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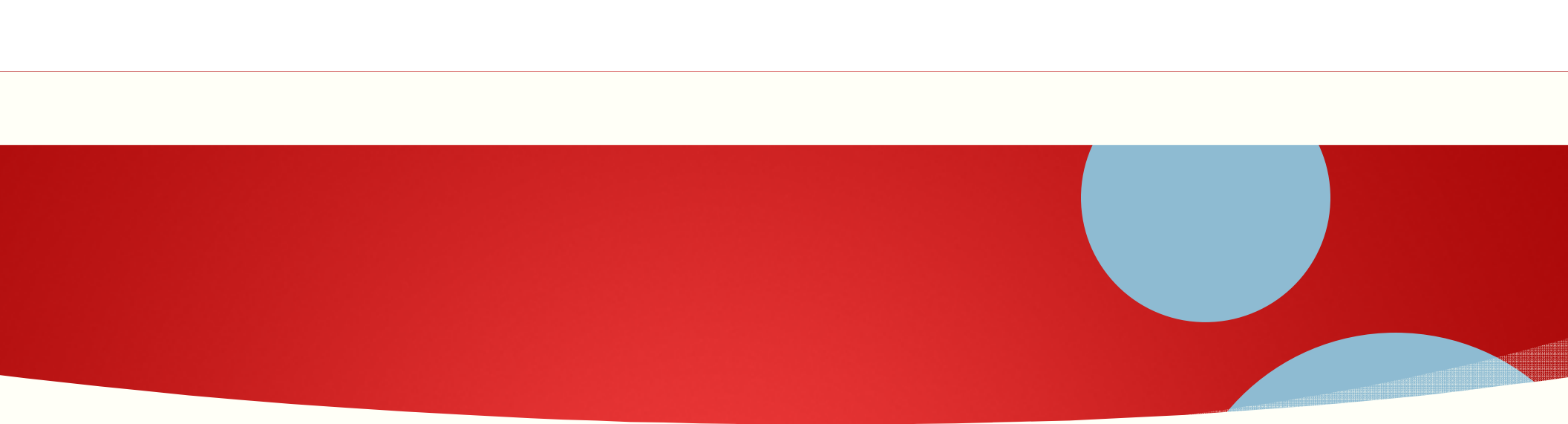
**EFFECT OF ECODESIGN PRACTICES ON THE PERFORMANCE OF
MANUFACTURING FIRMS IN MOMBASA COUNTY, KENYA**

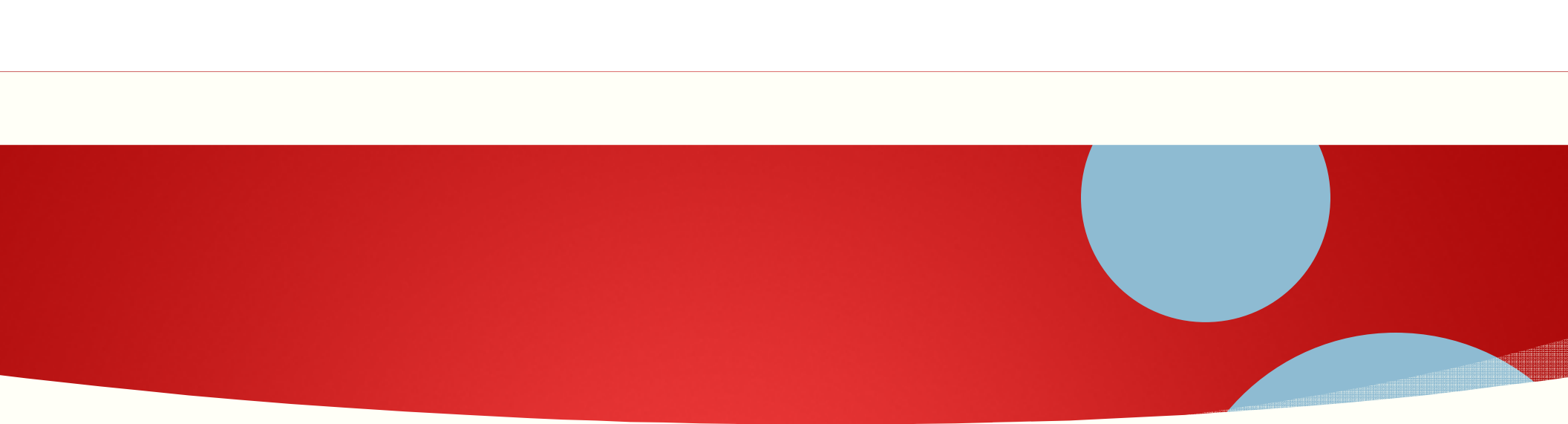
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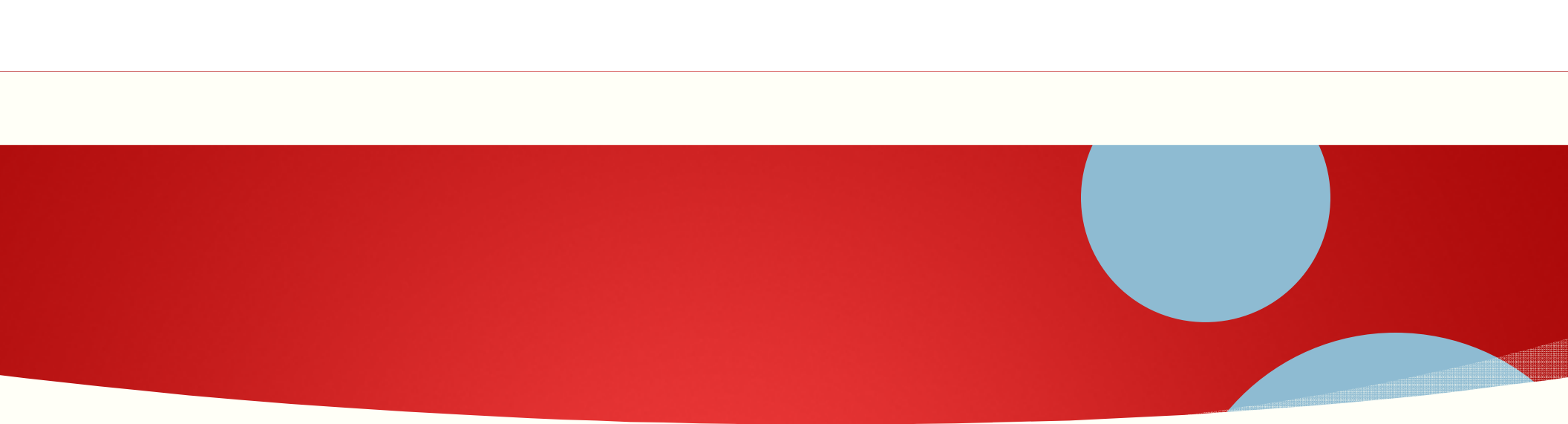
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Introduction / Background

- ▶ Firms all over the world are faced with challenges including global warming, declining natural resources, pollution control and a demand for environmentally friendly goods.
- ▶ To satisfy these green demands, firms have to implementing green technologies, eco-design and international environmental management systems (Zhu, Sarkis & Lai, 2008; Hsu & Hu, 2011).
- ▶ Ecodesign aims at the reduction of product environmental impact during a product's life cycle (Fiksel, 2006).

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- ▶ This study is grounded on resource dependence theory, resource based view, institutional theory and stakeholder theory
 - ▶ Mombasa County is the centre of industrial activities in the entire coastal region.
 - ▶ The ecosystem around the coastline receives large quantities of riverine and coastal watershed discharge which include industrial wastes (Mwaguni & Munga, 1997).

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- ▶ Ecodesign is defined as a set of project practices whose aim is at the creation of eco-efficient products and processes. (Jeswiet & Hauschild, 2005).
 - ▶ Organizational performances consist of environmental, financial and operational performance (Alvarez & Busenitz, 2001)
 - ▶ Ecodesign can improve environmental performance by reducing waste and emissions (Russo & Fouts, 1997). It can improve operational performance by increasing efficiency and enhancing productivity (Wagner, 2005). Increase in revenue can be brought about by better access to certain markets and offering pollution control technology. (Ambec & Lanoie, 2008).

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- ▶ Manufacturing sector in Kenya has been seen to constitute 70 per cent of the industrial sector contribution to GDP hence a key driver for achieving a sustained annual GDP growth of 10 per cent.
 - ▶ Manufacturing firms in Mombasa County have been connected to negative environmental impacts. (Mwaguni & Munga, 1997)
 - ▶ Urgent measures need to be put in place hence adoption of ecodesign practices will be an option for these firms

Statement of the problem

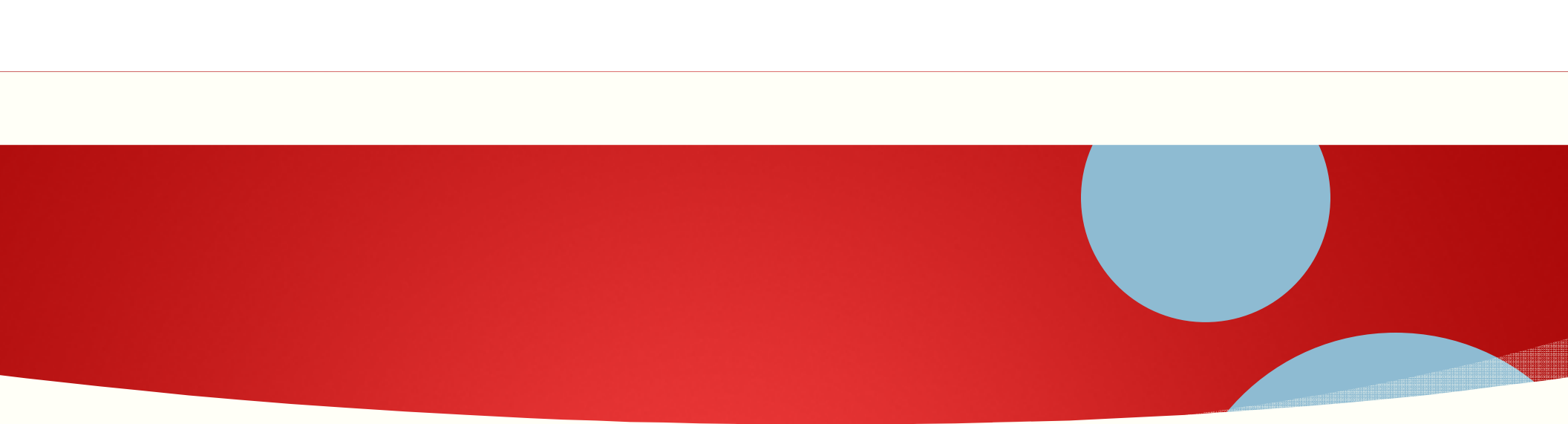
- . The examination of the possible direct link between environmental protection and organizational performance has produced mixed results. While some studies have found a positive relationship others do not identify a positive link
- . The lack of the consensus on these links causes a research gap. This study aimed to examine if there is a relationship between ecodesign and firm organizational performance hence the researcher question; what is the effect of adoption of ecodesign practices on organizational performance of manufacturing firms in Mombasa County?

Study objectives

- . Establish the effect of adoption of ecodesign practices on organizational performance of manufacturing firms.
- . Determine the extent to which ecodesign practices have been adopted
- . Establish the challenges of adopting ecodesign practices
- . Establish the relationship between adoption of ecodesign practices and organizational performance

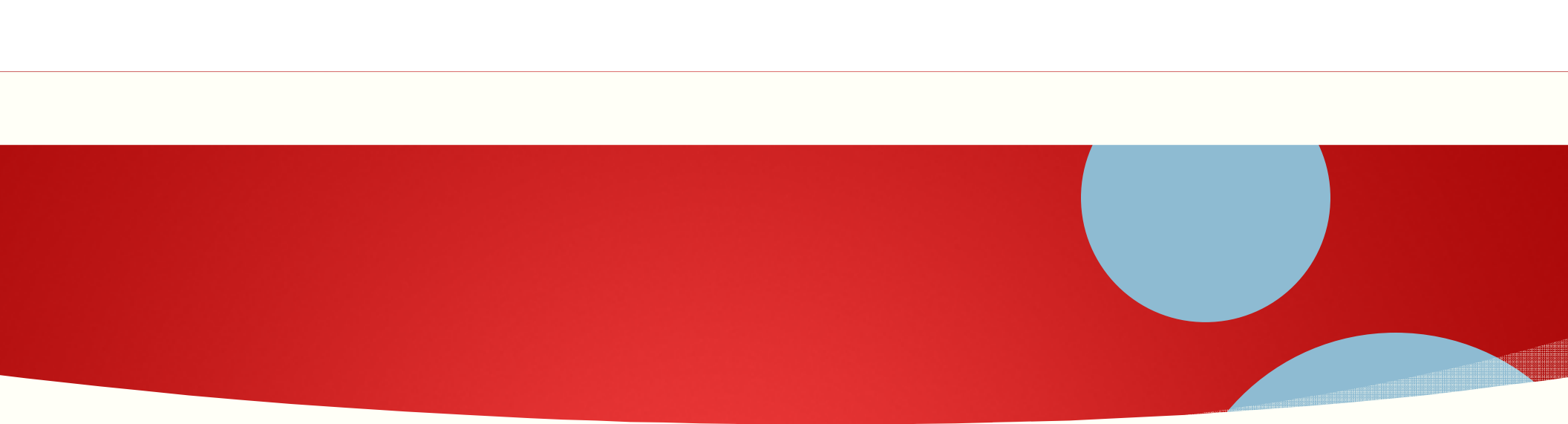
Brief literature review

- . The assumption of resource dependence theory is that the firm cannot be independent with regard to critical resources for its survivors. (Wathne & Heide, 2004).
- . The principal idea of the Resource-Based View is that for a firm to achieve competitive advantage then it all depends on its heterogeneous resources, which are inimitable, valuable and non-substitutable. (Barney, 1991).

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- . Institutional theory recommend that companies can only gain legitimacy through reduction of their environmental impact and being socially responsible (Bansal, 2005; Bansal & Clelland, 2004).
 - . Stakeholder theory states that firms should not narrowly focus their strategic management decisions on creating shareholder value only but rather broaden their objectives to include the expectations and interest of the wide group of stakeholders (D'Aunno, 2006).

Ecodesign Practices

- . Design for use of raw materials involves selection of low-impact materials, non-hazardous materials, non-exhaustible materials, low energy content materials, recycled materials and recyclable materials, material, weight and volume reduction (Hemel & Brezet, 1997)
- . Design for manufacture includes production techniques optimization, having alternative production techniques, low/clean energy use, fewer production processes, reduction in waste generation, few/clean production consumables, low environmental impact, minimize the use of auxiliary materials and energy, limited losses of raw material and generate little waste as possible (Singhal, 2013).

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- Design for distribution involves efficient distribution system, efficient transport mode, less/clean packaging and efficient logistics (Hemel & Brezet, 1997).
 - Design for product use includes reduction of the environmental impact in the user stage; consumption of low energy, few/clean consumables needed during use, ensuring clean energy source and no energy/auxiliary material use. (Hemel, 1995).
 - Design for end of life involves optimization of end-of-life system, reuse of product, material recycling and clean incineration. It aims at ensuring reuse of valuable product components and proper waste management. (Hemel & Brezet, 1997).

Challenges of Adopting Ecodesign Practices

- Main challenges are lack of technical knowledge on ecodesign, lack of ecodesign tools based on technology, lack of knowhow in managing changes in design procedures, differences in opinion among proponents and executors and organizational complexity (Theyel, 2000).
- Companies begin using ecodesign tools without transforming the operations of the company (Bahmaed, Boukhalifa & Djebabra, 2005).
- Lack of appropriate infrastructure and lack of cooperation between different departments (Boks, 2006). Many tools fail because they are not focused on new products and most of ecodesign tools require experts (Pochat et al, 2007).

Empirical Review

1. An empirical study of Green Supply Chain and ecodesign in the electronic industry by Singhal (2013) found out that ecodesign is positively related with organizational performance. Lopez Gamero, Molina Azorin, and Claver Cortes (2009) did a study to establish the whole relationship between environmental variables and firm performance and found a positive relationship.
2. While Watson, Klingenberg, Polito and Geurts (2004) in a study on the impact of environmental management system implementation on organizational performance found that the data analyzed did not show any significant difference in organizational performance between environmental management adopters and non-environmental management adopters.

Methodology

- . Cross sectional survey research design was used. The study population consisted of all manufacturing which are 753 (KEBS, 2015).
- . The study employed purposive sampling technique by using a sample comprised of all 65 firms registered with the Kenya Association of Manufacturers (KAM, 2014).
- . Primary and secondary data were used for this study.
- . Some of the data collected was analyzed using descriptive statistic and some using ordered probit regression. The data was summarized and interpreted with the aid of data analysis computer software's which are Microsoft excel, Stata and SPSS.

Ordered Probit Model

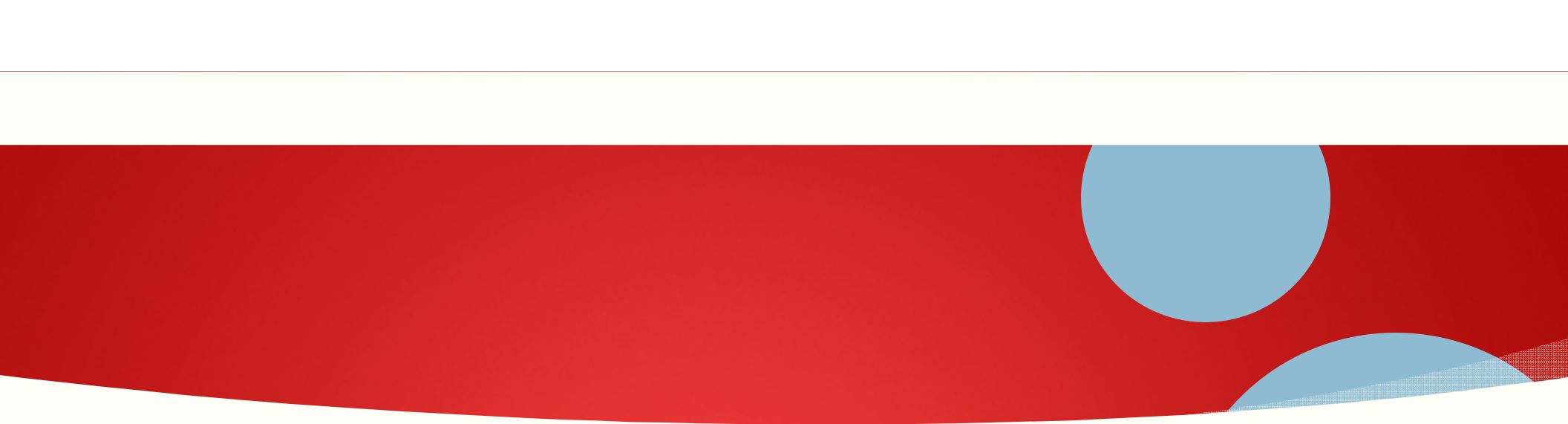
$$Y = \beta + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_i,$$

Where: Y = Organizational performance of manufacturing firms,
 X_1 = Design for use of raw materials, X_2 = Design for manufacture,
 X_3 = Design for distribution, X_4 = Design for product use, X_5 =
Design for end of life, **X_6, X_7 are control variables**, X_6 = Size of the
firm, X_7 = Years of existence of the firm, ε_i = random errors.

Findings / Results

With regard to Extent to which ecodesign practices have been adopted by manufacturing firms in Mombasa, the findings shows that the most favored ecodesign practice is design for product use, followed closely by design for manufacture, then design for use of raw materials, lastly design for distribution, while the least is design for end-of-life. In overall the study found the adoption of green manufacturing practices is in the planning/implementation phase.

Unsuccessful integration of ecodesign, Lack of knowhow in managing changes in design procedures and Lack of technical knowledge about ecodesign were the major challenges of adopting ecodesign practices with the least challenge being use ecodesign tools without transforming the company's operations. The overall indication is that this challenges poses as hindrances in the adoption of ecodesign practices.

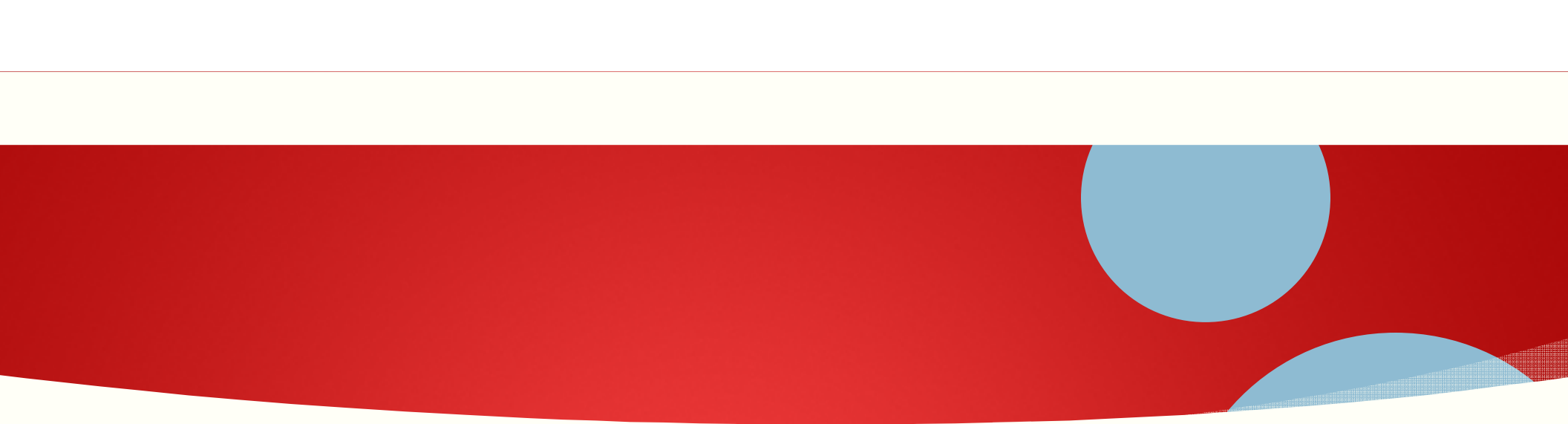


On the relationship between ecodesign practices and organizational performance it was found out that design for end of life, design for product use and design for distribution influence environmental impact reduction. Whereas the influence of other designs on environmental impact reduction was not significant. Design for distribution and design for product use influence environmental cost saving. While the influence of other designs were not significant on environmental cost saving.

Design for product use influence operation performance. Whereas the influence of other designs on operation performance were not significant. Design for distribution, design for raw materials and design for end of life influence financial performance. While the influence of design for manufacture and design for product use on financial performance was not significant.

Conclusions

- Most manufacturing firms in Mombasa County, are at the planning phase of adopting ecodesign practices. Hence have not implemented ecodesign, this confirm the findings by Mwanguni and Munga (1997) that Manufacturing firms in Mombasa County have been connected to negative environmental impacts and these firms face different challenges of sustainable energy consumption, management of solid and liquid wastes, and compliance with environmental regulations.
- The major ecodesign practices established were, design for product use followed closely by design for manufacture. The use of ecodesign tools without transforming the company's operations, lack of ecodesign tools based on technology and lack of appropriate infrastructure were considered as the least challenging factor for implementation of ecodesign practices. These practices require long-term investment and commitment by the firm thus most firms don't take them in early (Hart, 1995).



. The major challenges to adopting ecodesign practices include; unsuccessful integration of ecodesign, lack of knowhow in managing changes in design procedures and lack of technical knowledge about ecodesign, this finding shows that what may be holding Mombasa firms back may be the fear of failure and lack of knowledge, these findings are in line with the outcome of Jonbrink and Melin (2008) and Theyel (2000)

. Lastly, it can be generally concluded that ecodesign practices has positive influence on organization performance with greatest impact being on environmental impact reduction and financial performance and less on operational performance. Hence supporting the finding by Singhal (2012) and Lopez-Gamero, Molina-Azorin and Claver-Cortes (2009) who found out that ecodesign is positively related with organizational performance including competitive advantage, economic performance and environmental performance.

Recommendations

- . Manufacturing firms should act fast and implement ecodesign practices since there are potential benefits after implementation.
- . They should also get enough training and empowerment on how to implement ecodesign practices so as to ensure success
- . Government should review their policies and allocate more resources to ensure effective adoption and implementation of ecodesign practices

Areas for further study

- . The researcher recommends that future research should be undertaken in adoption of ecodesign practices by other economic sectors.
- . A research on the relationship between adoption of ecodesign practices and firm's financial performance.



THE END