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Diagnosing the Actual Reality of the Requirements of Ecological Design According to ISO14006:2020: A Case Study in Engineering Reconstruction Office-Iraq

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Abstract

The research aims to identify the extent of the commitment of the Department of Engineering Reconstruction to the application of ecological design according to the guiding specification ISO14006:2020 by measuring and diagnosing the gap between the actual reality in the Department of Engineering Reconstruction and the requirements of the specification, and to achieve this goal, the case study approach was adopted, and the checklist was adopted to measure the gap.

Methodology: The study starts from the problem represented by the gap between the actual reality of ecological design in the Department of Engineering Reconstruction and Ecodesign by the requirements of ISO 14006:2020. Prepared by the British Standards Organization (BSI).

Results: The results of the research show that the total rate achieved by measuring the availability of eco-design requirements in the Department of Engineering Reconstruction according to ISO14006:2020 obtained a percentage of (75%) and an implementation rate of (5), meaning that it is close to a fully documented application, which generated a gap of (24%).

The research came out with conclusions, the most prominent of which is that although the research organization understands design and development when integrating eco-design into design and development, it does not have documented information in this regard. Some internal problems in the documentation of some requirements of the standard.

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Keywords: Environmental design; ISO14006: 2020; Sustainable development; Green approach; Environmental approach.

1. Introduction

Eco-design is an approach to designing products and services with consideration of environmental impacts during the product life cycle, It is one of the areas of integrated design that aims to preserve the environment and pays primary attention to the coordination of human relations and their environment and the preservation of the natural environment, It aims to find an integrated system that includes a combination of a set of criteria (functional, structural, economic, and aesthetic) as well as environmental criteria. This study seeks to identify the gap between the actual reality of ecological design in the Department of Engineering Reconstruction and Environmental Design by the requirements of ISO 14006:2020. And protecting it from environmental risks, which in turn is a challenge for industrial organizations in how to convert these risks into opportunities to improve environmental performance and enhance environmental reputation, as well as embodying the environmental ethical commitment.

The reason behind adopting this study is to find a solution to a major part of the problem of environmental degradation and pollution by measuring the gap in the application of the requirements of ISO14006:2020 by identifying cases of non-conformance with the requirements, which helps to achieve compatibility with them to reduce that gap if possible.

2. Research Methodology and Some Previous Studies

2.1. Research methodology

2.1.1. Search Problem

After the field experience in the Department of Engineering Reconstruction, it was found that there is a weakness in the environmental awareness of the employees in the Department of Engineering Reconstruction, one of the formations of the Ministry of Housing, Construction and Public Municipalities (the field of study), which negatively affects the achievement of the requirements of ecological design, so the research problem was embodied by the following

question: What is the size of the gap between reality The actual application of eco-design in the Department of Engineering Reconstruction and Eco-Design according to ISO(14006:2020).

2.1.2. Search Goals

The goal of the research is derived from the question highlighted by the study problem, which is to diagnose the gap between the actual reality of the application of ecological design in the engineering reconstruction department and the requirements of ecological design according to the requirements of the specification (ISO 14006:2020) by identifying cases of non-conformity with the requirements, which helps to achieve compatibility with it to reduce that gap if possible.

2.1.3. Search Importance

The importance of the research is as follows:

A. Presenting a conceptual framework that clarifies the ecological design according to the requirements of the specification (ISO 14006:2020), as these concepts are recent and unclear to the Iraqi organizations in general and the researched organization in particular.
B. Awareness and guidance of senior management in the Engineering Construction Department of the importance of ecological design, as well as assisting them in applying the requirements of the standard (ISO 14006:2020) and the benefits it will achieve for them.

2.1.4. Data Collection Sources

The researcher relied on the following sources in collecting theoretical and practical data, as follows:
A. Theoretical aspect: [Arab and foreign letters and theses, published research and periodicals in refereed scientific fields, foreign articles and research via the global information network, publications of specialized organizations such as the International Standardization Organization (ISO)].
B. The practical side:

- Field coexistence in the research sample from (2/11 2021) to (1/3/ 2022), contributed to understanding the actual reality of the level of application of eco-design requirements.
- Personal interviews with the managers of the research sample before and during filling the checklist.
- Engineering Reconstruction Department reports and related documents and records.
- The gap analysis checklist for the eco-design item that was used in diagnosing the mismatch gap between the actual reality of the application of eco-design in the engineering reconstruction department and the requirements of eco-design according to the requirements of the specification (ISO 14006:2020), prepared by the International Standardization Organization and containing (22) questions For the necessities of the research, and in order to translate the answers to the questions of the checklists into quantitative expressions and to obtain greater accuracy in analyzing the data contained therein, a seven-point scale was used to identify the extent to which the actual implementation of the requirements in the research sample matched compared to the indicative specification with determining the weights of the answers to the questions contained in the checklists By allocating a specific weight to each paragraph of the scale, and Table 1 shows those paragraphs and their weights, which range from application and complete documentation with a weight of (6) degrees and lack of application and documentation with a weight of (0) degrees, and no program was used to analyze the data, as the results were extracted based on the data analysis tools represented by (arithmetic mean, matching percentage, determining the size of the gap).

Table 1 Heptagonal Scale for the extent (degree) of conformity with the standard [1]

Sequence	Paragraphs Scale	Paragraph Weight
1	Fully applied fully documented	6
2	Fully Applied Partially Documented	5
3	Completely applied not documented	4
4	Partially applied, fully documented	3
5	Partially Applied Partially Documented	2
6	Partially Applied Not Documented	1
7	Not applicable Not documented	0

2.1.5. Data Analysis Tools

After determining the grades for each paragraph in the light of the answers to the checklists, the following equations were adopted to extract the percentage of the extent of conformity, as follows:

A. Calculating the approximate rate of the extent to which implementation and actual documentation conform to the requirements of ecological design in the Department of Engineering Reconstruction, the study sample, in comparison with the requirements of the indicative specification ISO14006:2020)) by extracting the weighted arithmetic mean according to the following equation [2].
B. Weighted arithmetic mean = ((frequencies x weights) total) / (frequencies total)
C. The percentage of conformity of the application and the actual documentation of the requirement in the Department of Engineering Construction with the standard specification and according to the following equation:

Percentage of conformity = ((its frequencies x weights) total) / (the scale is in a higher weight x total repetitions)
The highest weight on the heptagonal scale is (6) degrees, and it represents the state of complete conformity with the requirements of the specification.

D. Calculate the size of the gap through the following equation:

Gap size = 1– the percentage of how much to match

3. Some Previous Studies

This topic presents some previous studies, and these studies dealt with the guiding specification ISO14006.
Below will be a review of the most important paragraphs addressed by the research method, the location of the research, the problems that prompted these topics, the research objective, the methods used to collect data, the most prominent conclusions, the differences and similarities, and finally the areas of benefit.

1. A Case Study of the Adoption of a Reference Standard for ISO14006 in the Lift Industry [3], Table 2.
2. Paving the way for the ISO14006 eco-design standard: an exploratory study in Spanish companies [4], Table 3.

Table 2 The Previous Study for The Specification ISO14006

The problem of the study	Using the Spanish standard UNE150301 as a basic reference point in paving the way for the ISO14006 eco-design standard.
The aim of the study	Analyzing the leading UNE150301 standard in addition to its adoption process and its practical results in the elevator industry.
The study population and sample	A company that manufactures elevators, and it is the first industrial company to adopt the ecological design standard UNE150301.
Study method and tool	Using a case study as a study method and using checklists as a study tool.
Similarities	Adopt a case study approach.
Differences	Apply the study in the elevator industry company.
The most important results	Show that the adoption of the UNE150301 standard leads to reducing the environmental impact of the products and obtaining some competitive advantages such as reducing costs, improving the energy efficiency of the product, and better adapting to regulations and laws. UNE150301 as a reference point.
Benefit areas	View the most prominent results of the study and how the UNE150301 standard affects environmental impact, leading to the formulation of the ISO14006 standard.

Table 3 The Previous Study for Eco Design

The problem of the study	is to use the Spanish ecological design standard as a reference point to pave the way for the ecological design standard.
The study	aims to analyze the experience related to the adoption of UNE 150301 in Spain.
The study population and sample	are four leading Spanish companies in adopting the environmental standard.
Study method and tool	Using the case study as a method of study and use direct observation, consultation, interviews, UNE 150301-related documentary databases of organizations, and other internal and external documentary information as study tools.
Similarities	Using the case study approach.
Differences	Applying the study to four leading Spanish companies in adopting the environmental standard.
The most important results	show that the companies are satisfied with the adoption of this criterion, as they have been able to reduce the environmental impact of their products. They have also obtained cost reductions when reducing the environmental impact requires an increase in costs.
Benefit areas	Strengthening the theoretical aspect of the ecological design variable and reviewing the results of the study.

4. The Theoretical Side

The last decades witnessed an increasing interest in environmental standards as one of the basic standards contributing to improving the quality of life. Therefore, major industrial organizations and design workers have tended to study these environmental standards in design and their integration with functional, economic, and aesthetic standards in product design. The emergence of the concept of sustainable development has had a great impact on directing the entrances. The urban and architectural shaping of the built environment aims through its strategies to achieve development and sustainability.

The concepts and dimensions of economic, social, and environmental sustainability had an impact in determining the entrances to environmental design, each of which focused on achieving many goals represented in achieving a positive relationship with the environment and reducing environmental impacts.

4.1. Define sustainable development

The term sustainability has been used since the eighties of the twentieth century, and it was first used in the sense of human sustainability on the planet. And his participation in the responsibility of social, economic, and environmental development events in the present and the future [5].

Also defined by [6] as the process by which the available resources are exploited to achieve sustainability, meet the needs of individuals and society, and improve living conditions, taking into account the environmental aspects and ensuring the right of the next generation to these resources.

From the above, we find that sustainable development is a process aimed at developing awareness among individuals by drawing their attention to the environment and related global problems and issues by providing them with knowledge and developing their skills to understand the relationship between man, society, and the natural environment.

4.2. Dimensions of sustainable development

There is almost agreement between writers and researchers regarding the dimensions of sustainable development, and these dimensions are determined according to [7], [8] as follows:

1. Environmental dimension: This dimension is concerned with preserving the environment, and given the difficulty in managing the relationships between social, economic, and environmental goals, this dimension is exposed to many challenges that in turn require decision makers to prepare procedures and policies to achieve environmental balance. The environmental dimension includes many elements related to the environment. Of which:

A. Reducing negative effects on human health.
B. Stay away from the use of toxic substances that have negative effects on human health.
C. Rationing water use.
D. Protect the soil and use pesticides appropriately.

2. The economic dimension: From the economic point of view, sustainable development refers to improving the level of well-being of individuals in light of their needs for housing, transportation, food commodities, health, and education. This dimension includes many economic elements, including:

A. Determining the responsibility of developed countries for environmental pollution and ways to treat it.
B. Creating new job opportunities and markets.

C. Ensuring people's access to natural resources.
D. Reducing resource drain.

3. The social dimension: This dimension ensures the achievement of social justice in the provision and distribution of social services, including equality, education, and health in providing them to all members of society, the reduction of poverty, the elimination of differences between urban and rural residents, the provision of political participation and their involvement in decision-making to spread freedom and implement Democracy is in addition to the challenge of the unbalanced and rapid demographic increase, which makes individuals ready for sacrifice, giving and teamwork. This dimension includes many social elements, including:

A. Providing safety and health for workers.
B. Positive impact on the quality of the environment and local communities.
C. Statistics of demographic growth.
D. Optimum use of human resources.

4.3. Define environmental design

The concept of environmental design adopts a new term, which is the term sustainability, which means continuous growth and renewal in a balanced and natural way, and respect for the symbiotic human relations with the environment and the natural cycles of the earth [9].

Environmental design is one of the integrated design fields that aim to preserve the environment. It helps in integrating the various efforts in the field of renewable and continuous agriculture, environmental restoration, green architecture, and industrial engineering.

Environmental design is defined as the design that is based on preserving the environment by considering environmental sustainability when carrying out the design process and working to achieve harmony and a positive impact between work and the surrounding environment [10].

From the above, we find that environmental design is a sustainable design that consists of a system of elements and relationships, the most important elements of which are: the elements of the land associated with the site, water, and air, and the vocabulary of the climatic system represented by the atmosphere, energy production, and control of the internal and external environment. Performance and the target element in environmental design are the human being working to achieve his needs and comfort and to achieve prosperity and his relationship with others and the environment.

4.4. Environmental Design Entrances

The entrances that tried to conform to the variables of the natural environment at the end of the twentieth century and the beginning of the twenty-first century included a set of architectural trends that relied in their names on the elements that are focused on compatibility with the natural environment and its variables, while they may converge in the final results achieved by the design in each of them the entrances included the following:

1. Sustainable Approach: A new method or style of design based on evoking the economic and environmental challenges that cast their shadows on various sectors in this era and has origins related to the energy crisis in the seventies, as efforts were active to protect the environment and achieve sustainable design during the eighties and nineties of the twentieth century [11].

The targeting of a sustainable approach led to the creation of a built environment with responsible environmental management based on the principles of ecological efficiency and resource and energy efficiency to reduce the negative impact on the environment and achieve the desired sustainability. These principles include the following [12]:

A. Enhancing, supporting, and harmonizing with the natural environment.
B. Reducing the consumption of non-renewable sources such as energy and materials.
C. Prevent pollution and reduce or prevent the use of toxic substances that hurt humans and the environment.
D. Water protection, conservation, and recycling.
E. Optimum use of natural energy.

From the above, we find that sustainable design is concerned with environmentally conscious design techniques through design in a manner based on respect for the environment and its components, whereas conscious design reflects the proportionality of work with its result through research to find the best performance, by creating a balance between effort and achievement.

2. Green Approach: The terms green and sustainable design are often used interchangeably although there are shades of meaning implicit in both, as sustainability is a goal that allows continuous improvement in the standard of living without causing damage that could negatively affect the resources, we need to survive Green design aims to develop products and processes that are more environmentally benign. The implementation of green design requires a special framework for considering environmental issues, challenging traditional design and manufacturing procedures, and reducing energy, operation, and maintenance costs [13].

From the above, it find that green design is a system that pays attention to environmental, economic, and social aspects by designing environmentally friendly products aimed at reducing energy and resource consumption, reducing the use of toxic materials in manufacturing and reducing gas emissions, as well as designing products that can benefit from some parts through Recycle the product or re-disassemble and use it [14]. Mentioned the basic principles of green design as follows:

A. The resources used should be of the least toxic resources available.
B. Use the minimum number of resources and energy in operations.
C. Designing products so that they can be reused or a new product created from them or their components.
D. Production should obtain its resources from the resources returned and reused and extracted from the discarded resources instead of from the new primary resources, ie, encouraging reuse and recycling.

3. Bioclimatic approach: the bioclimatic approach is a design trend that draws its ideas from nature and focuses on the use of nature and benefiting from the elements of the biosphere and its climatic characteristics, taking into account all the conditions related to construction, economy, and human health.

The entrance has a clear strategy based on reducing the negative impact on the environment and takes into account a set of issues such as achieving sustainability and energy saving [15].

4. Ecological approach: Ecology is the science that is concerned with the relationship between living organisms and their surrounding environment, according to which energy and materials are exchanged to make up an ecosystem, and ecology is the study of the relationship of animals and plants with their natural environment. The ecosystem refers to the functional relationship between society

and the surrounding environment, which is characterized by ecological unity within nature, which is the system resulting from the interaction between living organisms and the natural environment [16].

Eco-design has become important to many organizations due to its ability to reduce costs (eg by reducing the use of energy and materials), meet legal obligations, and reduce the environmental impact of the organization and its products while at the same time increasing expectations among customers to reduce the environmental impacts of products in line with concerns Related to climate change, resource depletion, and pollution, eco-design is defined according to (ISO14006:2020) as a systematic approach that takes into account environmental aspects in design and development to reduce adverse environmental impacts throughout the product life cycle.

Also, ecological design is not only limited to engineering, urban, architectural, and ecology design, but includes scientific branches such as energy studies, pollution control, resource conservation, climatology, technology and recycling, and land use planning and by integrating them we get a sustainable ecological design methodology [17]. Mentioned the basic principles of ecological design as follows:

A. Respect the site and include:

- Environmental compatibility: the ability to revive the built environment.
- Urban environment: compatibility with urban character.
- Geography of place: identifying design practices.
- Environmental Impact: Employable and Recyclable Materials.
- The nature of society: societal customs and traditions.

B. Climate adaptation includes:

- Urban composition: wind direction and sun movement.
- The relationship of the environment with climate: taking advantage of its natural resources.
- Architectural shaping: achieving the thermal comfort of space.

5. Environmental approach: It aims to focus on environmental compatibility and reduce the negative impact on both the external and internal environment of the building through:

A. Achieving serious design by achieving sound functional relationships, efficient mechanical systems, and a well-formed building.

B. The use of ecological building materials, reduces the potential for destruction of global ecosystems.

C. Providing a healthy indoor environment by taking precautions to ensure that materials and building systems do not emit toxic gases into the indoor atmosphere.

From the above, it find that despite the different names of the environmental design entrances, they have shared a set of principles that work to achieve common goals to achieve compatibility with the changes in the natural environment, as will be clarified in the Table 4.

Table 4 The environmental design

Sustainable Approach	Green Approach	bioclimatic approach	Ecological approach	Environmental approach
Dealing with the environment through the environmental preservation methodology in all elements of dealing with the environment.	It deals with equal priorities for environmental conservation, human health, and resource conservation during the life cycle of buildings that are characterized by balance.	Employing natural processes for the convenience of building users.	His priority is to create a positive relationship between the building and its users on the one hand and the external environment on the other.	It places equal priority on positive interaction with the internal and external environment. .

5. Applied Side

The topic seeks to present the results of the field research for the checklist and its analysis, based on the answers obtained by the researcher from personal interviews and access to records and documents related to ecological design in the Designs Department of the Engineering Reconstruction Department, to reach the arithmetic mean to know the true rate of the extent of application of the requirements of ecological design, the standard deviation and the application gap for each paragraph of the checklist, at the total level of the main axes, as the results were extracted based on the data analysis tools represented by (arithmetic mean, percentage of matching, determining the size of Gap), and the table (5, 6, 7, 8) shows the checklist for the item (11) related to eco-design activities in design and development to demonstrate how this test was conducted.

Table 5 A checklist for conforming to the requirements of (Eco-design activities in design and development)

11 Ecodesign activities in design and development 11.2 Design and Development	Fully Applied Fully Documented	Fully Applied Partially Documented	Fully Applied Undocumented	Partially Applied Fully Documented	Partially Applied Partially Documented	Partially Applied Undocumented	Not Applicable Undocumented
1. Design and development usually consist of the following activities: Defining requirements (from various stakeholders) in product	✔						

specifications.							
Convert specifications into product functions.	✔						
Incorporating functionality into product concepts (concept development).	✔						
Evaluation, refinement, and selection of the final product concept(s).	✔						
Refining the selected concept(s) into the final product(s).							✔
2. Apply eco-design to new products as well as redesign existing products, including modifying processes as needed in their delivery.	✔						
Repetitions	5	0	0	0	0	0	1
Result = (weights * repetitions)	30	0	0	0	0	0	0
	Weighted arithmetic mean = (score / sum of frequencies) = 30/6 = 5 Percentage of conformity = (weighted arithmetic mean / highest weight on the scale) = 5/6 = 83% Gap size = 1-percentage = 1 - 83% = 17%						

Prepared by the researcher based on ISO14006:2020

Table (5) indicates that there is a gap of (17%), and the strengths and weaknesses can be indicated as follows:

a. Strength points:

1. The organization identifies the requirements (from the various interested parties) in the product specification.
2. The organization converts specifications into product functions.
3. The organization integrates functions into product concepts (concept development).
4. The organization evaluates, refines, and selects the concept(s) of the final product.
5. The organization applies eco-design to new products as well as to redesign existing products, including modifying processes as needed in their delivery.

b. Weakness points:

The organization lacks a revision of the concept(s) selected in the final product(s).

Table 6 Checklist for Matching Requirements (How to Get Started with Eco-Design)

11.3 How to get started with eco-design	Fully Applied Fully Documented	Fully Applied Partially Documented	Fully Applied Undocumented	Partially Applied Fully Documented	Partially Applied Partially Documented	Partially Applied Undocumented	Not applicable Not documented
1. Ensure that those responsible for the Environmental Management System understand the following:	✔						
- Design and development. - In particular, their organization's approach and terminology, so that	✔						

they know how and when they can influence it. - In addition to the concepts of life cycle thinking and environmental requirements related to the product. At this stage, it is important to determine:	✔						
- Current environmental knowledge and experience related to the product within the organization. - Basic needs for education or training on eco-design for interested parties that may participate.					✔		
-Environmental activities requirements related to the product. 2. It enables the organization's top management responsible for the environmental management system to establish collaboration between design, development, and other business functions.		✔			✔		
Repetitions	3	1	0	0	2	0	0
Result = (weights * repetitions)	18	5	0	0	4	0	0

Weighted arithmetic mean = (score / sum of frequencies)
= 27 / 6 = 4.5
Matching percentage = (weighted arithmetic mean / highest weight on the scale)
= 4.5 / 6 = 75%
Gap size = 1-percentage
= 1- 75% = 25%

Prepared by the researcher based on ISO14006:2020

Table (6) indicates that there is a gap of (25%), and the strengths and weaknesses can be indicated as follows:

a. Strength points:

1. Those responsible for the organization's environmental management system understand design and development.
2. Those responsible for the organization's environmental management system understand their organization's approach and terminology so that they know how and when they can influence it.
3. Those responsible for the environmental management system in the organization determine the current environmental knowledge and experience related to the product within the organization.

b. Weakness points:

1. Those responsible for the organization's environmental management system lack an understanding of the basic needs for education or training in eco-design of interested parties who may participate.
2. Those responsible for the environmental management system in the organization lack an understanding of the requirements of environmental activities related to the product.

Table 7 Checklist for Matching Requirements (Developing a Plan to Integrate Eco-Design in Design and Development)

11.4 Develop a plan to integrate eco-design into design and development	Fully Applied Fully Documented	Fully Applied Partially Documented	Fully Applied Undocumented	Partially Applied Fully Documented	Partially Applied Partially Documented	Partially Applied Undocumented	Not applicable Undocumented
1. The following aspects should be considered when integrating eco-			✔				

design into design and development: Understanding of design and development.							
Understand how design and development are organized (ex. internally or outsourced).					✔		
Understand the concept of the life cycle.							✔
Understand relevant life cycles for individual products and business models.							
Understand the most important requirements from internal and external interested parties.	✔						
Understand the main environmental impacts of products, and where they occur in the life cycle.	✔						
Understand the environmental aspects that should be taken into account in design and development.	✔						
Determine resource needs (ex. efficiency, data, and budget).	✔						
Plan development and implementation.	✔						
Continuous review and improvement of the plan.		✔					
Repetitions	5	1	1	0	1	0	2
Result = (weights * repetitions)	30	5	4	0	2	0	0

Weighted arithmetic mean = (score / sum of frequencies)
= 41/10 = 4.1
Matching percentage = (weighted arithmetic mean / highest weight on the scale)
= 4.1 / 6 = 68%
Gap size = 1-percentage
= 1- 68% = 32%

Prepared by the researcher based on ISO14006:2020

Table 7 indicates that there is a gap of (32%), and the strengths and weaknesses can be indicated as follows:

a. Strength points:

1. An organization understands design and development when integrating eco-design into design and development.
2. The organization understands the most important requirements from internal and external interested parties when integrating eco-design into design and development.
3. The organization understands the main environmental impacts of products, and where they occur in the life cycle when integrating ecological design into design and development.
4. The organization understands the environmental aspects that should be considered in design and development when integrating eco-design into design and development.
5. The organization identifies resource needs (eg efficiency, data, and budget) when integrating eco-design into design and development.
6. The organization develops and implements the plan when integrating eco-design into design and development.
7. The organization reviews and continuously improves the plan for integrating ecological design into design and development.

b. Weakness points:

1. The organization lacks an understanding of how to organize design and development (eg in-house or outsourced) when integrating eco-design into design and development.
2. The organization lacks an understanding of the life cycle concept when integrating eco-design into design and development.
3. The organization lacks an understanding of the relevant life cycles of individual products and business models when integrating eco-design into design and development.

Table 8 Summary of the results of the level of conformity of the actual implementation of the requirements of ecological design according to ISO14006:2020 in the Designs Department of the Engineering Reconstruction Department

Requirements	Rating Score	Execution rate	Percentage rate	Gap
	Iterations	Weighted arithmetic mean	Commitment	
Design and Development	6	5	83%	17%
How to get started with Eco-design	6	4.5	75%	25%
Develop a plan to integrate eco-design into design and development	10	4.1	68%	32%
Total	7	5	75%	24%

6. Conclusions and Recommendations

6.1 Conclusions

After completing the theoretical and practical framework of the research, the most important conclusions emerged, namely:

1. It turns out that the overall rate achieved by measuring the availability of eco-design requirements in the Engineering Reconstruction Department according to ISO14006:2020 obtained a percentage of (75%) and an implementation rate of (5), meaning that it is close to a fully documented application, which generated a gap of (24%)., This is what answers the research question.
2. . The organization lacks a revision of the concept(s) selected in the final product(s).
3. The organization lacks an understanding of how to organize design and development (ex. in-house or outsourced).
4. The organization lacks an understanding of the concept of the life cycle.
5. The organization lacks an understanding of the relevant life cycles of individual products and business models when integrating eco-design into design and development.
6. Although the organization in question understands design and development when integrating ecological design into design and development, it does not have documented information in this regard.
7. Through personal interviews, it was concluded that the Engineering Reconstruction Department applies the requirements of ecological design, but it faces some internal problems in the documentation of some requirements of the specification.

6.2. Recommendations

1. The need for the department to seek to bridge the gap in the requirements of ecological design by the specification ISO14006:2020 according to the results of the research.
2. The necessity of working on a revision of the selected concept(s) in the final product(s).
3. The necessity of working to understand how design and development are organized (ex. in-house or outsourcing)
4. The necessity of understanding the concept of the life cycle to take into account the environmental aspects relevant to the product during its entire life cycle and this means looking at successive and interrelated stages such as material acquisition, design and development Manufacture, delivery, and installation, use (including reuse, maintenance, repair, remanufacturing, modernization and refurbishment), end-of-life treatment, removal.
5. The need to understand the relevant life cycles of individual products and business models when integrating eco-design into design and development by identifying environmental requirements related to the product expressed by customers and other interested external and internal parties, and avoiding unintended transformation of environmental influences within the life cycle.
6. The necessity of documenting all information related to the understanding of design and development when integrating ecological design into design and development.

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