
The Role of Restorative Design in the Achieving Principles of Industry 5.0

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Abstract:

Purpose: Industry 5.0 is the current wave of advances in the industrial sector, which focuses on the use of technology to make production processes more efficient and effective. As part of this new industrial revolution, restorative design is playing a vital role in helping businesses achieve their goals. Restorative design is a holistic approach to design that seeks to restore balance between humans, nature and the built environment. It emphasizes the use of natural resources, renewable energy, and sustainable systems to create a healthy, equitable and resilient future. By incorporating restorative design principles into Industry 5.0, businesses can create a more efficient, equitable and sustainable production process that serves the needs of both the environment and society. The aim of this article is to present the role of restorative design in the implementation of the principles of economy 5.0.

Design/Methodology/Approach: The research method used was the analysis of secondary data available in the literature and the construction of research hypotheses during expert interviews.

Findings: This article presents excerpts from research results that illustrate the scale of the problem. Restorative design plays a huge role in achieving the goals of Industry 5.0 and is likely to become a tool in its realization.

Practical implications: Restorative design can help businesses achieve their goals by incorporating natural systems into their production processes. For example, designers can incorporate renewable energy sources into their processes to reduce carbon emissions. They can also use natural resources to create products without polluting the environment.

Originality/value: The current paper contributes to the existing literature on the relationship between the tax rate and the relevant tax revenue in the field of corporate and personal income taxes, by incorporating in the analysis the size of shadow economy.

Keywords: Restorative Design, Industry 5.0, intelligent human empowerment.

JEL codes: L26, O31.

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1. Introduction

Restorative design is a holistic approach to design that seeks to restore balance between humans, nature and the built environment. It emphasizes the use of natural resources, renewable energy, and sustainable systems to create a healthy, equitable and resilient future. In the context of Industry 5.0, restorative design is a key component that is used to create a more sustainable, equitable and efficient production process. The core concept behind restorative design is that humans are part of a larger ecosystem and society is reliant on natural systems to function.

By creating a design that works in tandem with those systems, better future can be created for all parties involved. The industrial paradigm, Industry 5.0, emerged fairly quickly after Industry 4.0 and is a direct consequence of the COVID-19 pandemic and the debate over the role and importance of employees (Javaid *et al.*, 2020; Xu *et al.*, 2021; Iftikhar *et al.*, 2020). Industry 4.0 is the concept of the smart factory, where smart products, machines, storage systems and data come together in the form of cyber-physical production systems (Kagermann *et al.*, 2013; Lasi *et al.*, 2014).

And indeed, in the technical aspect, Industry 4.0 streamlined human-machine interaction, but did not consider the social sustainability and the central role of humans (Kong *et al.*, 2019). As a result, the idea of Industry 5.0 emerged as an extension of Industry 4.0 with a social and environmental dimension (Muller *et al.*, 2020).

On the one hand, Industry 5.0 focuses on the skills, knowledge and ability of workers to collaborate with machines and robots (Demi *et al.*, 2019), and on the other hand on the flexibility of production processes and environmental impact. Further Industry 5.0 is the latest industrial revolution that has been designed to make processes more digital and highly automated, giving companies a competitive edge in the global market.

With the advancement of digitalization, Industry 4.0 and its subsequent implementation, Industry 5.0, have become essential in allowing companies to effectively manage data from their operations, reduce costs, increase worker engagement and create an end-to-end business process for greater operational efficiency.

2. Literature Review

Design, which is human centric, and which transcends the boundaries of the subject, is increasingly identified with the search for innovative solutions in the sphere of broadly understood human activity and problems of the modern world. Therefore, among other things, it has recently become an important tool in the construction of various solutions that are in the interest of society and respond to social problems and reduce the negative impact of manufacturing on the environment.

In the context of Industry 5.0, the coexistence of man and robot, man and machine with an emphasis on the human at the center, is extremely important. Man, functions in a certain space, so how it is designed is important. Guided by the criterion of social needs, it is possible to design a space that is user-friendly, democratic and stimulates social relations.

The results of numerous studies by Robert B. Zajonc (1968) illustrate the so-called pure exposure effect, people change their attitude from passive (neutral) to positive in the face of neutral visual stimuli, under the influence of frequent observation, even if they do not realize this process. In other words, as humans we have a natural tendency to sympathize with objects we see more often, even if we are not aware of this increased frequency.

Thus, in order to build positive relationships based not on stereotypes, but on sympathy, it is necessary to create spaces where people can pass each other or be with each other, and consequently arouse feelings of sympathy and establish a relationship. Whether the planned effect is achieved will depend on the extent to which the designer's proposal meets or contradicts the needs of the individual and the community. Therefore, the function of design should also be considered in relation to the satisfaction of needs.

Observation of human behavior in the context of relations with a product or space can provide - information that will then help to develop an optimal design. It is used to assume that the work of the designer, architect or engineer ends when the building is put into use. However, only then does it begin to perform its most important function - the social function. It begins to serve man, to support him in his daily life. That is why it is so important to try to anticipate - at the design stage - how a given object, robot, machine can shape human behavior, and plan how it should do so.

Above all, whether planning small non-residential spaces, or office complexes or large residential areas, it is worth taking care of the common, social space - the one where traffic routes intersect. In this way, we will increase the chances of intensifying contacts and thus increasing positive attitudes towards each other. This is already an important step toward building relationships. It is also a good idea to plan a space where it will be possible to work together, to undertake joint activities, which also have a cohesive effect and produce a positive effect.

Of course, a balance between common and private space should be taken care of every time, as overexposure, too much interpersonal contact and the inability to escape from it - may have negative effects. A space that is welcoming, functional and well-designed encourages users to engage in three forms of activity. One is primary activity, which is related to fulfilling current needs. The second form is optional activity, which refers to various forms of leisure and recreation, and finally social activity, which is superstructure over the previous two and occurs when there is an opportunity for interpersonal contacts to occur (Gehl, 2011) .

Based on the research of Alexander Wallis (1990) and his distinction of the social functions of architecture, which he considers in different dimensions that are part of different areas of human existence, we can conclude that design performs the same social functions. According to the author, we can distinguish the following social functions of design:

- (a) protective,
- (b) distributive and organizational,
- (c) worldview:
 - identifying,
 - prestige,
 - political,
 - ideological,
 - philosophical,
 - cumulative and structuring,
- (d) catalytic,
- (e) artistic,
- (f) economic.

Meanwhile, as the example shows, what matters from both sociological and psychological perspectives is how design affects the sense of comfort, well-being and behavior of those who use it: does it promote the positive and prevent the negative? Or does it interact negatively, creating barriers and even encouraging socially harmful behavior? It is important to remember that no matter how outstanding a facility is, it is meant to serve people, and therefore create a welcoming, inspiring and supportive space for them. The social, catalytic function of design should be seen as influencing people both individually and collectively.

3. Methodology – Description of the Dataset

As the subject is very new and there is no previous literature on the correlation between restorative design and Industry 5.0, authors decided to conduct qualitative research. Qualitative research seeks to understand a certain topic in a more idealistic or humanistic way, in contrast with the quantitative approach which is a more dependable method since it is based on numerical data and techniques that can be objectively measured and replicated by other researchers.

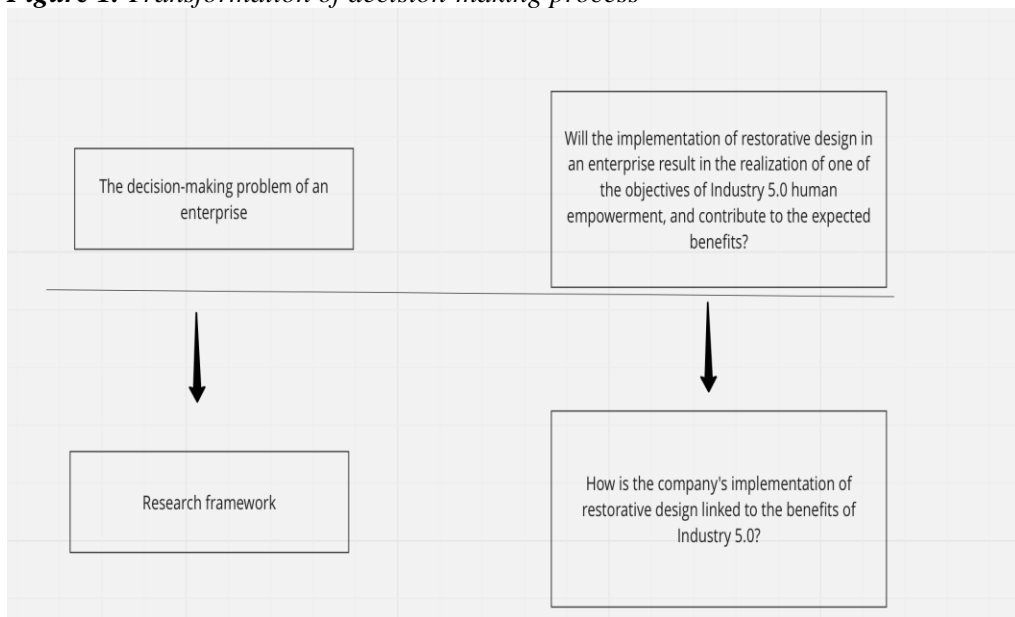
Qualitative research is utilized to comprehend people's beliefs, attitudes, actions, experiences, and interactions, and it produces non-numerical data. The inclusion of qualitative research into intervention studies is a research system that is getting more consideration from different disciplines. Although at one point in time it was thought to be incompatible with experimental research, it is now viewed as having the ability to add another dimension to interventional studies that can't be achieved with the sole measurement of variables. Qualitative research was initially used in psychological studies when researchers found it hard to quantify human behavior.

Since then, it has been used in other research as well. The expert meeting was held in London in October 2022, attended by 5 experts: designers, mid-level production managers, psychologists. A structured interview was conducted, which was recorded for internal use of authors.

3.1 Findings

During the interview, the company's decision-making problem was conceptualized and then transformed into the research scope. Excerpts of findings are presented in this article (Figure 1).

Figure 1. Transformation of decision-making process



Source: Own compilation.

Expert 1: Restorative design is a type of design that promotes a sense of wellbeing and encourages people to take care of themselves. It focuses on creating environments that are restorative and inviting, where people can relax and rejuvenate. It uses elements such as natural light, comfortable furniture, and calming colours to create a calming atmosphere. Restorative design is often contrasted with performance-oriented or transactional design, which is geared towards accomplishing tasks quickly.

Although these two types of design often go hand-in-hand, restorative design is designed with the intention of promoting relaxation, mindfulness, and self-care. There are two key components of restorative design: light and sound. Light is a key component of any indoor environment and has the potential to be restorative or draining. Sound is also a significant aspect of design that is often overlooked. It has

the potential to be restorative or distracting, depending on the sound and its volume. Considering the coexistence of man and machine, man in the workplace, appropriate sound intensity and lighting can affect behavior, progressive fatigue and overexertion. Thus, considering the concept of restorative design in the process of workplace design and interaction with the machine can positively affect human functioning.

Expert 2: Natural light is very important. Natural light has a lot of benefits for our health, mood, and productivity. It is important to incorporate it into our indoor environments as much as possible. Natural light is proven to increase the level of the mood-boosting hormone serotonin, which helps to regulate our mood. Temperature and humidity: Temperature and humidity are important aspects of design that are often overlooked.

Both of these elements affect how people feel and how productive they are, so it is important to select them appropriately. A temperature that is too high or too low can make people uncomfortable, which can affect their productivity. And humidity levels that are too low can also make people uncomfortable and dry their skin.

Expert 3: With the proper use of restorative design, people can get the most out of their digital lives without sacrificing their mental and physical health. There are many benefits of incorporating restorative design into digital life e.g. Mood enhancement: People who engage in activities that are designed with restorative elements experience an increase in positive emotions compared to people who use transactional designs.

Restoration of attention: Research shows that engaging in activities and restorative design can increase attention restoration. Improved productivity: Engaging in restorative activities and using restorative design increases productivity. Reduced stress: There is evidence that engaging in restorative activities and design can help reduce stress. Improved self-esteem and self-compassion, and better mental health, lastly improved creativity.

Expert 4: Technology and restorative design are often seen as two opposing forces, but, they can work together to create a restorative environment. Technology can be used as an element of restorative design to create a more restorative environment, while also giving people the benefits of technology.

Expert 5: Restorative design principles are rooted in the idea that a healthy environment can be created by working with natural systems and resources. These design principles can be applied to any Industry 5.0 process, but they are particularly helpful in the areas of sustainable systems, natural resources and human health. Sustainable systems are designed in a way that allows them to be self-sustaining over the long term. In an industrial context, sustainable systems would be designed to minimize waste and use resources as efficiently as possible.

Natural resources are elements found in nature that are freely available and can be used with minimal processing. Examples of natural resources include wind, sunlight and water. These resources should be used as much as possible in Industry 5.0 processes to minimize pollution and create a more sustainable environment for all parties involved. Human health - Human health refers to creating an environment that promotes good health and well-being and minimizes the risk of disease and illness. In the context of industry, this means creating an environment that is safe for workers and that does not expose them to harmful elements.

4. Conclusions

While many people focus on the technological advancements that come with Industry 5.0, restorative design can also play a vital role in creating a more efficient, sustainable, and equitable production process. By incorporating design principles that focus on natural systems, designers can create a more sustainable, self-sufficient process that sustains production for years to come without consuming excessive amounts of energy.

Industry 5.0 is the current wave of advances in the industrial sector, which focuses on the use of technology to make production processes more efficient and effective. As part of this new industrial revolution, restorative design is playing a vital role in helping businesses achieve their goals. The primary goal of Industry 5.0 is to make manufacturing more efficient. To do this, businesses rely heavily on automation and robotics to maximize production without increasing costs. In order to keep up with these advancements, designers are creating systems and interfaces that are designed for smart, connected devices. Restorative design can help businesses achieve their goals by incorporating natural systems into their production processes.

For example, designers can incorporate renewable energy sources into their processes to reduce carbon emissions. They can also use natural resources to create products without polluting the environment. Industry 5.0 has made great strides in the area of sustainable systems by using digital communication protocols to reduce the amount of wasted resources. In order to take this concept even further, designers can incorporate sustainable systems into their design process.

By designing production processes that use minimal energy, water, and materials, designers can help businesses create a more sustainable product. For example, designers can use 3D printing to create production components that use less material and use energy-efficient lighting to minimize electricity usage. They can also create self-contained systems that use only the amount of water needed to produce their desired result. One of the most important aspects of Industry 5.0 is its focus on renewable energy sources. By using solar and wind power, businesses are helping to reduce carbon emissions, pump money back into the local economy, and create a more sustainable future for all. In order to incorporate renewable energy into their design process, designers can use renewable energy devices, like solar panels, in

their production systems. They can also use digital communication protocols to integrate these systems into the broader production process. For example, designers can create systems that send data to the grid and request additional power from the grid in times of high usage.

The use of natural resources in Industry 5.0 has grown significantly over the past few years, with designers turning to wood, paper, and leather in the creation of their products. Although this is a positive development, designers can take this concept even further by creating products that use natural resources but are not visible to consumers. For example, designers can use wood in their production systems but cover the wood with a material that makes it invisible to consumers. They can also use natural fabrics, like cotton, to create interior designs that blend in with the environment.

Humans are a vital part of any production process, and designers can take steps to create a safer, healthier environment for workers. By incorporating restorative design principles into their designs, designers can create an environment that minimizes the risk of injury and illness. For example, designers can use low-emissions lighting that does not produce harmful radiation and can be easily cleaned. They can also use ergonomic designs to reduce the risk of injury and use materials that are free of harmful toxins.

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