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Diagnosis of Sustainable Business Strategies Implemented by Chilean Construction Companies

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Abstract: Construction companies need to formulate sustainable construction business strategies to create a competitive advantage and remain in the market. This requires that construction firms incorporate sustainability into their business model. However, the current situation of the firm must be known before following the path to be a sustainable construction firm. Therefore, the aim of this research is to identify sustainable business strategies and their level of implementation in Chilean construction companies. A survey was designed and applied to 245 construction firms to provide statistically valid and reliable information, thus supporting both the senior managers' decision-making process and the companies' strategic planning. The main results show that the companies do not pursue business strategies that promote profound organizational changes; instead, they focus their short-term efforts on urgent market demands. This is evidenced by the lack of the function of sustainability management as a permanent role in the organization. Also, this study found that only 32% of Chilean construction companies implement business strategies towards sustainability. Construction firms with higher turnover and subjected to stricter regulations, such as construction companies working in the mining sector, incorporate more sustainable business strategies across their organizations. The lack of a sustainability-oriented vision can affect the transformation of strategy into a competitive advantage, a step that is necessary to support both the company's permanence in the market and its long-term sustainability.

Keywords: sustainable business strategies; sustainable construction; competitive advantage; corporate sustainability

1. Introduction

Sixty percent of the most important goods and services that sustain life in the world's ecosystems have been degraded or consumed in an unsustainable manner [1]. As developing countries progress and the population increases, the demand for goods and services will continue to grow [2]. Additionally, humans need a large number of buildings and infrastructure to sustain life and develop civilization. The construction, operation, maintenance and demolition of this infrastructure causes many environmental problems [3]. The construction industry generates negative impacts related to the processes of raw material extraction, material manufacturing, and infrastructure construction, operation and demolition. These impacts can be summarized as the consumption of non-renewable resources, the decline of biological diversity, the destruction of forest zones, the loss of agricultural areas, the destruction of natural spaces, global warming, and water, air and soil contamination [4]. To mitigate this situation, sustainable construction can promote sustainable development that eliminates or mitigates these negative impacts. Essentially, sustainable development is a transformation process

in which the exploitation of resources, the course of investments, the direction of technological development and institutional change are harmonized to improve current and future potential so that human needs and aspirations can be fulfilled [5].

The introduction of sustainable development in construction is a new challenge that seeks to meet people's needs while considering the limited resources of the planet. Through the implementation of sustainable construction strategies, it is possible to contribute to the sustainable development of society and companies alike. To anticipate and adapt to change, the construction industry needs to devote more attention to developing new management strategies, techniques and management methods by incorporating new practices required by the market, organization, projects and processes. In recent years, authors such as Robichaud and Anantatmula [6] have noted the crucial role of sustainable construction and the need for modern methods to support decision-making processes. Construction firms' late adaptation to new environmental requirements [7] and stakeholders' demands [8] could entail reduced responsiveness and increased decision-making time, potentially resulting in increased costs.

According to the traditional view [9], delays in decision-making entail high costs. In the short run, costs become exponential and prices rise, thus encouraging competition. In the same way, decisions involve more variables that must be considered; associations and interactions among them are necessary to understand the relationship of a sustainable business model, in which the economic value is subject to social and environmental dimensions [10]. This vision of the construction business facilitates a long-term business strategy definition that favors the company's position and business sustainability. For example, Sfakianaki [11] pointed out that long-term recurrent cost reduction and potential increase in asset valuations will be driven by incorporating environmental and social aspects into the business model. Simultaneously, it reverses the cost curve by increasing brand value and conferring competitive advantages while generating business differentiation and mitigating risks.

Sustainable construction is an emerging field that aims both to apply general concepts of sustainable development to conventional construction practices and to propose models and strategies that include new social, environmental and cultural considerations [12]. Although knowledge in this field is continuously expanding, the sustainable model of the construction industry is not yet a standard industry practice.

1.1. Knowledge Gap

According to Epstein and Roy [13], managers have widely acknowledged the importance of formulating corporate sustainability strategies. For companies that have decided to assume economic, social and environmental responsibility, the question is not whether corporate sustainability strategies should be applied, but how they should be applied [14]. Nevertheless, transforming the concept into action and genuine initiatives remains a challenge. In this context, it is challenging to choose the right sustainability strategies [13,14], which are a consequence of distinguishing these strategies and knowing which are important for business sustainability in the long term. Companies lack a strategic approach to the integration of sustainability because of poor information and substantial uncertainty, meaning that failing to consider sustainability in strategic decision processes can increase the complexity of decisions and uncertainties [15]. From the firm's perspective, it is important to decrease uncertainty and achieve consistency with the purpose of promoting stability conditions. The integration of corporate sustainability into strategic management offers a potential approximation to address these challenges [15]. This complexity is especially related to long-term vision in the context of sustainable development and stakeholder commitment [16]. Thus, different types of strategies are related to different sustainability levels [17], which can be identified both in the literature and in practice [18]. However, this identification is less clear in the construction industry because this industry has failed to consistently prioritize its strategies. Decision-makers need clear sustainable criteria to evaluate their strategies.

The knowledge of which sustainable strategies will be applied in the construction sector will enable design strategies, clarify sustainability concepts and facilitate the fulfillment of the proposed objectives through systematic application. The diagnosis of sustainable construction strategies is useful for identifying the sustainable strategies that are applied in the construction sector and the needs to be met to achieve a sustainable construction industry in Chile.

The purpose of this research is to diagnose sustainable construction strategies implemented in Chile by construction companies, uncover which strategies are applied and analyze the main associations that favor the development of sustainable construction firms. Therefore, this study contributes to mapping the strategic behavior of construction firms in terms of corporate sustainability and identifies the gaps that need to be solved to advance toward a sustainable construction industry.

This paper aims to answer the following questions:

1. What competitive strategies are most frequently implemented to promote sustainability of construction companies?
2. How the dimensions of the business; organization, market, projects and processes, explain the current state of sustainability of construction in Chile?

1.2. Background

A strategy is a set of consistently made business decisions [19]. Business strategies aligned with sustainability reflect the nature and extension of sustainable development opportunities regarding value creation for companies [20]. Sustainable business development considers sustainable practices as the cornerstone of the company's survival; thus, the implementation of sustainable actions within the firm's business strategy can become a source of competitive advantage [21]. A company's competitiveness reflects its long-term relationships both within the industry and with its competitors. A competitive business is constantly informed about the conditions required to add value through a strategy that enables the fulfillment of organizational goals through social responsibility [20]. Thus, corporate social responsibility (CSR) defines companies that integrate social and environmental concerns in both their business operations and their interactions with stakeholders [22]. The construction industry has also incorporated sustainability in its corporate strategies through sustainable construction that targets the responsible and healthy creation and management of the built environment [23]. Sustainable construction is an integral process that seeks to maintain harmony between nature and the built environment by creating human settlements [4]. Its purpose is to achieve a balance among the economic, social and environmental dimensions of sustainability [24].

To standardize the concepts discussed in this paper, the authors propose the following definitions:

1. Sustainable strategies are the set of decisions that create a balanced relationship between the sustainable model and expected economic benefit.
2. Sustainable construction strategies reflect a construction company's awareness of the social, economic and environmental effects of its activities. These strategies are implemented as actions in the short, medium and long term by developing capabilities and skills that ensure sustainable competitive advantages.

1.3. Sustainable Construction Strategies

As corporate sustainability-based decisions are made at the strategic level, the scientific interest has also increased regarding the strategic management issue in relation to the integration of corporate sustainability into a company's strategy, vision and culture [25,26]. The same tendency is observed for sustainable construction strategies. There is increasing scientific and academic interest in studying the strategies implemented by construction firms. Although there have been few studies about this issue, Table 1 summarizes the most important ones, grouping them by topic and dimensions. Table 1 shows that sustainable strategies have been mostly studied on the project dimension, and there are no studies

on the marketing dimension, although a wide range of sustainable strategies can be implemented in all dimensions of the sustainable business model.

Moreover, Table 1 shows that the construction industry employs partially sustainable strategies; thus, strategies in other industries that can also be applied to construction companies are not considered. For instance, Table 1 shows that several authors have studied the incorporation of sustainable materials in construction projects but, to the best of the authors' knowledge, there are no studies regarding a sustainable supply chain and sustainable business models in the construction sector, an issue that has been studied in other industries by many several authors such as Lloret [20], Reefke and Sundaram [27], Sarkis et al. [28], Seuring and Müller [29], Walton et al. [30], Al-Saleh and Taleb [31] and Richardson [32].

Table 1. Progression of knowledge in the sustainable construction strategies.

Subdimensions (Business Strategies)	Authors	Market	Organization	Project	Processes
		Dimension			
Sustainable materials in the construction sector	[33,34]				●
Green marketing (includes construction)	[35–39]	●			
Waste and recycling in construction	[40–44]				●
Sustainable leadership in the construction sector	[45,46]		●		
Sustainable knowledge management in construction projects	[47–52]			●	
Sustainable clients in the construction sector	[24,53–55]			●	

● shows that research has been carried out.

A set of strategies—namely, market, organization, project, and process strategies—can be grouped into dimensions that represent the large corporate bodies, thus facilitating their study and understanding. It is key to establish which of these dimensions can add value to the sustainable business model by creating capacities (processes), developing skills (project), providing timely response (market) and establishing the business model (organization). Numerous authors agree on the importance of studying these four dimensions of sustainable business. Baumgartner and Ebner [17] attribute importance to market research. Porter and Kramer [56] note that markets define organizations. Robichaud and Anantatmula [6] consider the study of sustainable projects, and [57] analyze the knowledge of processes aimed at companies' sustainable and competitive development. The four dimensions are briefly described below.

1. Market: Economic development involves the management of a company as a long-term participant in the market and has a positive impact on the economic circumstances of its stakeholders at the local, national and global levels. According to [17,58], sustainability is important because it is a prerequisite for a company's survival. They state that economic development addresses general aspects of the company, which must be respected in the environmental and social contexts to stay in the market in the long term.
2. Organization: The management of organizational change implies a continuous process of renewal, direction, structure and ability to satisfy internal and external changing needs [59]. This is especially important because sustainability requires deeper and permanent organizational change [60]. A downward change is necessary to create the required structure, provide a sustainable vision and encourage participation by all employees. Scheneider et al. [61] state that structural changes in the organization are effective only as long as they are associated with individual changes.
3. Project: Robichaud and Anantatmula [6] indicate that traditional methodologies of construction management, which are usually described as linear and fragmented processes, can cause further setbacks to a project, specifically in the construction of sustainable projects. It is less expensive to address environmental issues early in the project's life cycle than during its implementation. Indeed, the time at which these decisions are made can significantly affect performance rates, short-term construction costs, and long-term operational costs.

4. Processes: Construction companies should continuously improve their operational processes to differentiate their products or services and achieve sustainable development and competitiveness in the long term [57]. Some examples of the construction process are services, acquisitions, supply chains, and financial aspects (see details in Table 1).

1.4. Adaptation of the Model of Increasing Competitive Advantage

The dimensions of market, organization, project and processes should contain a set of strategies that contribute to generate the construction company's competitive advantages and better environmental performance. The phases of strategic business development that increase competitive advantage through the dimensions of market, organization, project and processes can be seen in Figure 1. This figure, based on the model proposed by Fergusson and Langford [62], illustrates the relationship among environmental management, business strategy and competitive advantage. The left side of Figure 1 shows four dimensions to achieve leadership in the construction industry through business differentiation, trade opportunities, client requirements and compliance with legislation. In the lower x-axis, the model shows that the development of environmental strategies will allow growth and performance improvement, whereas the curve represents the opportunity to increase competitive advantage. The right side of Figure 1 displays the homologation of the dimensions studied in this paper: market, organization, project and processes. The dimensions of this model are consistent with those proposed in this research, emphasizing the environmental, social and economic sustainability for a better understanding of the relationship between sustainable strategy development and competitive advantages. Therefore, strategies have been replaced with the aim of evolving toward corporate sustainability to achieve not only the construction industry's leadership but also advancement toward medium- and long-term corporate sustainability models. For this reason, it is important to identify and understand strategies that contribute to create competitive advantages and developing a sustainable business model.

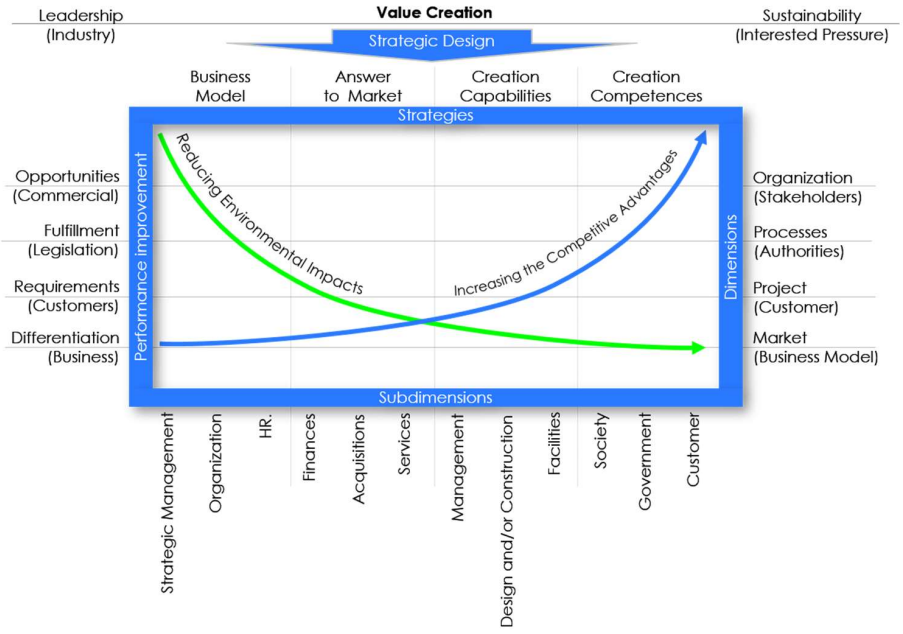

Figure 1. Increasing competitive advantage. Adaptation of the relationship among environmental strategy development, performance improvement and competitive advantage (Adapted from [62]).

2. Methodology and Data

Construction companies needs to develop sustainable competitive strategies to respond to new regulations and increasing social and environmental demands, thus they remain in the market.

This research is based on the data from Chilean construction companies, which is motivated by the need of exploring the main business strategies that affect their corporate sustainability. This research was exploratory, descriptive and correlational. This research is exploratory because of no evidence about the issues investigated in the local construction industry has been found; descriptive because the behavior of variables is analyzed; and correlational due to the validity and confidence of the measurement instrument. The design of this investigation is based on a quantitative, transversal and non-experimental approach. Its quantitative character corresponds to the empirical measurement of the variables under consideration, thus allowing the use of statistics as a tool for analysis. Furthermore, this quantitative study aims to standardize the results obtained in the sample for the population of construction industries. The transversal aspect is justified because it is a one-time measurement, and the non-experimental condition is attributable to the lack of deliberate manipulation of independent variables.

This research considers the following specific objectives: (1) establishing the state-of-the-art about the implementation of sustainable business strategies in the construction industry; (2) collecting data from Chilean construction companies; (3) estimating the validity and reliability of the collection data instrument and its content validity; (4) determining the relative importance among dimensions; (5) evaluating the impact of companies' socio-demographic data on sustainable business strategies (sub-dimensions); (6) categorizing which sustainable business strategies (sub-dimensions) are more implemented by Chilean construction industry; (7) identifying the main associations among sustainable business strategies (sub-dimensions); and (8) determining the attitudes of Chilean construction firms toward sustainability.

Figure 2 shows the research methodology to accomplish the specific objectives. The methodology consists in three main stages (state-of-the-art review, data collection and data analysis) divided in three main activities: literature review, survey design and application, and statistical tests and analysis, which are explained below.

Figure 2. Schematic diagram of the research methodology.

2.1. Literature Review

The literature review was focused on establishing the state-of-the-art about the sustainable business strategies that are implemented by construction and non-construction companies worldwide.

2.2. Survey Design and Application

The instrument used in this research was a survey that collects socio-demographic data (5 questions) and the implementation of sustainable strategies in construction firms (40 questions). The survey was designed not only to provide a diagnosis of the strategies used in Chile's construction industry, through comparison, association and significance but also to determine companies' priorities in terms of the application of sustainable strategies. The socio-demographic variables that are collected are main business activity, position of the interviewee, experience in years, number of employees, and turnover of the construction firms. The 40 questions are measured with a Likert scale (Never, Hardly Ever, Sometimes, Almost Always and Always). The responses in the Likert scale are scored between 1 (Never) and 5 (Always).

The sample design considers a sub-group of the Chilean construction companies that are registered with the Chilean Chamber of Construction (CChC). The survey was administered online for 5 months through the website www.e-encuesta.com. During this period, 75 CEOs of construction companies answered the survey, which corresponds to 30.6% of the construction companies included in the CChC database. The answered surveys were statistically processed using Statistical Package for the Social Sciences software (IBM, New York, NY, USA) to obtain the following statistical results: descriptive analysis, estimate of the instrument's psychometric features, association tests, variance analysis and multiple comparisons.

The measurement instrument was designed to collect information in the following five dimensions, which are divided into 12 sub-dimensions or sustainable construction strategies (Figure 3) and 3 opinion questions.

The measured dimensions and sub-dimensions are set forth below.

1. Market. This dimension focuses on exploring the importance of concerns such as the following: (a) reducing the impact of construction works in the communities; (b) considering policies for managing hazardous waste; (c) protecting air quality both inside and outside of the works; (d) protecting natural resources; (e) creating strategies to encourage sustainable projects; (f) encouraging marketing strategies integrated into the business model; and (g) supporting the development of interest groups in the scope of sustainability. Therefore, the sub-dimensions or sustainable construction strategies studied focus on the main stakeholders of the construction firms (society, government and client).
2. Organization. When companies give importance to the organization dimension, they hold a vision of sustainable organization by engaging in the following activities: (a) clearly defining the role of the sustainable function; (b) developing monitoring processes and measuring practices; (c) communicating the importance of sustainability in the work processes both for the business and for the stakeholders; (d) promoting incentives and rewards; (e) guaranteeing proper environmental work conditions; and (f) developing recycling and other policies, enabling the development and implementation of strategies to address new social, environmental and economic demands. Thus, the sustainable construction strategies studied focus on the main organization roles such as senior management, organization and employees.
3. Project. This dimension is important because the design, construction and sustainable facilities are addressed from a sustainable management perspective, which favors the following considerations: (a) energy efficiency; (b) materials; and (c) construction processes. It also addresses the implementation of sustainable practices, including; (d) recycling; (e) the use of non-toxic chemical products; (f) the reuse of materials and water; and (g) waste management. As consequence, the strategies evaluated can be grouped into management, construction and project facilities.

4. Processes. This dimension is studied to determine the relationship among (a) the financial and social impact of the acquisition of non-sustainable products; (b) the incorporation of sustainable factors into investment decisions; and (c) the implementation of financial-analysis tools to compare costs and assess sustainable solutions or practices. The survey focuses on strategies related to finance, acquisitions and services.
5. Opinion. This dimension has been included in the survey to measure (a) the degree of implementation of sustainable practices; (b) the viability of adopting those practices under the under the current scenario; and (c) the importance that the company assigns to sustainability.

2.3. Statistical Test and Analysis

The answered surveys were statistically processed using Statistical Package for the Social Sciences software (SPSS, release 20). The main statistical analysis and tests were:

- Univariate descriptive analysis [63]: Analysis that is based on the study of a single variable individually. The techniques used in the univariate analysis were the frequency distribution, measures of central tendency, measures of variability and asymmetry.
- Analysis of reliability and validity: The reliability of the survey means how effective is this instrument to measure what it is intended to be measured. This is evaluated based on reliability analysis, Cronbach's alpha coefficient [64], and exploratory and confirmatory factorial analysis [63]. The validity corresponds to the consistency of the questions and the suitability of their formulation, which are evaluated by interrogation analysis.
- Analysis of associations between two variables: this allows determining the existence of some type of association involving two variables and some type of trend or pattern of matching between the different values of the associated variables. The association analysis comprises the following tests: principal components analysis [65], Varimax normalization with Kaiser [66], correlation matrix [67], KMO (Kaiser-Meyer-Olkin) [68], Barlett's sphericity test [69], and Tukey's comparison method [70].
- Statistical comparisons: this allows identifying differences, correlations and means among the variables studied. The following tests are used to perform multiple comparisons: Pearson correlations [71], χ^2 test [72], *t*-test [73], one-way Analysis of Variance (ANOVA) and multiple comparisons.

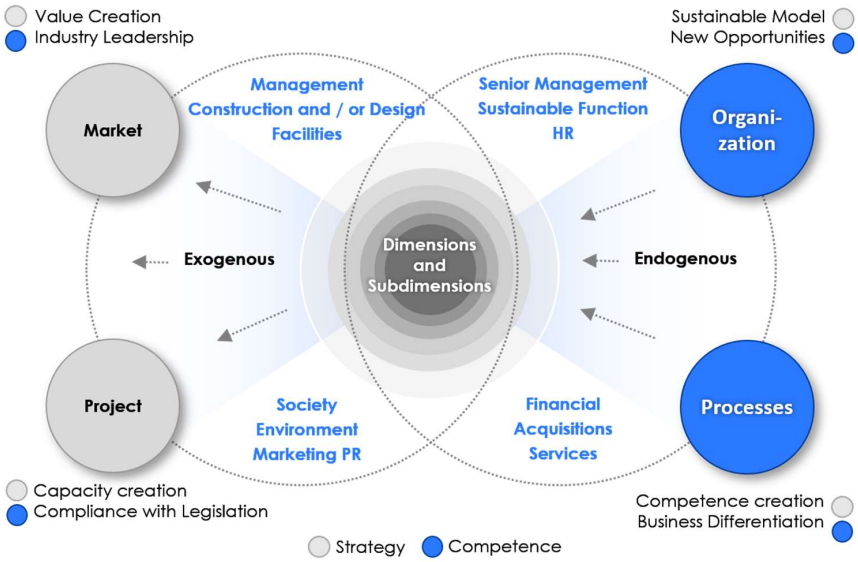

Figure 3. Sustainable strategies in the context of the organization. Overview of strategies leading to the creation of value in the sustainable business model.

3. Results

The presentation of results is primarily based on responses from top-level directors, managers, partners, and superintendents of construction companies. The survey covered the following sectors of the construction industry: industrial, residential buildings, non-residential buildings, mining, road and highways, others. More than 80% of the sample is composed of companies with less than 20 years of experience, with an average of 12.5 years and standard deviation of 9.84. Thirty-two companies were predominant, with a turnover level above US$30 million. In terms of number of employees, there were 30 small companies with 1–100 employees (40%), 21 medium-size companies with 101–500 employees (28%) and 24 large companies with more than 500 employees (32%). Detailed data can be seen in Table 2.

Table 2. Cross tabulation No. of Company Employees vs. Turnover (Million USD).

		Turnover (US$ Million)					
		Under US$1	**1–5**	**5–15**	**15–30**	**Greater than 30**	**Total**
Number of company employees	Between 1 and 10	0	5	0	0	0	5
	Between 11 and 25	2	2	0	1	1	6
	Between 26 and 50	1	3	1	1	0	6
	Between 51 and 100	1	6	0	2	4	13
	Between 101 and 150	0	0	0	0	0	0
	Between 151 and 200	0	1	2	0	1	4
	Between 201 and 250	0	1	2	2	1	6
	Between 251 and 500	0	1	2	3	5	11
	Between 501 and 1000	0	0	1	1	6	8
	More than 1000	0	2	0	0	14	16
	Total	4 5.3%	21 28.0%	8 10.7%	10 13.3%	32 42.7%	75 100.0%

Several statistical tests were performed to validate the survey and identify the significant sustainable construction strategies implemented by Chilean construction firms. Section 3.1 evaluates reliability, and the validity of the survey which was assessed based on Cronbach's alpha, Kaiser-Meyer-Olkin and Bartlett's sphericity tests. Section 3.2 shows the importance of dimensions evaluated based on the median of the strategies for each dimension. Section 3.3 shows the results of several comparative tests to identify the socio-demographic variables that have the strongest impact on the sub-dimensions. Section 3.4 shows the ranking of sustainable construction strategies implemented by Chilean construction firms. Section 3.5 shows significant associations among sub-dimensions through an analysis of association. Finally, Section 3.6 shows the results of the Opinion dimension about the construction companies' overall level of sustainability.

3.1. Survey Reliability and Validity

The scale's internal consistency was measured by the Cronbach's alpha indicator (0.962), estimating the reliability of 40 items with 71 valid cases. An exploratory factor analysis was performed to estimate the scale validity of the construct. In the correlation matrix, high and significant associations were observed among statements. In addition, a very small determinant was found, indicating that a factor analysis should be performed. The same applies to the Kaiser-Meyer-Olkin measure of sampling adequacy (0.82) and Bartlett's test of sphericity (x2 approx.: 2361.56, gl: 780 and significance: 0.00), whose result is significant. Considering these two indicators, a factor analysis is appropriate. In the exploratory factor analysis, eight dimensions that account for 71.99% of the total variance of sustainability were configured. Although there are eight dimensions in the exploratory analysis, only five are distinguished in the sedimentation graphic, which is consistent with the theoretical dimensions of the scale. Based on the results of the reliability and factor analyses, it is concluded that the survey is both valid and reliable.

3.2. Importance of Dimensions

Table 3 shows the importance given to the dimensions by the respondent. The dimension with the highest median is Project (32.9%), followed by Market (30.8%), Organization (27.6%) and Process (26.4%). The Project dimension is the highest, but with increased dispersion (less homogeneous). Otherwise, the Market dimension has lesser dispersion (more homogeneous data). The Opinion dimension is indicative of the overall sustainability assessment. From the average behavior of the sub-dimensions of the construct, the most highly valued are (1) Sustainability in construction and/or design, but with increased dispersion (less homogeneous), associated with the Market dimension; (2) Sustainability in the environment, also associated with the Market dimension; and (3) Assessment of Sustainability associated with the Opinion dimension, with a slightly increased dispersion (less homogeneous), regarding the Sustainability in the environment. Likewise, Sustainability in Facilities is one of the most highly valued dimensions, which is a consequence of the close relationship with the Sustainability sub-dimension in construction and/or design, where both sub-dimensions are grouped in the Project dimension.

Table 3. Ranking of importance of the dimensions of sustainability.

Dimension	Min.	Max.	Mean (*)	Typical Deviation
Market	12	44	30.89	6.257
Organization	10	45	27.69	8.738
Project	11	50	32.99	8.432
Processes	9	40	26.49	7.880
Opinion	1	4	2.99	0.814

Note: (*) Distribution of mean scores of each dimension.

3.3. Impact of Companies' Socio-Demographic Variables on Sustainable Business Strategies

First, a one-way ANOVA test was carried out to identify which socio-demographic data have a significant effect on which sub-dimensions. Next, multiple comparison tests were carried out to identify significant relationships between socio-demographic variables and sustainable strategies.

(a) One-way ANOVA test: Only one significant relation was found between socio-demographic variables and sub-dimensions given by the impact of company size (turnover and number of employees) on a society's sustainability strategies ($F = 2.631$ and $p = 0.031$), including the environmental and social impacts and management of hazardous waste.

(b) Multiple comparison tests: As the one-way ANOVA test showed that turnover is the most important socio-demographic variables, multiple comparison tests were carried out to evaluate the impact of turnover on other sustainable strategies. Table 4 shows the results of these tests. It can be observed that larger companies with turnover above US$30 million show a significant impact on several strategies such as marketing and public relations, role and structure for sustainability in the firm's organization, high-level direction, construction-project management and financial sustainability. In addition, there was a significant impact on small construction companies with turnover between US$1 and US$5 million on human resource and construction management.

3.4. Ranking of Sustainable Strategies

Table 5 ranks the sustainable construction strategies implemented by Chilean construction companies based on the obtained score of each sub-dimension.

Table 4. Multiple Comparison Tests on the Turnover Sub-Dimension.

Sub-Dimensions	**US$ Million**				
Sustainability	**Under 1**	**1–5**	**10–15**	**15–30**	**Greater than 30**
Marketing/PR		(−)			(+) $p = 0.009$
Function		(−)			(+) $p = 0.048$
Senior Management		(−)			(+) $p = 0.012$
HR		(+) $p = 0.041$	(−)		
Management	(−)	(+) $p = 0.031$			
Management			(−)		(+) $p = 0.031$
Construction and/or Design	(+) $p = 0.056$	(−)			
Financial		(−)			(+) $p = 0.022$
Financial				(−)	(+) $p = 0.027$
Acquisition and Supply Chain			(+) $p = 0.052$	(−)	

Note: (+): In that category, it means that scores are higher, (−): In that category, it means that scores are lower.

Table 5. Ranking of importance in the implementation of sustainable strategies.

Sub-Dimensions	**Min.**	**Max.**	**Mean** (*)	**Typical Deviation**
1. Construction and/or Design	4	20	13.25	3.499
2. Environment	6	15	11.55	1.912
3. Facilities	3	15	10.27	2.522
4. Senior Management	3	15	9.93	3.465
5. Society	3	15	9.93	2.533
6. HR	3	15	9.91	2.548
7. Management	3	15	9.47	3.198
8. Marketing and PR	3	15	9.41	3.146
9. Services	3	14	9.25	2.800
10. Acquisition and Supply Chain	3	15	8.83	3.198
11. Finance	3	13	8.41	2.881
12. Function of Sustainability	3	15	7.85	3.910

Note: (*) Distribution of the mean scores for each sub-dimension.

3.5. Association Among Subdimensions

Table 6 shows the results of the analysis of associations among the sub-dimensions. This table reveals that the most significant associations are: (1) Sustainability in the Facilities with Sustainability in the Construction and/or design (*R*-value 0.816), in which 66.6% of each sub-dimension's total variability is explained by the other; and (2) Sustainability of Acquisition with Supply Chain and Financial Sustainability (*R*-value 0.796), in which 63.4% of each sub-dimension's total variability is explained by the other.

Table 6. Analysis of associations, correlation coefficients and significance levels of sub-dimensions.

	Sub-Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13
Market	Sustainability in Society	1 75												
	Environmental Issues	0.566 0.000 75	1 75											
	Sustainability in PR Marketing	0.587 0.000 75	0.362 0.001 75	1 75										
Organization	Function of Sustainability	0.605 0.000 75	0.333 0.004 75	0.698 0.000 75	1 75									
	Sustainability of Senior Management	0.551 0.000 75	0.536 0.000 75	0.667 0.000 75	0.718 0.000 75	1 75								
	Sustainability of HR	0.472 0.000 75	0.429 0.000 75	0.558 0.000 75	0.590 0.000 75	0.642 0.000 75	1 75							
Project	Management of Sustainability	0.560 0.000 75	0.413 0.000 75	0.611 0.000 75	0.717 0.000 75	0.813 0.000 75	0.619 0.000 75	1 75						
	Sustainability in Construction and/or Design	0.516 0.000 75	0.480 0.000 75	0.593 0.000 75	0.537 0.000 75	0.686 0.000 75	0.638 0.000 75	0.773 0.000 75	1 75					
	Sustainability in Facilities	0.451 0.000 75	0.435 0.000 75	0.516 0.000 75	0.432 0.000 75	0.554 0.000 75	0.624 0.000 75	0.655 0.000 75	0.816 0.000 75	1 75				
Processes	Financial Sustainability	0.595 0.000 75	0.405 0.000 75	0.552 0.000 75	0.600 0.000 75	0.551 0.000 75	0.456 0.000 75	0.520 0.000 75	0.485 0.000 75	0.394 0.000 75	1 75			
	Sustainability of Acquisition and Supply Chain	0.527 0.000 75	0.376 0.001 75	0.515 0.000 75	0.533 0.000 75	0.534 0.000 75	0.464 0.000 75	0.488 0.000 75	0.506 0.000 75	0.423 0.000 75	0.796 0.000 75	1 75		
	Sustainability in Services	0.549 0.000 75	0.436 0.000 75	0.559 0.000 75	0.527 0.000 75	0.634 0.000 75	0.572 0.000 75	0.642 0.000 75	0.522 0.000 75	0.453 0.000 75	0.561 0.000 75	0.671 0.000 75	1 75	
Opinion	Assessment of Sustainability	0.413 0.000 75	0.341 0.003 75	0.563 0.000 75	0.527 0.000 75	0.497 0.000 75	0.535 0.000 75	0.517 0.000 75	0.476 0.000 75	0.412 0.000 75	0.476 0.000 75	0.379 0.001 75	0.500 0.000 75	1 75

3.6. Overall Opinion About Company Sustainability

When respondents were asked about "an overall assessment of the degree of implementation of sustainable practices in their company", only 32% answered, "almost always" and "always". When asked, "Do you think the implementation of sustainability strategies could be applicable in your company?" 70.6% responded, "almost always" and "always". However, there is unanimity among the 88% of respondents who answered, "almost always" and "always" regarding the question of whether "they think it is important to implement sustainability strategies in construction". Surprisingly, no one answered "never" and "hardly ever" to this question. Moreover, 36% of the companies stated that they favor technological solutions for energy efficiency, and 32% of the respondents indicated that they favor the reduction of energy consumption as solutions.

4. Discussion

The research question was analyzed and addressed from the perspective of the following dimensions: (1) Market Dimension: Companies that address their strategies mostly around marketing (market) have a lower development of endogenous processes. This shows that there is less progression in obtaining a long-term competitive advantage, but rather in achieving an immediate market position; (2) Organization Dimension: This should be the most relevant dimension because it is in the organization where business strategy is defined. However, this is not evidenced in the case of the Chilean construction industry; (3) Project Dimension: The management of sustainable processes allows evaluating and improving performance or environmental risks of future projects, although in practice this is not addressed; (4) Processes Dimension: An additional precedent is market pressure, which forces a public relations' reaction from the company, with the subsequent disregard of internal processes, especially present in the residential construction industry.

Although mining construction companies are aware of potential environmental damage, they tend to only respond in compliance with either world-class standards or industry sustainability requirements. All business strategies are directly assessed by society and can generate positive or negative effects if decisions are not properly sized; the cost of inaction could destroy the company's social position with significant consequences for the business.

The importance and understanding of the Marketing sub-dimension is observed in all dimensions of the companies surveyed. However, this importance declines in the following order: organization, project and process, which is consistent with the importance given to the market, along with less intra-organizational promotion. Although a great deal of effort is focused on the Market, there is a gap in (a) understanding the social responsibility-related needs and demands raised by the market; and (b) incorporating bottom-up knowledge from workers who already have ideas about the transformation of sustainable processes. To address these issues in practice, it is important to have innovative employees with the ability and vision to redesign products, processes and business models. Above all, these employees must be able to coherently justify why this journey is a meaningful one [74].

Figure 4 shows a gradual change within the organization, starting with the strategic decision and projecting to the process dimension to conceive the market dimension. This ideal situation takes the shape of a snail; this is compared with the survey's results, privileging the market's public relations response, which takes a more diffuse and disorganized shape (stain) in the direction opposite from the snail. This represents a rapid adaptation of the processes needed to meet the project requirements through design, construction and facilities, albeit in the absence of the traceability of the company's strategic decisions (senior management), which seems diminished in relation to these sub-dimensions. It is interesting to pay attention to the points projecting outside the snail, which both indicate the current situation and show Chilean construction firms' lack of a sustainable strategic plan. Decisions that contribute to defining sustainable construction strategies must be conceived as part of a system involving the whole company. One common mistake is to address decisions separately. The policy should be transversal, primarily adopted in the internal process and then projected to the market. Good decisions should not be conceived separately because this makes them more diffuse and increases the

risk of inaccurate results; neither should independent decisions be fused together. Synergies should be found so that the result is successful.

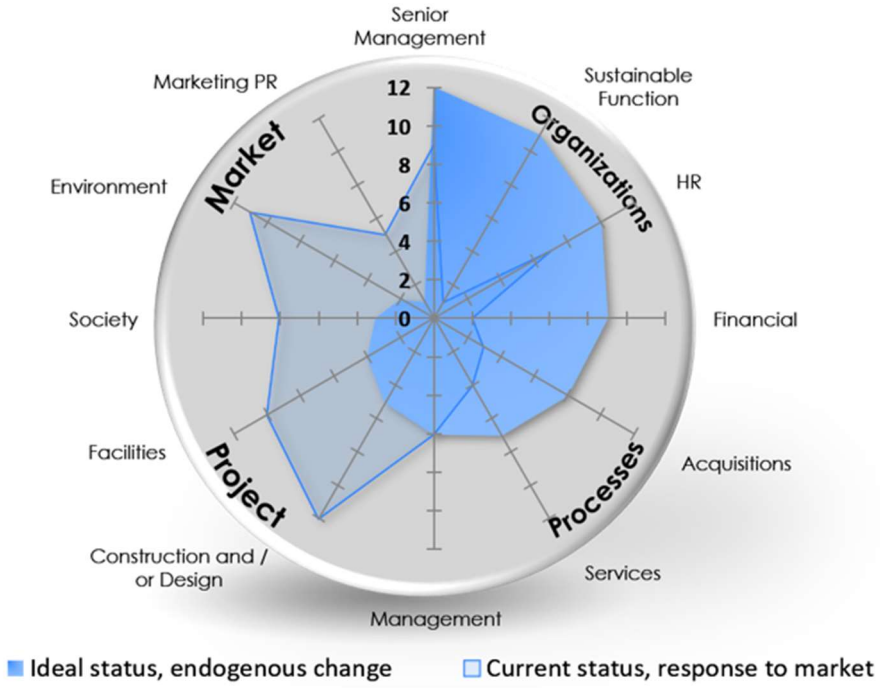

Figure 4. Comparison of endogenous change (ideal, snail-shaped) versus approach based on market response (current situation, irregularly shaped).

Despite the undisputable importance of waste management and recycling, the construction industry takes time to incorporate efficient internal processes, thus placing endogenous strategies at a disadvantage. This is seen in the fact that Construction is the most highly evaluated dimension (average score of 13.25, see Rankings in Table 5), and other dimensions have lower scores, such as Service (9.25), Acquisition and Supply Chain (8.83) and Finance (8.41). Thus, there is greater concern for the delivery of energy-efficient installations to the market. In contrast, water and material recycling from companies' own construction processes are not favored with the same intensity, which reveals the companies' lack of interest in endogenous change.

One of the advantages of endogenous change is the transmission of a company's own knowledge and culture toward the organization and the market, along with the implementation of strategies focused on the project that incorporates sustainable processes. As seen in this study's results, influence is exerted from the company's core. However, it should be exerted from the senior management level in response to the strategic definition.

Respondents not only adhere to the immediate need to rethink strategies but also visualize fertile ground for implementing sustainable strategies; this is indicated by the 79% who responded that the new sustainable business model is "Applicable in the company". Nevertheless, respondents also recognize the implied positive impact on society and the economic benefit for the company, evidenced by the 88% support for the "Importance of Sustainability".

Thirty-six percent of respondents indicated that they favor energy-efficient solutions because of new building requirements or new market demands. The residential construction sector is gradually realizing that has to move towards sustainability because (a) construction operations interfere with society and affect the community's quality of life; (b) certain processes are more beneficial for workers; (c) certain practices are economically viable; and (d) they can achieve greater profitability and social acceptance in the process.

The structured function of sustainability, defined as a permanent role, has a significant impact on both the supply chain and the sustainability of services. The reason is that the Sustainability Function is responsible for disseminating strategy from the senior management level and coordinating all of the company's processes with an economic, social and environmental approach, boosting actions in the primary processes in which practices should be internalized. Notwithstanding, the Sustainability Function is the least valued sub-dimension (7.85, see Table 5). The sustainability role is important in (a) sustaining a plan of activities aimed at involving workers based on different approaches; (b) adequately communicating senior management's vision; (c) transferring intra-organizational knowledge; (d) encouraging practices through incentives; (e) developing policies; (f) managing technical counterparts; (g) consistently articulating processes; and (h) guiding efforts and collecting and transmitting new social, economic and environmental requirements.

Although adaptation to this context seems irreversible, companies can dangerously delay this change until they are not experiencing regulatory pressure. This traditional approach could put the company at a disadvantage compared with competing companies that have accepted the impending change and have decided both to act and to be consistent with the sustainable model. Therefore, conceiving a sustainable vision and acting accordingly will confer a competitive advantage, provided the company reacts in time.

It should be noted that the process of generating strategies is a learning and dynamic process; therefore, it involves a permanent adjustment in which decisions can also be reversed for consistency with the results of other decisions. Practices that are applied as part of a sustainable process should be supported by major decisions involving other overall aspects of the process, probably driven by the market but strengthened by internal processes.

To identify how sustainability has been incorporated into companies operating in Chile, Ernst and Young surveyed 407 business executives from different sectors (e.g., retail, mining, energy, manufacturing, and telecommunications). When asked whether their companies have implemented a sustainability strategy, 51% answered "yes". This is a surprising answer because most of the surveyed companies do not have a sustainability strategy that includes this area in their core business, which should be aligned with their strategy [75]. When comparing this survey with the construction industry survey presented in this paper, it is evident that the construction industry has delayed longer in implementing sustainable strategies. Only 32% of respondents had an overall assessment of their companies' sustainability strategies, thereby demonstrating that the construction industry takes more time than other industries to incorporate sustainable strategies. This is consistent with the degree of importance attributed to sustainability. However, companies do recognize the importance and applicability of providing a high degree of value to sustainability in the company.

Similar results are found worldwide. International studies show agreement about CEOs of different productive sectors about the relevance of corporate sustainability for the business model, while their attitude towards sustainability has increased significantly. For example, the report "A New Era of Sustainability" [76] shows the results of a survey conducted to 766 CEOs of 13 productive sectors in 100 countries. This report reveals that 93% of 766 CEOs believe that taking care of sustainability issues in advance will be critical to their businesses' future success, whereas 96% believe that sustainability issues should be fully integrated into their companies' strategy and operations [76]. This report also shows a significant increase of the CEOs attitude toward sustainability which increases from 72% in 2007 to 96% in 2010. Other survey based-study carried out by the Massachusetts Institute of Technology in 2012 involved 2874 managers and executives from 113 countries [77]. The study shows that 70% of firms have incorporated sustainability on their management agendas, while 66% of respondents indicates that sustainability was crucial to be competitive under today's market and social demands. Moreover, this study found 31% of companies are currently profiting from sustainable business practices. The results of these international and national studies as well as the results shown in this paper agree that companies' commitment toward sustainability is increasing significantly because this is key for competitive advantages and company's long-term permanence.

5. Conclusions

Overall, construction companies implement sustainable construction strategies focused on introducing their construction projects to the market. Despite companies provide timely responses to market pressure, this approach is usually incompatible with long-term organizational changes. Although companies adapt their processes to meet customers' requirements, they lack a transversal strategy involving all of the processes within the organization. This gap is evidenced in management processes that prioritize customer-oriented strategies such as energy-efficient facilities and architectural design strategies instead of other management processes that address waste and materials recycling, acquisitions and supply chains. Although these strategies are visible to the market, they only approach the finished product, not a deep organizational change.

Nevertheless, this study showed that although construction firms need to respond to the sustainable demands of society, they implement more and deeper sustainable construction strategies when regulations are stricter, such as the case for construction companies working in the mining industry. There is also evidence that company size directly affects sustainability. Large companies, as indicated by the number of employees, are more likely to develop and implement strategies to address new social, environmental and economic requirements. Likewise, the greatest effect on sustainability is observed in companies with a higher turnover.

This research showed that the participating companies did not pursue strategies that encourage profound organizational change toward corporate sustainability. The function of sustainability management is not a permanent role in the organizational structure, as evidenced by the lack of a permanent sustainability role such as a Director of Sustainability. The lack of a role and organizational structure related to sustainability is a significant barrier for establishing a corporate sustainable strategy and the dissemination, follow-up, and results of sustainable strategies. This strategy should be conceived from the senior management and extended downwards to the entire organization. Thus, the strategy's fragmentation indicates a gap in the dissemination of the policy and a defective communication of the long-term sustainable vision.

As evidenced by this study, only 32% of construction companies declare that they implement sustainable strategies. However, 71% of the respondents believe these strategies could be applied and 88% indicate that these strategies are important for business sustainability. From this perspective, companies recognize sustainable strategies' positive impact on society and on the environment, along with their inherent economic benefits for the firm. Nevertheless, their efforts are focused on the market's demands. The lack of a long-term vision may affect the transformation of sustainable strategy into a competitive advantage. Therefore, if companies do not proceed opportunely, the delay might represent a disadvantage when competitors have experienced transformation based on a sustainable business model.

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