. The case began with an explanation of the historical context that informs energy efficiency policy in Australia. It then examined the energy management practices that were applied in large energy consuming organisations as they initially responded to the EEO legislation which commenced in July 2006. Then, the rising interests of stakeholders in the organisational field were identified before the process of changing and maintaining new energy management practices was examined.

Chapter 9 discussed the findings from the research within and across the different levels of analysis. These are, the organisational field, the organisational and the project-levels. Four conditions that support successful institutional change as a process of collaborative co-creation emerged from the research. These conditions are that:

- stakeholders with multiple levels of embeddedness are engaged in the change process
- roles emerge for institutional entrepreneurs
- collaboration is created through the enactment of constructive social skills, and
- change is underpinned by shifts in institutional logic, by which diverse stakeholders develop shared understanding of newly-created energy management practices.

The implications of the research for energy efficiency policy development were then considered. It was argued that energy efficiency policy measures should aim to be:

- *Connected*. That is, policies should encourage a wide range of stakeholders to

engage in the process of energy efficiency improvement. This includes greater collaboration between government departments with energy efficiency-related policies.

- *Enduring*. Policy-makers should aim to create policy and program stability over a period of time to provide organisations with a level of consistency that can help them to develop and adopt new energy management practices.
- *Flexible*. This can improve the extent to which policies influence change by targeting the different capabilities and degrees of energy management sophistication within organisations.

The thesis offers the following contributions to the academic literature:

1. Original and empirically tested insights into the conditions that support institutional change as a process of ‘collaborative co-creation’
2. Novel insights into how and why the interactions between stakeholders with varying degrees of social embeddedness play an important part in the dynamic processes of institutional change
3. New perspectives on the role and social skills of individuals in institutional change, and
4. New perspectives on the energy efficiency gap and how it can be resolved through the adoption of effective energy management practices.

A number of important opportunities for future research were identified. In particular, it was highlighted that by applying the model developed in this thesis to examine the adoption of energy management practices within other country and industry specific contexts, further understanding of institutional change and ways to accelerate the uptake of effective energy management practices will be forthcoming.

Ultimately the motivation of this research has been to inform action that will accelerate the implementation of energy efficiency projects to deliver on the significant economic, social and environmental benefits that energy efficiency offers. It is hoped that this research can play a small part in sharing the experiences of effective practitioners and to highlight the power of effective communication and collaboration to create value for people and society as we address the urgent need to minimise the economic, social and environmental impacts of climate change.

11. Appendices

11.1 Conference papers and presentations

Table 11.1: Conference papers and presentations

Authors, date and title	Conference
Crittenden, P. & Lewis, H. 2011 'Accelerating the uptake of energy efficiency in industry – a case study of the Australian Energy Efficiency Opportunities program'.	Energy efficiency first: The foundation of a low-carbon society, European Council for an Energy Efficient Economy 2011 Summer Study, Belambra Presqu'île de Giens, France.
Crittenden, P. 2011 'Transforming energy sub meter data into results in commercial buildings – evaluation of an innovative training program in Sydney, Australia'.	Behavior, Energy and Climate Change (BECC) Conference Nov. 29 – Dec. 1 2011, Washington, DC.
Crittenden, P. & Lewis, H. 2012 'Influencing financial decisions on energy efficiency: six key strategies to build management support'.	American Council for an Energy-Efficient Economy, Summer Study on Energy Efficiency in Buildings, Pacific Grove, California, USA.
Crittenden, P. 2012 'Integrating energy efficiency into core business practices: An institutional work perspective on the implementation of energy management systems'.	European Council for an Energy Efficient Economy, Industrial Summer Study, Arnhem, the Netherlands.

11.2 Interview questions

- Please briefly describe your role and responsibilities with regard to energy management in your organisation.
 - How long have you been in this role in your organisation?
 - Has the nature of your role changed over the past few years?
 - If so, how has it changed?

- Are there any specific events (within or external to your organisation) that you can recall that had a strong influence on the way in which your organisation has viewed energy management over the past few years?

- Do you consider that your organisational stakeholders have a greater interest in your organisations approach to energy management than they did five years ago?
 - If so, who are the key stakeholders that have an interest in energy management?
 - How have those stakeholders influenced your organisations approach to energy management?

- When the Energy Efficiency Opportunities (EEO) legislation commenced in 2006, how did your organisation conduct the first energy efficiency assessments required under the legislation?
 - To what extent did you use consultants external to your organisation?
 - What was the rationale for using external consultants?
 - To what extent did you use internal staff?

- What was learnt from the way in which these first assessments were conducted?
 - Describe what worked well and why.
 - Describe what didn't work well and why

- How did your organisations approach to conducting energy efficiency assessments change when subsequent energy efficiency assessments were conducted?

- How does your organisation intend to approach energy efficiency assessments differently in the second five-year energy Assessment Cycle of the Energy Efficiency Opportunities program (i.e. the period 2011-2016)?

- Reflecting on your own role, what actions have you taken to influence the way in which energy management is conducted in your organisation?

- What do you consider the main benefits of energy management to be?

- Has your or your organisation's view of the main benefits of energy management changed over the past few years?
 - If so, why do you think they have changed?

11.3 Key elements and requirements of the EEO Assessment Framework

The 'EEO Assessment Framework' outlines the key requirements that companies have to meet in order to comply with the EEO legislation. A detailed summary of those key requirements are provided in Table 11.2.

Table 11.2: Summary of the key requirements of the EEO Assessment Framework

Key element	Summary of the key requirements
1. Leadership	<ul style="list-style-type: none"> • Sufficient resources are made available to enable a rigorous and comprehensive assessment to be completed. • Senior management support for the assessment must be communicated clearly, and includes energy efficiency assessment or energy use objectives. This is intended to provide direction, legitimacy and encouragement from senior and operational management to those involved in the assessment.
2. People	<p>Personnel with the appropriate level of technical expertise, as well as personnel who influence energy use on a daily basis through operational decisions, are involved in the assessment to:</p> <ul style="list-style-type: none"> • broaden the pool of potential opportunities identified by drawing on a range of perspectives and experience • improve understanding of the full range of costs, benefits and implementation issues associated with each of the opportunities • build ownership and motivation for the implementation of projects across functional and professional boundaries • encourage the involvement of people in the assessment process who will be necessary for the project to be funded.
3. Information, data and analysis	<ul style="list-style-type: none"> • Business contextual information is considered so that energy efficiency projects can be reviewed within the context of other business priorities. • The accuracy of facility-level data must be within $\pm 5\%$ for each fuel type. • Energy analysis tools, such as an energy mass balance, are used to encourage consideration and evaluation of opportunities at different

Key element	Summary of the key requirements
	<p>levels of the business, including:</p> <ul style="list-style-type: none"> – system-wide opportunities – within sub-system opportunities – opportunities for individual processes, and – opportunities associated with individual items of equipment. <ul style="list-style-type: none"> • An energy mass balance identifies where energy is used and ‘lost’. Companies are asked to think about the theoretical minimum level of energy use rather than industry benchmarks to identify areas of unnecessary energy use. • A range of data analysis approaches must be applied to improve the rigour and comprehensiveness of the assessment, including the identification and evaluation of opportunities.
4. Opportunity identification and evaluation	<ul style="list-style-type: none"> • A systematic process combining the analysis of energy and production data with review and interrogation by a range of personnel must be part of the assessment to broaden the pool of potential opportunities identified. • The process encourages personnel within the firm to share their ideas openly. • The process encourages unsubstantiated assumptions to be tested using objective data, combined with evidence-based analysis to challenge individual and group assumptions about energy use and production processes. • All opportunities with a potential four-year payback must be evaluated. • Detailed investigation is conducted to an accuracy level of $\pm 30\%$. • All quantifiable business costs and benefits must be included in the evaluation of opportunities to provide a more complete evaluation, rather than the sole focus being on energy-related costs and benefits.

Key element	Summary of the key requirements
5. Decision-making	<ul style="list-style-type: none"> • Managers responsible for investment decisions must review and then determine the business response to each of the identified opportunities evaluated. • Timelines, resources and accountabilities are allocated for projects to be adopted or evaluated further.
6. Communicating outcomes	<ul style="list-style-type: none"> • Senior management and the board must review and note the outcomes of the assessment and consider these in relation to strategic business issues, including energy. • Senior management and the board must review the EEO report each year. • The outcomes from the assessment must be communicated by senior managers to those involved in the assessment and across the organisation.

(Source: Crittenden & Lewis 2011, p. 800)

11.4 Data sources for the empirical research

	Code	Job title	Sector	Involvement	Year
1	Presenter AA	GM Carbon & Energy	Mining	Presentation	2011
2	Presenter AB	Chief Engineer	Manufacturing	Presentation	2011
3	Presenter AC	Energy Analyst	Manufacturing	Presentation	2011
4	Presenter AD	Principal Greenhouse & Energy	Manufacturing	Presentation	2011
5	Presenter AE	Energy Engineer	Manufacturing	Presentation	2011
6	Presenter AF	Group Environment Manager	Mining	Presentation	2011
7	Presenter AG	Manager Energy and Emissions Projects	Mining	Presentation	2011
8	Presenter AH	Manager Greenhouse & Sustainability	Mining	Presentation	2011
9	Presenter AI	Maintenance Superintendent	Transport	Presentation	2011
10	Presenter AJ	Principal Energy Efficiency Engineer	Manufacturing	Presentation	2011
11	Presenter AK	Manager, Climate Change and Environment	Commercial	Presentation	2011
12	Presenter AL	Energy Project Engineer	Manufacturing	Presentation	2011
13	Presenter	Head of	Commercial	Presentation	2011

	Code	Job title	Sector	Involvement	Year
	AM	Sustainability			
14	Presenter AN	Director of Consultancy	Commercial	Presentation	2011
15	Presenter AO	Director of Consultancy	Commercial	Presentation	2011
16	Presenter AP	Energy & Sustainability Manager	Commercial	Presentation	2011
17	Presenter AQ	Sustainability Manager	Commercial	Presentation	2011
18	Presenter AR	Head of Finance Products	Commercial	Presentation	2011
19	Presenter AS	Chief Financial Officer	Commercial	Presentation	2011
20	Presenter AT	Sustainability Analyst	Manufacturing	Presentation	2011
21	Presenter AU	Infrastructure Capability Manager	Manufacturing	Presentation	2011
22	Presenter AV	Project Manager Energy Efficiency	Manufacturing	Presentation	2011
23	Presenter AW	Group and Risk Sustainability Manager	*Multi-sector	Presentation	2011
24	Presenter AX	Senior Consultant	Transport	Presentation	2011
25	Presenter AY	Senior Consultant	Manufacturing	Presentation	2011
26	Presenter AZ	Senior Environmental Advisor	Manufacturing	Presentation	2011
27	Presenter	Sustainability	*Multi-sector	Presentation	2011

	Code	Job title	Sector	Involvement	Year
	BA	Manager,			
28	Presenter BB	Energy Champion	Manufacturing	Presentation	2011
29	Presenter BC	Superintendent Energy	Mining	Presentation	2011
30	Presenter BD	Energy Coordinator	Mining	Presentation	2011
31	Presenter BE	Product Manager	Mining	Presentation	2011
32	Presenter BF	Senior Consultant	Mining	Presentation	2011
33	Presenter BG	Senior Consultant	Mining	Presentation	2011
34	Presenter BH	Energy and Carbon Manager	Commercial	Presentation	2012
35	Presenter BI	Greenhouse and Energy Advisor	Mining	Presentation	2012
36	Presenter BJ	Chief Engineer	Manufacturing	Presentation	2012
37	Presenter BK	Strategic Projects Manager	Mining	Presentation	2012
38	Presenter BL	Manager Sustainability	Commercial	Presentation	2012
39	Presenter BM	Greenhouse and Energy Advisor	Manufacturing	Presentation	2012
40	Presenter BN	Carbon Policy Manager	Electricity generation	Presentation	2012
41	Presenter BO	Energy Analyst	Manufacturing	Presentation	2012
42	Presenter BP	Group Sustainability Manager	Manufacturing	Presentation	2012

	Code	Job title	Sector	Involvement	Year
43	Presenter BQ	Senior Environmental Specialist	Transport	Presentation	2012
44	Presenter BR	Energy Manager	Utilities	Presentation	2012
45	Presenter BS	Climate Change Manager	Multi sector	Presentation	2012
46	Presenter BT	Sustainability Manager	Commercial	Presentation	2012
47	Presenter BU	General Manager Sustainability	Commercial	Presentation	2012
48	Presenter BV	Manager Resource Efficiency and Climate Change	Manufacturing	Presentation	2012
49	Presenter BW	Environmental Advisor	Commercial	Presentation	2012
50	Presenter BX	Environmental Programs Manager	Transport	Presentation	2012
51	Presenter BY	Senior Environmental Advisor	Manufacturing	Presentation	2012
52	Presenter BZ	Environmental Systems Manager	Manufacturing	Presentation	2012
53	Presenter CA	Environmental Manager	Transport	Presentation	2012
54	Presenter CB	Technical Manager	Manufacturing	Presentation	2012
55	Presenter CC	Environment Advisor	Manufacturing	Presentation	2012
56	Presenter CD	Environmental Sustainability Manager	Commercial	Presentation	2012

	Code	Job title	Sector	Involvement	Year
57	Presenter CE	Energy Manager	Mining	Presentation	2012
58	Presenter CF	Energy and Carbon	Manufacturing / resource processing	Presentation	2012
59	Presenter CG	Manager	Manufacturing	Presentation	2012
60	Presenter CH	Manager Environment & Sustainability	Mining	Presentation	2012
61	Presenter CI	Principal Consultant	Mining	Presentation	2012
62	Presenter CJ	Senior Consultant	Mining	Presentation	2012
63	Interviewee CK	Sustainability Manager	Commercial	Interview	2013
64	Interviewee CL	Principal Climate Change and Energy Efficiency	Mining	Interview	2013
65	Interviewee CM	Climate Change and Resource Efficiency Manager	Multi sector	Interview	2013
66	Interviewee CN	Business Development Manager	Transport	Interview	2013
67	Interviewee CO	Environmental Manager	Transport	Interview	2013
68	Interviewee CP	Project Manager Energy Efficiency	Manufacturing	Interview	2013
69	Interviewee CQ	Principal Energy Advisor	Mining	Interview	2013

	Code	Job title	Sector	Involvement	Year
70	Interviewee CR	Principal Energy Efficiency Engineer	Manufacturing	Interview	2013
71	Interviewee CS	Manager Carbon and Energy	Mining	Interview	2013
72	Case CT	Iluka Resources: case study 2011 http://www.ret.gov.au/energy/documents/energyefficiencyopps/res-material/iluka-resources-ltd.pdf	Manufacturing	Archival	2011
73	Case CU	Fortescue Metals Group http://eeo.govspace.gov.au/files/2012/11/Analyses-of-Diesel-Use-for-Mine-Haul-and-Transport-Operations.pdf	Mining	Archival	2011
74	Case CV	Downer EDI Mining Pty Ltd http://eeo.govspace.gov.au/files/2012/11/Analyses-of-Diesel-Use-for-Mine-Haul-and-Transport-Operations.pdf	Mining	Archival	2011
75	Case CW	Leighton Contractors Pty Ltd http://eeo.govspace.gov.au/files/2012/11/Analyses-of-Diesel-Use-for-Mine-Haul-and-Transport-Operations.pdf	Mining	Archival	2011

	Code	Job title	Sector	Involvement	Year
76	Case CX	Thiess Australia's Mining Business Unit: case study 2010 http://eeo.govspace.gov.au/files/2012/11/Thiess-Australian-Mining-Business-Unit.pdf	Mining	Archival	2010
77	Case CY	OneSteel - Newcastle Rod Mill: case study 2010 http://eeo.govspace.gov.au/files/2012/11/OneSteel-Case-Study.pdf	Manufacturing	Archival	2010
78	Case CZ	Nyrstar - Port Pirie Smelter: case study 2009 http://eeo.govspace.gov.au/files/2012/11/Midland-Brick-case-study.pdf	Manufacturing	Archival	2009
79	Case DA	Midland Brick: case study update 2009 http://www.ret.gov.au/energy/Documents/energyefficiencyopps/PDF/Industry%20Case%20Study%20Midland%20Brick%20update.pdf	Manufacturing	Archival	2009
80	Case DB	Incitec Pivot - Gibson Island: case study 2009 http://eeo.govspace.gov	Manufacturing	Archival	2009

	Code	Job title	Sector	Involvement	Year
		.au/files/2012/11/Incite c-Pivot-case-study.pdf			
81	Case DC	Alcoa Pinjarra: case study 2008 http://eeo.govspace.gov .au/files/2012/11/Alcoa- -Case-Study.pdf	Manufacturing	Archival	2008
82	Case DD	Xstrata Copper: case study 2007 http://eeo.govspace.gov .au/files/2012/11/Xstrat a-Copper.pdf	Manufacturing	Archival	2007
83	Case DE	Orica: case study 2007 http://eeo.govspace.gov .au/files/2012/11/Orica. pdf	Manufacturing	Archival	2007
84	Case DF	Bunker Freight Lines: case study 2008 http://eeo.govspace.gov .au/files/2012/11/Bunk er-Freight-Lines-case- study.pdf	Transport	Archival	2008
85	Case DG	Woolworths http://eex.gov.au/case- study/woolworths- evaluating-customer- feedback-on- refrigerated-display- case-doors/	Commercial	Archival	2012
86	Case DH	The GPT Group http://eex.gov.au/case- study/the-gpt-group- energy-performance- contracting-for-	Commercial	Archival	2012

	Code	Job title	Sector	Involvement	Year
		cogeneration-and-energy-efficiency-initiatives-at-530-collins-st-melbourne/			
87	Case DI	Spotless http://eex.gov.au/case-study/spotless-group-approach-to-energy-efficiency/	Commercial	Archival	2012
88	Case DJ	National Australia Bank http://eex.gov.au/case-study/nab/	Commercial	Archival	2012
89	Case DK	Sydney Water http://eex.gov.au/case-study/sydney-water-intermittent-mixing-in-sewage-treatment-plants/	Utility	Archival	2012
90	Case DL	Simplot http://eex.gov.au/case-study/simplot-refrigeration-at-the-bathurst-plant/	Manufacturing	Archival	2012
91	Case DM	Foster's Group http://eex.gov.au/case-study/fosters-group-boiler-upgrade-at-cascade-brewery/	Manufacturing	Archival	2012
92	Case DN	Centennial Coal http://eex.gov.au/case-study/centennial-coal-supporting-project-implementation-through-an-energy-efficiency-fund/	Mining	Archival	2012
93	Case	Downer EDI	Mining	Archival	2012

	Code	Job title	Sector	Involvement	Year
	DO	http://eex.gov.au/case-study/downer-edi-mining-approach-to-energy-efficiency/			
94	Case DP	Newmont Asia Pacific http://eex.gov.au/case-study/newmont-asia-pacific-business-case-and-beyond/	Mining	Archival	2012
95	Case DQ	Rio Tinto Iron Ore http://eex.gov.au/case-study/rio-tinto-iron-ore-investing-in-energy-metering-at-yandicoogina-mine/	Mining	Archival	2012
96	Case DR	Australia Post http://eex.gov.au/case-study/australia-post-approach-to-energy-efficiency/	Transport	Archival	2012
97	Case DS	Linfox http://eex.gov.au/case-study/linfox-eco-driver-training/	Transport	Archival	2012
98	Case DT	Ron Finemore Transport http://eex.gov.au/case-study/ron-finemore-transport-increasing-payload-capacity-on-bulk-tipper-trucks/	Transport	Archival	2012