



POLITECNICO
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DIPARTIMENTO DI
INGEGNERIA GESTIONALE

Barriers to energy efficiency measures and the role of industrial sustainability

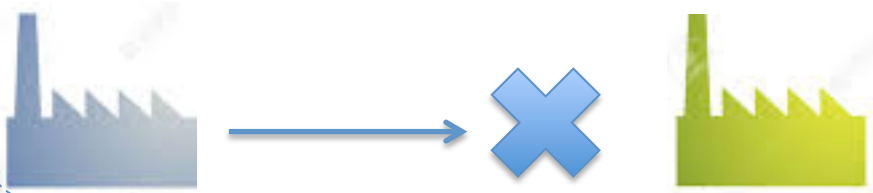
Alessandra Neri, Andrea Trianni, Enrico Cagno
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1. Energy efficiency and Sustainability



Energy efficiency as a very important **part of Sustainability**

In order to improve their energy efficiency and Industrial Sustainability performances, firms can implement measures, but this is often prevented by barriers to decision making process and willingness to implement

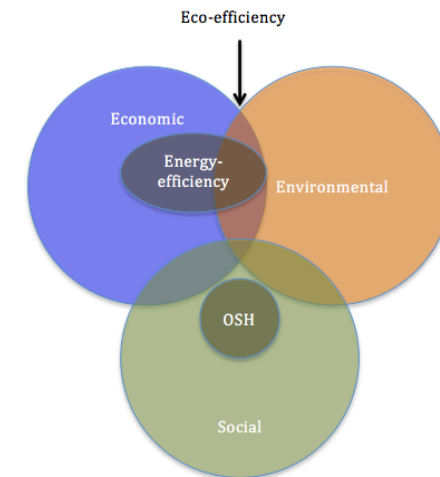


The industrial world is one of the main contributors to the energy consumption (1/3 of the primary energy consumed in EU)

2. Background

Barriers to EEMs have been largely investigated in literature, but they have **never been linked** to the broader context of **Sustainability**

In an Industrial context Sustainability can be identified with the areas of **Eco-efficiency, Energy-efficiency and Occupational Health and Safety (OHS)**



Different **Industrial decision makers** are involved in the different areas of industrial Sustainability within the same firm:

- Importance of the *socio-technical* perspective (Thollander and Palm, 2012)
- Differences between the *perception* of a barrier by a decision maker and its real value (Cagno et al., 2013)
- Possible different *relevance of a barrier* with reference to a specific EEM *according to the level* at which it is investigated (Cagno and Triani, 2014)

2. Background

Could the most effective way to evaluate an EEM be to evaluate them as an industrial sustainability measure?

1. Could EEMs be prevented by barriers related to **other areas** of Industrial Sustainability?
2. What are **the differences among the perspectives of different responsible** accountable for Industrial Sustainability areas within the same firm, with reference to the same EEM?
3. What is the **impact of these different perspectives?** Can an EEM be **supported or prevented** by issues related to the **other areas of industrial sustainability?**

3. The model for the investigation

Barriers to EEMs implementation have been investigated by means of a model specifically developed for barriers to Industrial Sustainability

The model has been developed analyzing literature on barriers to implementation of measures in the areas of:

- Eco-efficiency
- Energy-efficiency
- OHS

Category	Barrier	OHS	Eco-eff	Energy-eff
Organization	Lack of time			
	Lack of time			
	Resistance to change/inertia			
	Attitude/Other priorities			
	Communication			
	Workplace and task			
	Organizational system			
Management behaviour	Commitment/Awareness			
	Expertise			
Workers behaviour	Not trained/skilled			
	Awareness			
	Involvement			
	Incorrect behaviour			
Information	Lack of information			
	Trustworthiness of sources			
Technology/Service	Lock in			
Economic	Limited access to capital			
	Hidden cost			
	Risk			
	Investment cost			
	PBT			

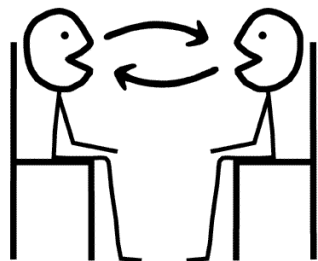
4. Research Methodology

First exploratory empirical investigation

- EEMs implemented, rejected or considered for implementation
- Northern Italy manufacturing firms

Data	Firm A	Firm B	Firm C
Sector	Manufacture of machinery and equipment	Manufacture of fabricated metal products	Manufacture of fabricated metal products
Size	Small	Medium	Large
Turnover	Medium	Medium	Large
Responsible Interviewed	<ul style="list-style-type: none"> • Energy and Environment • OHS • Administration 	<ul style="list-style-type: none"> • Energy and Environment • OHS 	<ul style="list-style-type: none"> • HSE

Semi-structured interviews



- In-depth account of experience and perception of individuals
- Provided:
 - Descriptive information about the firm
 - Main barriers to the implementation of Industrial Sustainability measures
 - Main barriers to the implementation of EEMs
 - Possible relationship and interdependences among the different areas of Industrial Sustainability within the same firm

5. Results

1. Different responsible have different perspectives on the relevance of the barriers in the implementation of an EEM

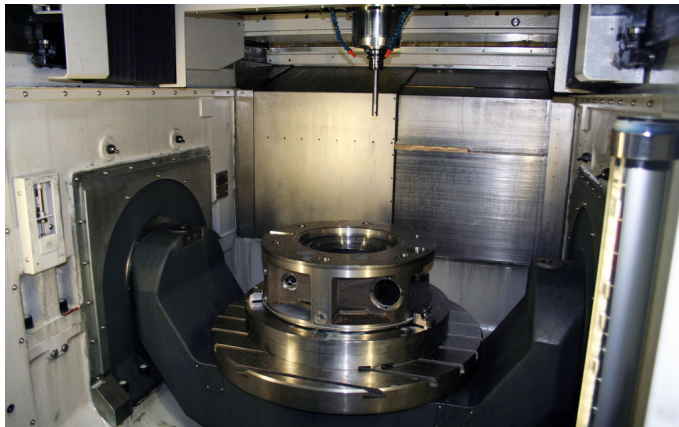
Firm A			
<i>Measure</i>	<i>Energy and Environment</i>	<i>OHS</i>	<i>Administration</i>
General level of barriers to EEMs	<ul style="list-style-type: none"> Workers Behaviour Economic 	<ul style="list-style-type: none"> Workers Behaviour Technology/Service 	<ul style="list-style-type: none"> Organization Management Behaviour Economic

Firm B		
<i>Measure</i>	<i>Energy and Environment</i>	<i>OHS</i>
Substitution of motors with more efficient one	<ul style="list-style-type: none"> Lack of Information Lack of Awareness Lack of Time High Cost of Investment 	"We have few motors and not particularly energy consuming"
Preventive Maintenance	<ul style="list-style-type: none"> Lack of Time Cost Workers Behaviour 	Not implemented

The most effective way to evaluate EEMS is to evaluate them under the umbrella of Industrial Sustainability

5. Results

2. EEMs' implementation can be stopped for safety reason



Firm B

Processing parameters lowered for safety reason

→ Parameters lowered in order to reduce noise

“Of course it increases the energy consumption [...] workers were properly equipped with ear protections, but they did not use them. Nevertheless, they complained about the noise and, in order to guarantee a comfortable place for workers to work in, it was decided to lower the parameters”

Energy and Environment Responsible

Firms can not prevent from workers' safety and comfort when implementing EEMs

5. Results

2. EEMs' implementation can be stopped for safety reason



Firm C

Substitution of lamps with more efficient one

→ Possible danger related to the storage of explosive material

"Given the economic feasibility, there were however some places in the plant that would have never been equipped with more efficient lamps. Indeed, in these areas explosive material is stocked so the implementation of this measure would have been quite dangerous"

HSE Responsible

Firms can not prevent from workers' safety and comfort when implementing EEMs

5. Results

3. EEMs can also bring safety benefits

Firm A

Use daylight when possible

→ Comfort in the workplace

“Of course a daylight illuminated space positively impacts on the comfort of the workers and they prefer to work in such a space instead of in one illuminated only by artificial light”

OHS Responsible



EEMs can be linked to an improvement in performance in other areas of Industrial Sustainability

5. Results

3. EEMs can also bring safety benefits

Firm C

Detection/elimination of Compressed Air Leaks

→ Reduction of noise

“After the implementation of this measure we have recognized a considerable improvement in working conditions and, among others, noise reduction. Then, of course, the detection and elimination of leaks is also money that you save”

HSE Responsible



EEMs can be linked to an improvement in performance in other areas of Industrial Sustainability

6. Concluding Remarks

- Energy efficiency is largely recognized as an important part of Industrial Sustainability
- EEMs are not properly implemented within firms due to the presence of barriers
- These barriers have been largely investigated in literature, nevertheless any contribution considers energy efficiency in the broader context of Industrial Sustainability



- Implementing an EEM, it is necessary to **consider** not only the energy/energy efficiency department within the firm, but also **all those areas of Industrial Sustainability that may be involved**
- **Different perspectives on the same EEM**, related to the different **Industrial Sustainability responsible** within the firm must be considered
- Implementing an EEM, it is not possible avoid taking in consideration the **impact of the measure on the other areas of Industrial Sustainability**

7. Further Development

- Extension of the sample
 - Common patterns (according to firms' clusters)
 - Statistical analysis
- Role of energy efficiency in preventing/supporting the implementation of Industrial Sustainability measure
- Drivers that may act on barriers to implementation of both energy efficiency and Industrial Sustainability measures
- Analysis of the drivers according to the different perspectives related to Industrial Sustainability

Thank you for your attention

alessandra.neri@polimi.it

andrea.trianni@polimi.it

enrico.cagno@polimi.it