Industrial Design and Vision Zero Strategy

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Abstract

The main subjects of this article include the field of industrial design and the Vision Zero strategy. Industrial design focuses on the creation of products and services based on the needs of users and producers, while also considering aspects such as quality of life and sustainability. Additionally, Vision Zero, as a new strategy aimed at enhancing safety, health, and welfare, could provide an effective framework for industrial design thinking. In this study, we aim to clarify the relationship between industrial design and Vision Zero. In this research, 68 industrial designers participated as the volunteers filled out our online 10-score questionnaires. Furthermore, some related articles were assessed based on the Scopus database. The assessment of the questionnaires revealed that most participants believe industrial design has a significant impact on health, safety, and environmental protection in both product and service design. The read articles and VOS viewer showed that some countries i.e. USA, Sweden, Germany, and Australia, were involved in the research conducted in the field of vision zero more than other communities. Considering the findings, it seems that to improve the industrial design scope based on the quality of life for all, making a synergy between industrial design, and vision zero on the context of sustainability is inevitable.

Keywords

Industrial Design, Vision Zero, Safety, Wellbeing, Sustainability.

Introduction

The main subjects of this article include the field of Industrial Design (ID) and the Vision Zero (VZ) strategy. The World Design Organization (WDO) states, *Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences* (WDO, 2025). Certainly, user health, safety, and security are special in industrial designers' design thinking. Industrial design is known as a human-centered discipline in which both the producer's requirements and the end-user's needs will be met.

Nowadays, industrial design fields are not limited to physical comfort and encompass quality of life, lifestyle, and users' psychological characteristics. Furthermore, environmental concerns are recognized as another critical aspect of industrial design. Moreover, well-designed products, services, or systems enhance productivity and promote overall well-being.

The mentioned industrial design point of view is not limited to the end user; in fact, the processes involved in bringing a design idea to production must also be environmentally friendly and must not compromise the health and safety of workers, in fact, there is a commonality between sustainability and industrial design.

Another key focus of this article is Vision Zero. Vision Zero encompasses three key objectives: eliminating accidents, eliminating diseases, and eliminating environmental damage. At the same time, Safety, Health, and Well-being (SHW) are fundamental pillars of the Vision Zero approach.

The yearly deaths and accidents interrelated to the use of consumer products are huge (Seifert, 2020). Control of health hazards and accidents and design for consumers' safety is a crucial subject, in this regard, Vision Zero is known as a prominent plan in terms of quality of life. When discussing zero accidents, zero diseases, and zero environmental damage, it implies that designers — through their design approach and the dominant design thinking (whether in environmental design, service design, or product design)— must ensure that both environmental and user health are given special attention. Considering the scope of Vision Zero and based on industrial design scope, the role of industrial design in the Vision Zero domain is highly critical.

This paper aims to clarify industrial design as a discipline contributing to develop product or service design based on three aspects of health, safety, and prevention of negative impacts on the environment. The mentioned three fields are related to the Vision Zero approach, in this regard, in this study the association between Vision Zero and industrial design was assessed.

Industrial Design, Sustainability and Well-Being

Industrial design plays a crucial role in designing and redesigning products, services, and places. According to IDSA *Industrial Design is the professional practice of designing products, devices, objects, and services used by millions of people around the world every day. Industrial designers typically focus on the physical appearance, functionality, and manufacturability of a product, though they are often involved in far more during a development cycle. All of this ultimately extends to the overall lasting value and experience a product or service provides for end-users* (IDSA, 2023).

As a discipline that integrates aesthetics, functionality, and user-centered approaches, industrial design has profound implications for health and safety, in which some kinds of fields are highlighted such as ergonomics, sustainability, innovation, and values. Furthermore, Industrial designers should involve manufacturing-based productivity (Koch, 2022). Industrial design has a wide scope in which manufacturing, innovation production, and sustainability are highlighted (Kuys et al., 2021). Also, there are some familiar disciplines i.e. product design engineering and mechanical engineering in which production and related activities are involved. Industrial design has a strong association with two different disciplines product design engineering and mechanical engineering. Even though there are some different approaches among these fields, these disciplines have some firm connections (Figure 1).

Undeniably, the process of design which is introduced by a designer and an engineer has a common context but there are some kinds of differences among them (Kuys et al., 2014).
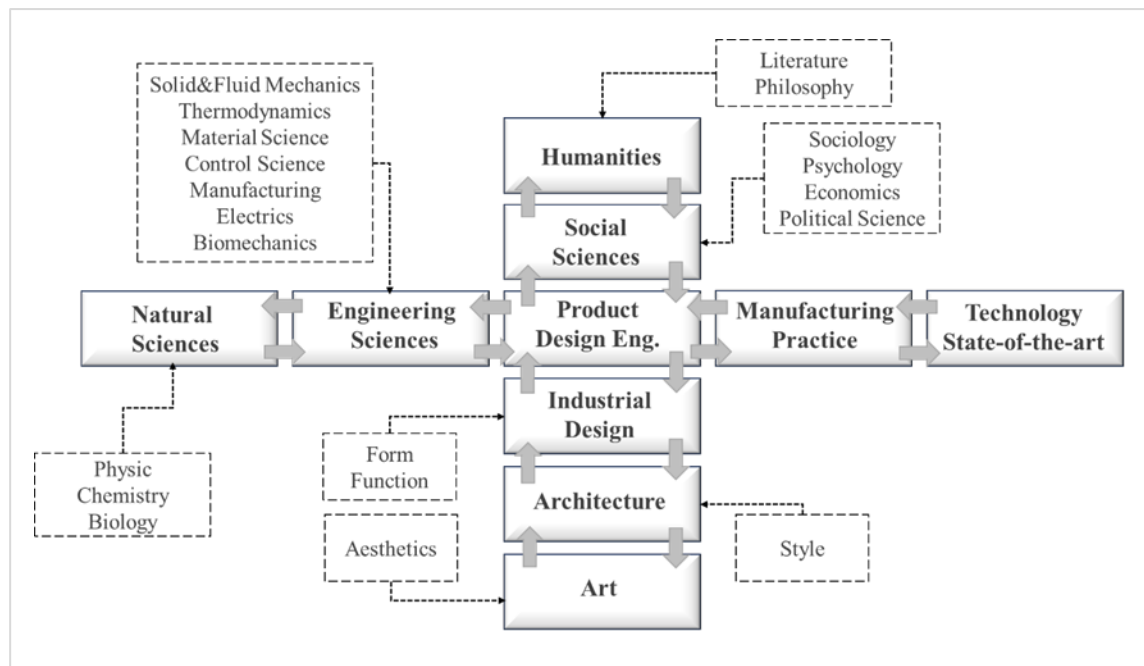

Figure 1: *The place of Industrial Design, Product Design Engineering, and other disciplines (Adapted from Kuys et al. (2014)).*

Moreover, industrial design, health, and safety are connected in the context of sustainability, and several sorts of examples confirm the mentioned association such as environment-friendly manufacturing, product safety considerations, and substitution of hazardous materials with non-toxic ones. In fact, product designers should be concerned about society's health and safety based on sustainability goals (Worksafe, 2025). Nowadays focusing on product design based on aesthetics and function in the context of Industrial design has some changes toward sustainable design (Alahira et al., 2024).

Considering the above-mentioned points, industrial design plays a crucial role in enhancing quality of life and promoting sustainable development, with a focus on both nature and human well-being. The impact of product and service design on the environment spans the entire lifecycle, from material extraction and manufacturing to usage and disposal. Undoubtedly, poor design — whether in products, services, or environments— can lead to stress, accidents, health hazards, disorders, and other negative consequences. In contrast, well-designed products and services enhance efficiency, promote resource conservation, and support sustainable consumption patterns. In this regard, product design has a firm association with sustainable development.

Industrial design also plays an effective role in fostering a sustainable culture, addressing both the economic and social aspects of sustainability while mitigating the environmental impacts of products, in fact, designers inspire sustainable consumption (Davoodian et al., 2023). In this regard, industrial designers would think about sustainable products and artifacts lifecycle (Berberoğlu, 2024).

During the last two decades, product design and development based on environmental considerations has been changing to a crucial subject in which product lifecycle and green design are known as prominent fields (Vezzoli et al., 2014). In this context, some sorts aspects such as the Cradle to Cradle (C2C) design approach, environmentally friendly products, and greenhouse gas reduction are involved (Berberoğlu, 2024). Given the above, the scope of industrial design encompasses several important fields related to sustainability, health, and safety promotion. As such, it significantly overlaps with the Vision Zero strategy, which aims to eliminate accidents, injuries, and harm in all aspects of life.

Vision Zero (VZ) and Industrial Design (ID)

The history of the Vision Zero strategy goes back to Sweden (1997) and the national plan. The Vision Zero aimed to achieve a highway system with no road traffic-based fatalities or serious injuries (Värnild et al., 2020).Actually, road accidents cause major loss of life and property. According to WHO (2018), about 1.3 million people are killed on the road and another 20–50 million are suffered Seaver injuries, per year. About 90% of these problems happen in middle and low-income countries (Edvardsson Björnberg et al., 2023). The tragic road accidents, and Sweden's success in implementing the Vision Zero program, have led to the VZ strategy gaining significant importance for other countries as well. This perspective even extended beyond the issue of road safety, meaning it entered other domains as well. Nowadays, the Vision Zero strategy has a wide scope beyond traffic safety and it covers all aspects of lifestyle, especially working life and workplaces. As Figure 2 shows the core target of this strategy is safety, health, and welfare (SHW).

VZ concerns fatalities and injuries elimination Greer et al. (2025) which aligns design for human (ISSA, 2017). Undoubtedly injury prevention, quality of life, well-being, health, and safe lifestyle are important in industrial design as a human-based discipline. As Figure 3 shows, Vision Zero is founded on the seven golden rules (ISSA, 2017). Besides, in VZ strategy the following subjects are prominent (ISSA, 2023):

- Ethical Imperative: No loss of life is acceptable in transportation or occupational settings.
- Shared Responsibility: Governments, businesses, and individuals must collaborate to ensure safety.
- Proactive Prevention: Risks should be identified and mitigated before accidents occur.
- Systemic Approach: Vision Zero focuses on designing safer systems to eliminate accidents and errors.
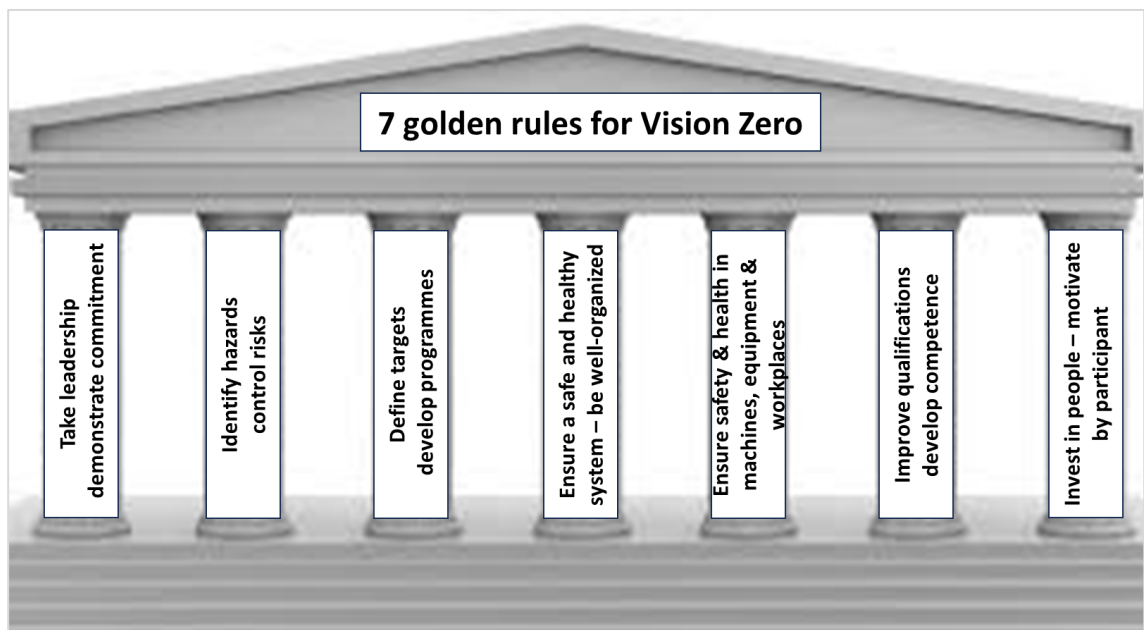

Figure 2: *Vision Zero fields.*

Figure 3: *Seven Golden Rules for Vision Zero-Based on (ISSA, 2017).*

Considering the Vision Zero strategy, it seems there is a firm association between the Vision Zero approach and the product design process in terms of preventing harm and ensuring safety through proactive user-centered design. The following subjects explain this relationship:

1. *Human-Centered Design (HCD) and Vision Zero*

Vision Zero emphasizes well-being and quality of life (ISSA, 2023) which aligns with the human-centered design approach. Product design based on industrial design considerations concerns meeting the end users' needs and requirements (Sadeghi Naeini, 2020; Sadeghi Naeini et al., 2023). In this regard, VZ and human-centered design as a main approach in industrial design are overlayed.

2. *System Thinking in Design*

Vision Zero adopts a systemic approach to safety, recognizing that accidents result from interactions between humans, vehicles, and the environment. Similarly, design thinking as a context of product design has a systematic approach (Luchs, 2015), furthermore, ecosystem considerations are focused on design processes.

3. *Proactive Risk Mitigation*

preventing accidents before they occur is focused on Vision Zero (Edvardsson Björnberg et al., 2023), undoubtedly the mentioned approach should be considered in the product design process. Safety promotion and risk assessment are prominent subjects for designers (Subramanian et al., 2023).

4. *Ergonomics*

It also seems the relationship between ergonomic design and VZ strategy. Ergonomics as a multidisciplinary science concern human-being. Improvement of quality of life, comfort, health and safety promotion, and productivity evolution (Hoke et al., 2024; Motta et al., 2024; Naeini et al., 2025).

5. *Iterative Design and Continuous Improvement*

Vision Zero is a long-term strategy that requires continuous improvement. This characteristic is also emphasized in product design methods such as user center design which is known as an iterative process (Grott, 2019; Roth et al., 2015) to figure out the user's needs and design based on the user's requirements.

6. *Ethical Responsibility in Design*

Vision Zero is rooted in the ethical belief that no loss of life is acceptable (Tingvall & Haworth, 1999; Whitelegg & Haq, 2006). This principle is also important for designers.

Moreover, there are several cases and samples in Vision Zero plans. In the United States, a program entitled *Zero in on Safety* as a two-year plan was introduced in 1971. In Japan, the Japan Industrial Safety and Health Association (JISHA) also started a similar safety plan in 1973. An industrial safety plan was launched in the UK in 1988 the New Zealand Aluminium Smelters Limited (NZAS) started a similar program with the slogan *Our Goal is Zero* in 1990. Also, another program in Finland (2003), and Australia (2002) was also introduced (Edvardsson Björnberg et al., 2023). Volvo's Vision Zero Commitment in Automotive Design (Volvo Group, 2025), Vision Zero in Norway (Elvik, 2023), Vision Zero in New York City is another samples (Vision Zero, 2025).

Methodology

This study as descriptive research includes a case study in which the 68 industrial designers as the volunteer samples participated and filled out the Google form-based online questionnaire (from 26/02/2015 to 05/03/2025). The effectiveness and role of industrial design in promoting health and safety, as well as addressing environmental considerations, were evaluated using a 10-scale questionnaire. A 10-point scale was selected to allow for greater sensitivity in capturing the nuances of respondents' opinions.

This scale provides a wider range of response options, enabling more precise measurement of attitudes or experiences compared to smaller scales.

Specifically, the usefulness of industrial design as a discipline was examined in the following areas:

- Product design and people safety and health
- Service design and people safety
- Tools design and workers safety
- Workstation design and workers safety
- Service design and workers safety
- Environmental protection based on Energy saving
- Environmental protection on product & service design

The gathered data were analyzed using SPSS Win 27. Additionally, some parts of the data were collected based on a literature review and the examination of relevant articles. To illustrate the position of Vision Zero (VZ) in prior research and to visualize the related data, a VOS viewer was utilized. These data were collected through a search conducted in the Scopus database during the last week of February 2025. Furthermore, the R-Bibliometrix software was employed for a more in-depth analysis of the sources.

We searched for articles related to the keyword *Vision Zero* in the titles, abstracts, and keywords sections within the Scopus database. The data were then exported in CSV format and imported into a VOS viewer for visualization.

To examine the collaboration between countries, after loading the downloaded file in Scopus, we selected the *Co-authorship* and *Country* options. In the threshold selection section, we set the minimum number of documents per country to 1. Due to the limited number of documents, no minimum citation count was applied.

Results

Online questionnaires were completed by 68 industrial designers as volunteer participants (63.2% female, 36.8% male) across three academic levels: bachelor's, master's, and PhD (Table 1).

The participants' ages varied, with 72.9% being under 30 years old, 14.6% between 30 and 40 years old, and 12.5% over 40 years old. Based on the SPSS Win analysis, Cronbach's alpha for the mentioned questionnaire was 0.921.

Table 1: *Participant data.*

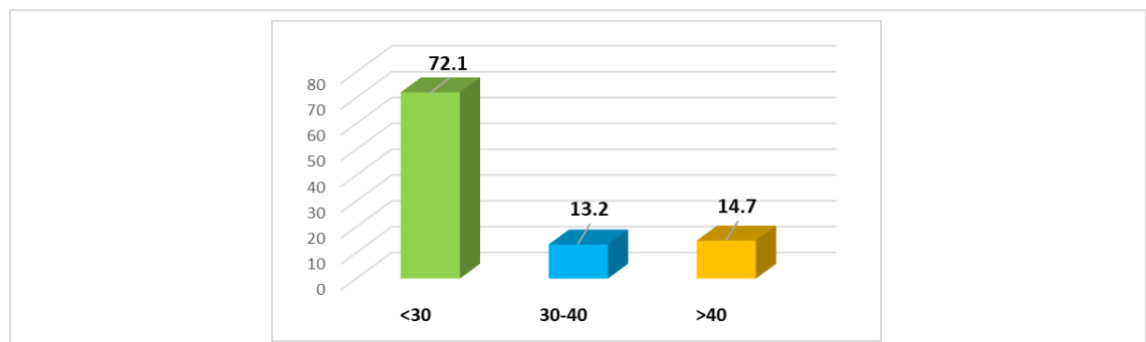| Participants		Fem (No.)	Male (No.)
PhD	8.80%	4	2
MSc.	33.80%	8	15
BSc.	57.40%	31	8
Total	100.00%	43	25
		68	

Figure 4: *Participants (%) in three ages group.*

Based on the article search conducted in the Scopus database, 434 documents matching the specified criteria were identified. Figures 5 and 6 illustrate the countries that have published articles related to Vision Zero. The United States, along with several Northern European countries and Australia, holds a prominent position in terms of research and publications on this topic. In Figure 6, the blue columns indicate a higher level of collaborative research. Additionally, Figure 7 displays the keywords map associated with the term *Vision Zero* and other related words.
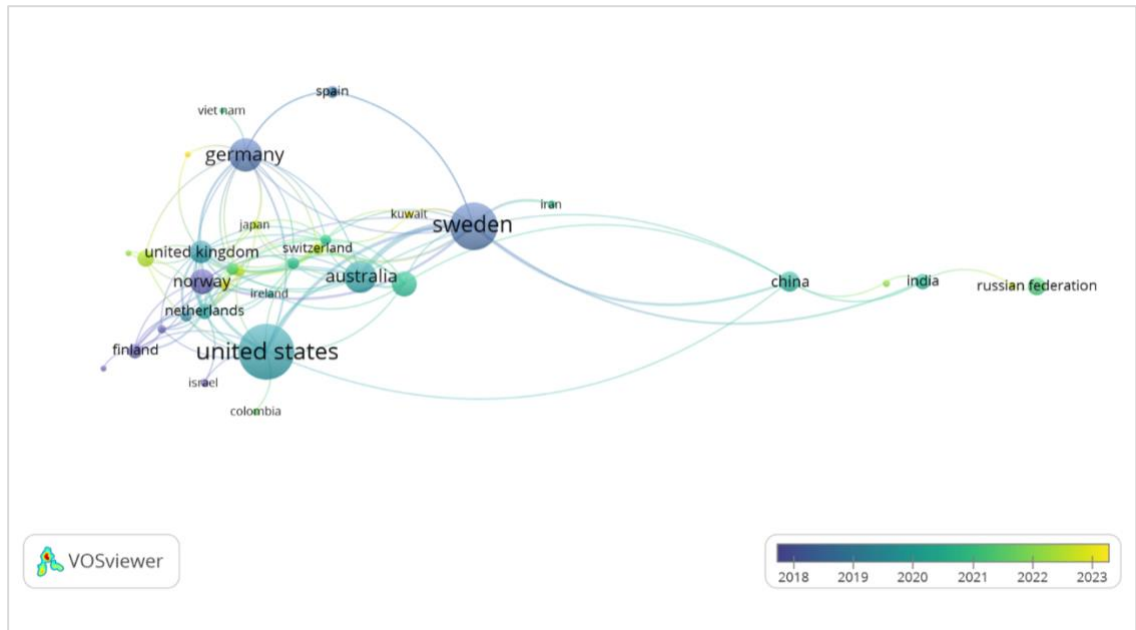

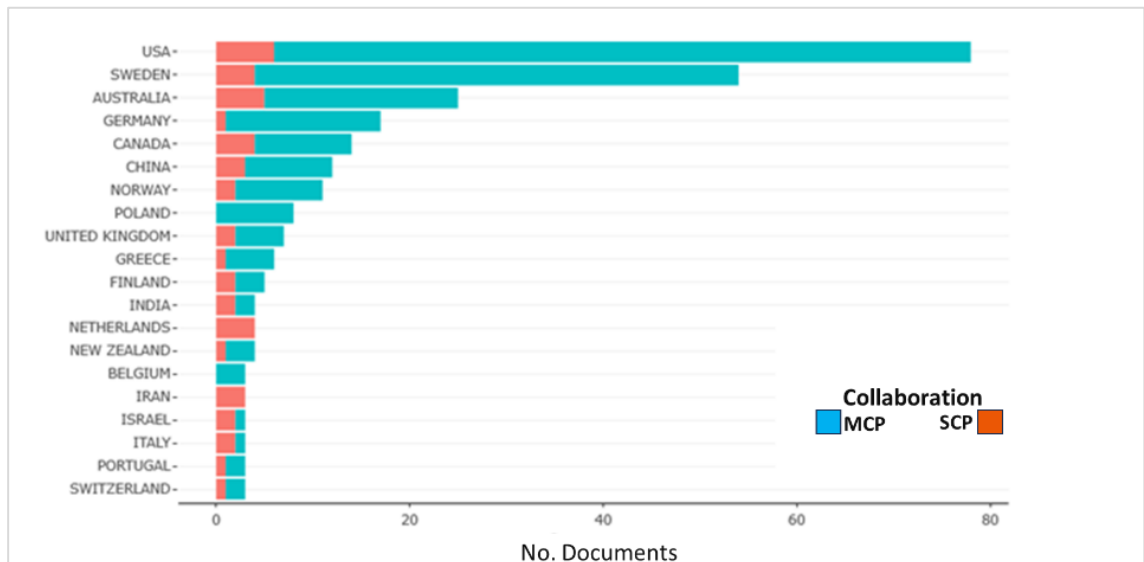**Figure 5:** *Involved countries in VZ research.*

Figure 6: *Distribution of published articles based on the country and their collaboration (MCP=Multiple Country Pub., SCP=Single Country Pub).*

The analysis of the questionnaire responses revealed that the majority of participants believe industrial design, as a discipline, significantly impacts health, safety, and environmental protection in both product and service design ($p = .000$). Additionally, the role of industrial design in creating workstations and tools for industrial sectors was strongly emphasized.

As shown in Figure 8, the average scores given by participants for the questions were above 7 (out of 10) for all items.

In detail, these results show that the mean score (out of 10) for the effectiveness of industrial design in:

a. Product design based on safety is 8.13

b. Safer service design is 7.50

c. Safe tools design for workers is 8.60

d. Industrial workstation design is 8.35

e. Service design for employees is 7.49

f. Tools designed for public health is 7.72

g. Design for energy saving is 7.53

h. Selection of the environment-friendly material is 7.72

i. Environmental-based service design is 7.49

Figure 7: Keywords map.

Figure 8: *Boxplot: Scores illustrating the role of industrial design in nine issues.*

However, all of the mentioned scores for the role of ID in nine studied fields were meaningfully more than average, the Mann-Whitney U test confirmed a significant difference in the effectiveness of the industrial design discipline on *safety product design* between two groups of participants: undergraduate (B.Sc.) and postgraduate (M.Sc. - Ph.D.) participants. Similar results were also observed for *safe tools designed for workers*, and *design toward public health*.

Discussion

Research and scientific reports confirm that environmental concerns play a significant role in guiding industrial design toward sustainability. Our findings also show that approximately 84% of participants believe industrial design positively contributes to environmental protection, particularly in terms of energy efficiency and the use of environmentally friendly materials. Berberoğlu (2024) in his review article pointed to four major topics about sustainable culture development and industrial design:

a. Sustainability frameworks
b. The designer's role in sustainable product design
c. Challenges and opportunities for sustainable product design
d. Influence of sustainable product design on environment and community.

The authors show that the traditional models of innovative product design need to consider sustainability in marketing development (Berberoğlu, 2024).

Authors have already pointed out some main challenges in industrial design to overcome environmental impacts such as (Berberoğlu, 2024);

a. A systematic approach to product-service design based on sustainable design
b. Developing new business models for product-service design processes
c. Developing an effective association between designers and the related stakeholders

The same as some previous research, this paper explores the relationship between industrial design and health and safety, emphasizing the importance of a human-centered approach that ensures well-being, reduces risks, and enhances quality of life.

Climate change, natural resources, and environmental degradation are known as important subjects which need more research (Dipasquale et al., 2025), however, according to scientific reports, some kinds of multidisciplinary science i.e. ergonomics may play a crucial role as it is a practical field that concerns human beings, and sustainability. Furthermore, there is an association between ergonomics approaches and Industry 5.0 pillars (Sadeghi Naeini et al., 2023).

Ergonomic interventions include some sorts of fields i.e. administrative, behavioral, and engineering-based interventions (Sadeghi Naeini, 2015; Sadeghi Naeini et al., 2023).Ergonomics emphasizes health and productivity (Sadeghi Naeini, 2022; Sadeghi Naeini et al., 2018). Cradle-to-cradle C2C (Bakker et al., 2010), green design (Chen, 2016; Yousif & Moalosi, 2024), global warming problems are related to industrial design scope, directly, or indirectly. Our finding also showed that most of the questionnaires confirmed the effectiveness of industrial design in the mentioned environmental-based challenges.

Conclusion

Nowadays, industrial designers' activities extend beyond the physical and aesthetic design of tangible products. Other aspects such as safety, well-being, and sustainability also fall within the scope of the industrial design discipline. Moreover, Industry 5.0, with its three core pillars — sustainability, resilience, and human-centricity— further emphasizes the importance of integrating the Vision Zero approach into design thinking. Undoubtedly, connecting design thinking in industrial design with the Vision Zero strategy involves multiple disciplines, including ergonomics, which is a multidisciplinary, human-centered science.

Considering the above-mentioned industrial design scope, Vision Zero, and the importance of sustainable development as a global pledge, it seems that to improve the industrial design scope based on the quality of life for all, making a synergy between industrial design, and Vision Zero on the context of sustainability is inevitable. While features, aesthetics, and shape are critical aspects of product design, considerations such as product safety, user health, and environmental impact are often overlooked. Integrating the Vision Zero approach as a foundational framework in product design thinking can help designers systematically address these aspects.

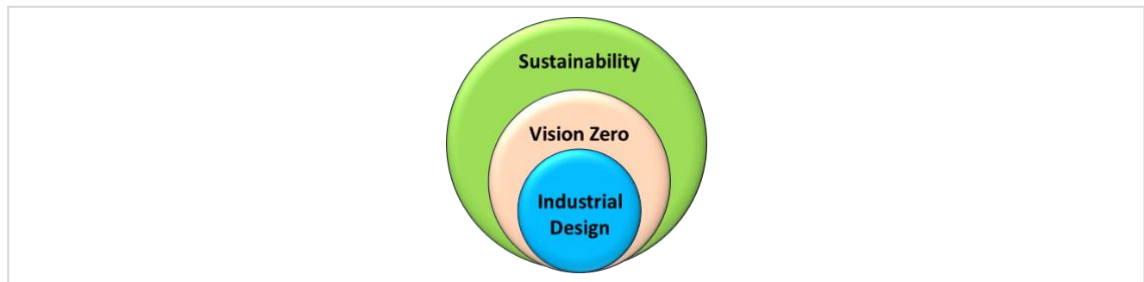Figure 9 is a recommended collaboration between the mentioned fields.

Figure 9: *ID, VZ, and Sustainability Hierarchy.*

In conclusion, product and service design as the core activities in industrial design are essential tools in advancing environmental protection. By incorporating sustainable materials, leveraging technological innovations, and embracing circular economy principles, designers can play a pivotal role in creating a more sustainable world.

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