Effects of environmental product brand on corporate entrepreneurship technology and environmental competitive advantage

H.-M. Hsieh and A. Maritz

Abstract. The occurrence of extreme climate and continuous environmental disasters has various countries in the world realize the urgency of environmental protection and remind the countries of making the best efforts for environmental protection. In the visible future, there is rising and complete environmental awareness, and relevant green systems would become an alternative trade barrier tactic. Aiming at supervisors and employees in high-tech industry in Taiwan as the research objects, total 500 copies of questionnaire are distributed, and 425 valid copies are retrieved, with the retrieval rate 85%. The research results show that 1. Entrepreneurship Technology is an asset for enterprises in high-tech industry and is different from the Entrepreneurship Technology capabilities of other companies that it is the source of the competitive advantage, 2. enterprises in high-tech industry have to consider the possession of Entrepreneurship Technology and increase in relevant Entrepreneurship Technology to conform to the environmental product brand strategies and the requirements for environmental product systems, and 3. the trend of creating environmental competitive advantages of high-tech industry through environmental management would be the critical factor in changing future market. According to the results to propose conclusion, it is expected to help enterprises acquire environmental competitive advantages in the environmental protection wave.

1 Introduction

Most current international green systems aim at high-tech manufacturing. Instead of being restricted to regulations, it would be better to promote the sustainable development with environment and economy win-win by the overall integration of environmental protection and economic development. In this case, environmental product brand would become the sustainable management strategy for enterprises turning crises into opportunities.

Enterprises could receive better environmental product brand fame and benefits from environmental protection, and humans’ living environment could be sustained. In face of the constant environmental protection wave, many enterprises regard high Entrepreneurship Technology as the major strategy to make profits in the market and face the existence of

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Entrepreneurship Technology with active and positive attitudes to promote corporate image as well as enhance competitive advantage. In this investigation, we elucidate the ramifications of brand reliance on environmentally sustainable products on corporate entrepreneurship technology, ultimately examining its influence on environmental competitive advantage. The aim is to provide insights that will enable the high-tech industry to enhance its societal image in terms of environmental stewardship, thereby gaining both societal benefits and a competitive edge in the environmentally conscious marketplace.

2 Literature review

Entrepreneurship Technology is rapidly developed in advanced countries in past few years. Enterprises adopting Entrepreneurship Technology could deal with waste and pollutants, reduce costs, and enhance quality to show the better competitiveness in the environmental consumer market. The growth is related to the emphasis of corporate product brand on environmental issues as well as the technology development and innovation capability (Chen et al., 2020; Visentin et al., 2021, nUshakov et al., 2022; Ezhak et al., 2021).

Environmental innovation generally covers the innovation of Entrepreneurship Technology and environmental products, referring to an enterprise preceding environmental management with positive attitudes to enhance environmental product brand and making product, process, and management innovation for promoting environmental management performance (Kalenova et al., 2020; Mou et al., 2020). An enterprise preceding Entrepreneurship Technology innovation aims to enhance production efficiency or optimize product effect to enhance the utilization of resource and energy, reduce the use and disposal of toxic materials, pay attention to the recycle and reuse design, and reduce the burden of environmental pollution to improve environmental quality. Accordingly, the hypothesis is proposed in this study.

H1: Environmental product brand presents significant and positive effects on corporate Entrepreneurship Technology.

An enterprise adopting Entrepreneurship Technology could deal with waste and pollutants, reduce costs and enhance quality, as well as present environmental competitive advantage on environmental consumer market (Ru et al., 2020; Mezinova et al., 2022).

An enterprise simply considering environmental management with short sight, aiming to conform to regulations, and expecting to spend less costs would become routinely coping with regulations. Effectively using Entrepreneurship Technology to reduce production costs and enhance product value would make up the costs invested in environmental protection and even acquire environmental competitive advantage (Wu et al., 2022). The adoption of corporate Entrepreneurship Technology remarkably and positively affects the environmental competitive advantage of an enterprise; corporate Entrepreneurship Technology plays the full mediation role in the effects of internal and external environmental pressure on environmental competitive advantage that the innovation of Entrepreneurship Technology could promote the environmental competitive advantage of an enterprise (Lu et al., 2020). The following hypothesis is therefore proposed in this study.

H2: Corporate Entrepreneurship Technology shows remarkable and positive effects on environmental competitive advantage.

Li et al. (2020) proposed that an enterprise facing environmental problems with active and positive attitudes would enhance corporate environmental product brand image and reputation, attract more consumers stressing on green environmental protection, acquire positive investment evaluation, enhance production efficiency through recycle, reuse, and pollution control to reduce costs, save expenses through energy saving, avoid high
insurance fee, present better relationship with neighboring communities, as well as produce high-value green products to further promote environmental competitive advantage.

Rinandiyana et al. (2022) considered that environmental management could result in economic benefits for enterprises, such as more efficient production, more economical resource use, reducing costs, and enhancing environmental product brand. An enterprise should adopt active and positive corporate environmental strategies to present the environmental competitive advantages, such as reducing costs, improving quality, enhancing environmental product brand, and developing new markets. The following hypothesis is then proposed in this study.

H3: Environmental product brand reveals notable and positive effects on environmental competitive advantage.

3 Methodology

Environmental product brand.

Referring to Pan et al. (2021), environmental product brand in this study contains four dimensions of (1) brand message, (2) brand contact, (3) brand association, and (4) brand link.

Corporate Entrepreneurship Technology.

Referring to Jang et al. (2021), corporate Entrepreneurship Technology in this study includes three dimensions of (1) entrepreneurship equipment, (2) entrepreneurship production, and (3) entrepreneurship products.

Environmental competitive advantage

Referring to Chang et al. (2021), environmental competitive advantage in this study is measured with the single dimension.

Research sample and object.

Aiming at supervisors and employees in high-tech industry in Taiwan, 500 copies of questionnaire are distributed in July 1st-November 30th, 2022. Total 425 valid copies are retrieved, with the retrieval rate 85%.

Reliability and validity test.

The survey items in this study were developed in consultation with domestic and international researchers, ensuring a strong content validity. The constructs of environmental product brand, corporate entrepreneurship technology, and environmental competitive advantage were thoroughly tested through an overarching structural cause-effect examination. Analysis through the linear structural relations model revealed an overall model fit within the acceptable range, indicating satisfactory convergent and predictive validity.

The construct validity of the survey content was assessed using item-to-total correlation coefficients in a reliability analysis. The resulting coefficients were employed to evaluate the questionnaire content. In this study, the item-to-total correlation coefficients for the constructs exceeded 0.7, signifying a certain degree of construct validity. To deepen our understanding of the reliability of the questionnaire, a reliability analysis was conducted. In accordance with the standards for formal questionnaire development, the measured Cronbach's alpha value ranged between 0.70 and 0.90, indicating it falls within the acceptable reliability range.

4 Results and Discussion

Structural equation modeling index
The research data are organized as below. The preliminary fit, internal fit, and overall fit are further explained.

The complete model analysis results, Table 1, show that four dimensions of environmental product brand (brand message, brand contact, brand association, brand link) could notably explain environmental product brand (t>1.96, p<0.05), and three dimensions of corporate Entrepreneurship Technology (environmental equipment, environmental production, environmental products) could significantly explain corporate Entrepreneurship Technology (t>1.96, p<0.05). Apparently, the overall model presents good preliminary fit.

Table 1. Overall linear structural model analysis result

<table>
<thead>
<tr>
<th>Evaluation item</th>
<th>Parameter/evaluation standard</th>
<th>Result</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary fit</td>
<td>Environmental product brand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brand message</td>
<td></td>
<td>0.723</td>
<td>10.31**</td>
</tr>
<tr>
<td>Brand contact</td>
<td></td>
<td>0.705</td>
<td>8.77*</td>
</tr>
<tr>
<td>Brand association</td>
<td></td>
<td>0.718</td>
<td>9.24*</td>
</tr>
<tr>
<td>Brand link</td>
<td></td>
<td>0.736</td>
<td>11.25**</td>
</tr>
<tr>
<td>Corporate Entrepreneurship Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurship equipment</td>
<td></td>
<td>0.754</td>
<td>12.91**</td>
</tr>
<tr>
<td>Entrepreneurship production</td>
<td></td>
<td>0.773</td>
<td>15.12**</td>
</tr>
<tr>
<td>Entrepreneurship products</td>
<td></td>
<td>0.762</td>
<td>13.46**</td>
</tr>
</tbody>
</table>

Note: * stands for p<0.05, ** for p<0.01

Table 2. Overall linear structural model analysis result

<table>
<thead>
<tr>
<th>Evaluation item</th>
<th>Parameter/evaluation standard</th>
<th>Result</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal fit</td>
<td>Environmental product brand→</td>
<td>0.816</td>
<td>15.41**</td>
</tr>
<tr>
<td></td>
<td>corporate entrepreneurship Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental product brand→</td>
<td>0.862</td>
<td>23.69**</td>
</tr>
<tr>
<td></td>
<td>environmental competitive advantage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technology→ environmental competitive advantage</td>
<td>0.874</td>
<td>27.55**</td>
</tr>
</tbody>
</table>

Note: ** for p<0.01

Regarding the overall model fit as shown in Table 3, the χ2/Df value of 1.698 is notably less than the standard value of 3, and the Root Mean Square Residual (RMR) value of 0.002 indicates favorable χ2/DF and RMR results. However, it's important to bear in mind that chi-square is sensitive to sample size, rendering it less suitable for direct judgements of model fit. Additionally, the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI), valued at 0.959 and 0.923 respectively, surpass the benchmark of 0.9.
values suggest that the closer GFI and AGFI are to 1, the better the model fit. Consequently, these figures convey strong indices of a well-fitted model.

Table 3. Overall linear structural model analysis result

<table>
<thead>
<tr>
<th></th>
<th>Overall fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X2/Df</td>
</tr>
<tr>
<td></td>
<td>1.698</td>
</tr>
<tr>
<td></td>
<td>GFI</td>
</tr>
<tr>
<td></td>
<td>0.959</td>
</tr>
<tr>
<td></td>
<td>AGFI</td>
</tr>
<tr>
<td></td>
<td>0.923</td>
</tr>
<tr>
<td></td>
<td>RMR</td>
</tr>
<tr>
<td></td>
<td>0.002</td>
</tr>
</tbody>
</table>

5 Conclusions

The research results reveal that high-tech industry, in face of constant environmental protection wave, has to face the requirements for environmental product brand systems, but not all enterprises achieve the same level. Once high-tech industry determines to involve in environmental management activities, it would make relevant environmental product brand strategies. In this case, high-tech industry has to consider the possessed Entrepreneurship Technology and the increase in Entrepreneurship Technology under the requirements for environmental product brand systems to conform to the environmental product brand strategies as well as the requirements for environmental product system factors.

Managing stakeholders’ demands through environmental product brand distribution is an important source for high-tech industry maintaining or creating environmental competitive advantage; and, the trend to create environmental competitive advantage through environmental management will be a critical factor in the future market in high-tech industry.

What is more, the competition in high-tech industry is getting fierce, along with globalization development, and the competition becomes multiple. In the visible future, there is rising and complete environmental awareness that relevant environmental product brand systems would become an alternative trade barrier tactic. As a result, high-tech industry facing with active and positive attitude would acquire and create environmental competitive advantages.

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