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FACTORY BUILDING INSPIRED BY A PRODUCT – A SEEK FOR THE TRUTH OR A LIE?

BUDYNEK FABRYKI INSPIROWANY PRODUKTEM – POSZUKIWANIE PRAWDY CZY KŁAMSTWO?

Abstract

The aim of this paper is to examine whether founding a building's form on an object related to its function is a search for the truth about architecture or a false reference to that object. The discussion is based on examples of manufacturing plants, whose forms were inspired by the products of relevant branches. The method used is logical analysis, while the research material consists of academic projects. The advantage of their use is that the authors' intentions in terms of basing the form on the product's characteristics are known. The research results capture the advantages and disadvantages of the adopted design approaches, indicating their potential to convey the truth about the building's function as well as the risk of falsely transferring the meaning from product to architecture.

Keywords: architecture, form, design, inspiration

Streszczenie

Celem artykułu jest próba wyjaśnienia, czy budowanie formy w oparciu o przedmiot związany z funkcją obiektu stanowi poszukiwanie prawdy o architekturze, czy jest fałszywym odwołaniem się do skojarzeń z tym przedmiotem. Poruszone zagadnienia omówiono na przykładach obiektów o funkcji produkcyjnej, których forma została zainspirowana wytworami danej branży. W pracy wykorzystano metodę analizy logicznej, zaś materiał badawczy stanowią projekty akademickie. Zaletą ich wykorzystania jest wiedza o intencjach autorów w zakresie oparcia formy o cechy produktu. Rezultaty analizy ujmuje zalety i wady przyjętych podejść do projektowania, wskazując na potencjał przekazania prawdy o funkcji obiektu i jednocześnie na ryzyko kłamliwego przeniesienia znaczenia przedmiotu na architekturę.

Słowa kluczowe: architektura, forma, projektowanie, inspiracja

1. INTRODUCTION

Architectural design of manufacturing plants is a unique topic in the architect's practice due to the high degree of complexity. Designing a factory is a multifaceted task that has to take into consideration multiple different issues. First, it must provide optimal space for the production line, also complying to the relevant legal acts and occupational safety and health requirements. Then, it has to meet the needs of employees, providing them with adequate workplace spaces as well as with all necessary facilities, including locker rooms, washrooms and lavatories, dining rooms and recreational areas. The third important and integral aspect of factory design is office space, often combined with

representative customer area. It can include a showroom as well as a variety of meeting rooms and workshops, depending on the industry branch. Including spaces dedicated to customers influences the design in a particular way, revealing to the architect an unparalleled opportunity to shape the visitors' perception of the company's status. Such a possibility also corresponds to the investor's willingness to build the firm's recognisable image, and thus the desired reputation, which can provide long-term benefits in market competition.

Level of complexity of the design task consisting in creating a conceptual project of a factory, with many intersecting problems, aspects and varied points of view presented by different stakeholders, makes of industrial architecture a field of special interest to both practitioners and theoreticians of architecture. The main focus in both architectural research and practice remains so far centred on technology and production line optimisation,¹ as well as on meeting diverse requirements, including those imposed by the applicable building code, occupational health and safety regulations, and ergonomics.² Among other pragmatic aspects of industrial architecture that gain much attention, the studies on construction cost and energy efficiency can be distinguished.³ Besides the mainstream research, one of more recent perspectives identifies the added values of architecture as an important theme to be discussed. These include the quality of architecture, the aesthetics of interior design as well as the selection of finishing materials. Hence the growing importance of inspirations used in the design of industrial architecture. The purpose of this paper is to supplement the existing discourse with a more detailed insight into the situations in which the architect draws inspiration from the product of the industry he designs for, placing special interest in the product's characteristic features, including its shape, colour, material and assembly method. This approach to architecture has been generally discussed as one of design methods for creative industry buildings.⁴ More recently, however, the method has transferred from creative branches to the industry sector in general. The aim of the presented paper is to focus on the moral aspects of this approach to design, trying to answer the question whether modelling of architectural form on the characteristics of a particular industry product, associated with a selected branch, is an evidence of the designer's search of the truth about architecture, his will to express its function. Or, on the contrary, is it a lie, an attempt to transfer the meaning of the object to the building, falsely referring to its basic concept, known to most users of public space? The latter option corresponds to the marketing attempt to build the company's recognisable image, which makes architecture a tool to bring economic benefits. The dichotomy in the approach to product inspiration will be discussed on examples of factory designs, with particular emphasis on the moral aspects of design.

¹ E.g.: E. Ares et al., *Optimisation of a production line using simulation and lean techniques* [in:] B. Tjahjono et al. (eds.), *Proceedings of the Operational Research Society Simulation Workshop 2012 (SW12)*, Birmingham 2012, p. 4.

² E.g.: H.P. Wiendahl, J. Reichardt, P. Nyhuis, *Handbook Factory Planning and Design*, Springer Heidelberg, Berlin 2015, pp. 197–212.

³ E.g.: A. Zhou et al., *Promoting Energy-Efficient Buildings in the Industrial Sector*, Alliance to Save Energy, 2009.

⁴ M. Pieczara, *Design Methods for Creative Industry Buildings*, *Journal of Engineering Technology*, 2016, vol. 4, no. 1, 2016, pp. 18–23.

2. RESEARCH BACKGROUND

2.1 ARCHITECTURAL DESIGN THROUGH THE FOUR INDUSTRIAL REVOLUTIONS

A brief analysis of design trends in industrial architecture is an important background for the presented study. The literature on the subject is abundant, therefore only a modest selection of it can be discussed. The aim is to briefly discuss the changes in architectural design introduced by the shifting production paradigm.

The First Industrial Revolution, which has brought such significant inventions as steam engine, railway as well as large scale iron and steel production, has also popularised new construction methods. Simultaneously with the global dissemination of technical advances, industry and new building methods, it has also contributed to the global spread of thought, including the sense of aesthetics. The new architectural style, which appeared in relation with the use of iron construction elements, has completely changed the point of view on architectural detail, i.e., on the definition and use of ornaments. While the architectural style of the First Industrial Revolution is often referred to as the architecture of iron,⁵ the works of civil engineering (e.g. bridges, railway stations and infrastructure) as well as industrial buildings (e.g. power plants, mine shafts, factories and warehouses) can be considered the driving force of its evolution. Nonetheless, the aesthetics of iron construction has gone far beyond the pragmatic aspects of its application. The Sainte-Geneviève Library in Paris, designed by Henri Labrouste and realised in the years 1843–1850,⁶ can be referred as the most classical example of the aesthetics canon shift from iron construction engineering to representative architecture. Numerous other iconic realisations of the epoch focused on the iron construction's potential to cover large spans, with the pavilions built for the universal expositions being most renowned examples, such as the Galerie des Machines, designed by Dutert and Contamin for the Paris Universal Exposition in 1889. The Eiffel Tower, erected for the same occasion, remains the most famous symbol of the First Industrial Revolution, especially with regard to both the aesthetics of wrought iron construction as well as the significance of structural engineer over the architect, whose name, Stephen Sauvestre, remains definitely less known than the name of engineer Gustave Eiffel. Moreover, from the point of view of truthfulness, the architecture of the First Industrial Revolution can be associated with the desire to express the truth about the iron structure and its aesthetics.

The Second Industrial Revolution, which was strictly linked with the spread of electricity and mechanisation, has also brought important social changes, including the specialised education of qualified labour as well as the emergence of middle class workers. In terms of architectural design, both the progressing mechanisation of manufacturing process as well as the specialisation of workplaces contributed to the development of large scale factory model, suited for mass production of goods. The ethos of work and the concept of modernity found their expression in the new principles of factory design, with

⁵ B. Lemoine, *L'architecture du fer. France: XIXe siècle* [*The architecture of iron. France: 19th century*], Champ Vallon, Seyssel 1986.

⁶ *Ibidem*, p. 240.

the emphasis being now placed on the workplaces. Among the most influential impacts on design practice brought in relation with the Second Industrial Revolution, the development of occupational safety and health regulations in contemporary sense has to be distinguished. Grounded over the long-time experience in the field of ergonomics and workplace hazards, dating back to Bernardino Ramazzini's work from the early 17th century, workplace design principles and relevant optimal dimensions, intended to protect the health and safety of workers, found their written and graphic expression in design manuals, such as the *Architect's Data* by Neufert,⁷ which had its first edition published in 1936. Among the most influential industrial architects of the epoch, Albert Kahn ought to be distinguished. His significant contribution to the design of factories in the US in the 20th century was strictly linked to the architect's cooperation with Henry Ford and later with other automobile manufacturers. As the designer of numerous large-scale factories, Albert Kahn popularised innovative steel-framed factory building models, providing generously day-lit work spaces that combined the simplicity of modern movement with the aesthetics of machinery. Moreover, while working on the designs of automobile factories, Albert Kahn revolutionised the operation of the architectural office, implementing a team approach to design based on integration of different specialists, including architects and engineers. Citing Charles K. Hyde, Albert Kahn's architecture studio became "an assembly line,"⁸ where large-scale factory designs were efficiently built up of multiple components prepared by different professionals. In that sense, Albert Kahn's approach to design can be considered as a search for truth about factory architecture, meaning the mass production of designs for mass production plants, without forgetting about the moral obligation to protect the labourers' health and safety.

The Third Industrial Revolution occurred as a result of computerisation. This applies not only to manufacturing processes, but also to almost every aspect of our daily lives. Architectural design has not been omitted, while the use of computers in this professional activity is meant not only to increase the efficiency and universal compatibility of design process, but also to optimise architecture. Computer aided design delivers tools to perform various types of simulations that usually serve pragmatic purposes, i.e., cost calculation and energy use, and more recently also ecological goals, like for example carbon footprint calculations. The architectural models of factories that are used across the industry of the third generation result from the continuation of the design principles promoted by Albert Kahn, with an emphasis placed on efficiency and pragmatism. As a result of ongoing optimisation, the currently prevailing trend in design of factories is strictly utilitarian architecture, and the most common factory model would consist of simple steel-frame machinery hall and a pragmatic office building. The truth of such architecture relies on fulfilling the economic goals of an investment. However, while the emphasis falls on strictly utilitarian values of architecture, many other important aspects of design are omitted, like for example its impact on the landscape, which can be understood as common good. While the marketing gains importance, leading to the appearance of garish industrial buildings and related advertising devices in the rural landscape, the resulting planning problems expose the dichotomy of the truth and a lie that appears in architectural design.

⁷ E. Neufert, P. Neufert, *Architect's Data*, Wiley-Blackwell, London 2012.

⁸ C.K. Hyde, *Assembly-Line Architecture: Albert Kahn and the Evolution of the U.S. Auto Factory, 1905–1940*, *The Journal of the Society for Industrial Archeology*, 1996, vol. 22, no. 2, p. 5.

The ethics of architecture starts to concern industrial buildings in particular and while the architect strives to express the truth about utilitarian values of a factory, he needs to stay cautious about other design values, so that his final work does not turn out to be dishonest to the landscape.

The Fourth Industrial Revolution is an ongoing process, which is characterised by robotisation of manufacturing and the use of artificial intelligence to control the processes in industry. There are many aspects to the impact of this recent shift in production paradigm on architectural design practice and education. Firstly, the industry of the fourth generation provides an unparalleled technical support to design, including Building Information Modelling (BIM), Augmented Reality (AR), Rapid Prototyping (RP) and Virtual Reality (VR) that contribute to the construction sector⁹ by enhancing the efficiency in work organisation, accelerating the flow of information and facilitating tests and trials of new systems, just to mention a few examples. Robotisation in architectural design is also utilised to produce unique ornaments and finishing details, which takes place not only in the stage of their physical fabrication, but also in the design stage, with the use of parametric design software.¹⁰ Admitting that computers can already produce unique ornaments faster than ever and in a more precise way than humans could, it can also be predicted that the computer will soon replace man in more aspects of architecture design, for example in optimising the functional layout and bearing structure choices. Analogically to the change observed with regard to the roles played by humans in the industry of the fourth generation and a new set of required competencies,¹¹ the character of the architect's occupation will also evolve towards legible polarisation between the competencies of computers and those of humans. "Computation is digitising design and architecture practices need to ensure they stay ahead."¹² If many activities in the design practice can be taken over by computers, the hardest to imagine is the conceptualisation of architectural form, where the creativity of a human seems irreplaceable. Other than creativity, the human possesses the unique ability to conceive a form that can make reference to the collective memory of people by recalling the association inherent in their collective unconscious. Hence the lasting importance of symbols, which are also utilised in the design of factories, often accompanied by the intention to express the investor's identity. In this context, industrial architecture constitutes an interesting area to observe the duality in approach to using symbols while conceptualising architectural form, and, in particular, with regard to their authentic relevance.

2.2 THE USE OF SYMBOLS IN ARCHITECTURE

From the point of view of this work, the notion of symbols in architecture has two important aspects. The first relates to the question of symbolic significance that is attributed to certain buildings, while the second concerns the way in which symbols are utilised in

⁹ B.M.F. Leal, M. Santos Salgado, M. Martinez Silvosio, *Impact of Fourth Industrial Revolution on Architecture Undergraduate Course* [in:] ZEMCH Network International Conference, Melbourne 2018.

¹⁰ K. Strehlke, R. Loveridge, *The Redefinition of Ornament. Using Programming and CNC Manufacturing* [in:] B. Martens, A. Brown (eds.), *Computer Aided Architectural Design Futures 2005*, Springer, Dordrecht 2005.

¹¹ D. Buhr, *Social Innovation Policy for Industry 4.0*, Friedrich-Ebert-Stiftung, Berlin 2015, p. 9.

¹² S. Fox, *The fourth industrial revolution*, 26.09.2019, Australian Design Review, <https://www.australiandesignreview.com/architecture/fourth-industrial-revolution/> (access: 29.03.2020).

architecture to evoke meanings that are rooted in the collective unconscious of humans. The notion of the iconic significance of forms has been discussed, among others, by Alan Colquhoun, who used the existence of symbolical forms in architecture to question the validity of the so-called objective design method, which was supposed to be free from reusing universal models, while being backed up with diverse analytic tools.¹³ Colquhoun demonstrated that even modern society has a psychological relationship with the forms so fundamental that the elements they are built of become inseparable. Such forms, which cannot be broken down into their components, recomposed in another way and, at the same time, keep the original meaning of the whole, can be defined as *gestalt* entities,¹⁴ or artefacts. These aesthetic unities are the carriers of meaning in the sense that they remain in close relation with human feelings they generally evoke. To explain what the *gestalt* entities are in the context of modern society, Colquhoun uses the examples of a car and an aircraft. In the field of architecture, however, the problem seems more complex, as it intersects with the notion of archetype¹⁵ (e.g. archetype of castle, ramparts, temple, monastery, house and settlement), which can be considered as timeless reference of an architectural type, a pure concept represented in different projects and realisations.¹⁶

A particularly interesting interpretation of symbols and their meanings through architecture was presented by Robert Venturi, Denise Scott Brown and Steven Izenour in "Learning from Las Vegas."¹⁷ According to the authors, despite the determination of modern architects to break from the historically grounded design patterns, they have only substituted one set of symbols for another, without being aware of it.¹⁸ This demonstrates that cutting off from the history and heritage is not possible, while the symbolism of architectural form is both inevitable and necessary. Hence the importance of their studies carried out in Las Vegas, considered by Venturi, Scott Brown and Izenour as the living laboratory to analyse the symbolism of forms used in commercial architecture. Backed up with the knowledge of structural anthropology, the three authors have considered Las Vegas as a communication system and have analysed its urban tissue with the emphasis placed on the structure of signage system and the symbols used. Among the first observations made, the results of the relationship study between the sign scale and the building scale can be distinguished. The authors discuss the phenomenon of the big sign-small building relation, comparing it with the concept of the building itself as a sign.¹⁹ This observation becomes the starting point for the further development of the theory regarding the typology of commercial architecture in Las Vegas. In particular, two opposite types are distinguished: the *decorated shed* and the *duck* building.²⁰ The *decorated shed* typology of buildings highlights the importance of the front facade, which is the carrier of meanings regarding the building function. In the typology of the *duck*

¹³ A. Colquhoun, *Typology and Design Method*, Perspecta, 1969, vol. 12, p. 72.

¹⁴ *Ibidem*.

¹⁵ T. Kozłowski, *Archetyp w architekturze*, Teka Komisji Urbanistyki i Architektury, PAN Oddział w Krakowie, 2016, vol. 44, pp. 101–111.

¹⁶ M. Pieczara, *Archetypes in Contemporary Architecture*, Technical Transactions, 2019, vol. 4, pp. 71–84.

¹⁷ R. Venturi, D. Scott Brown, S. Izenour, *Learning from Las Vegas: the forgotten symbolism of architectural form*, MIT Press, Cambridge 1977.

¹⁸ *Ibidem*, p. 137.

¹⁹ *Ibidem*, p. 17.

²⁰ *Ibidem*, pp. 88–89.

buildings, on the contrary, the whole three-dimensional architectural form is significant, referring to the object's purpose.

The two different approaches to designing commercial architecture will be further analysed in the presented paper, based on exemplary projects of industrial and commercial buildings that were inspired by the products of the selected branch as well as by their characteristic features.

3. METHODOLOGICAL APPROACH

The first step of the research, which consisted of literature review presented above, has revealed that the architecture of factories is not less efficient in expressing the designer's seek for the truth than the institutional one. To the same extent as other functions, industrial architecture does not hesitate to refer to the epoch's significant symbols, for example to the technological progress, expressed in adopting the aesthetics of the wrought iron, or to the work ethos, expressed through the emphasis placed on workplace design, or, more recently, to the contemporary consumerism, expressed in the increased significance attributed to the objects. The latter issue links to the use of symbols in the commercial architecture, as considered by Venturi, Scott Brown and Izenour. The problematics of the architectural form referring directly to the product will be analysed further in the presented paper and illustrated by exemplary designs.

The basic method used in the implementation of the presented work is logical analysis of the design process, with particular emphasis placed on the decision making stages. The designs selected to illustrate the problems discussed are student projects, developed within the framework of a course on architectural design of workplaces. The reason for choosing student projects instead of actual implementations and existing buildings is that the authors' intentions regarding the use of an architectural form inspired by industry products are known, as they were vocalised during weekly consultations. On the contrary, discussing the design of existing buildings would be burdened with a serious error of guessing the architect's intentions.

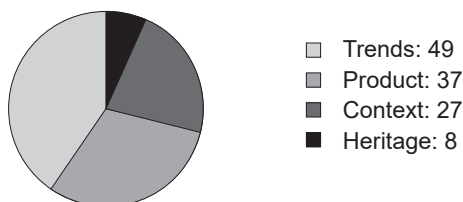
The task assigned to students was to design an industrial plant for an individually chosen manufacturing branch, while the selection options included creative and culture industries as well as fourth generation industries. Referring to the characteristic features of the product was not a mandatory point of the program, it was nonetheless mentioned in the presentation explaining the topic of the design task as one of the various potential sources from which to draw inspiration. Numerous young designers engaged in the studio showed their interest in such a possibility, however their response was differentiated and involved adopting varied approaches to the idea of using the product as inspiration for defining the architectural form. In most cases, the projects analysed can be classified according to two design approaches to the symbolism of architectural forms described by Venturi, Scott Brown and Izenour, which can be summarised as emphasising either the building's front facade or its whole three-dimensional form. Knowing the designers' intentions regarding inspirations derived from the product's characteristic features, namely whether it is to convey the truth about the building's vocation or to catch a passer-by's eye, the logical analysis of selected projects will place a particular attention to the ethical background of the adopted design principles.

4. RESULTS AND DISCUSSION

The design principles adopted in the discussed projects of manufacturing plants are in each case an individual decision of the author. Moreover, in most cases there are several sources of inspiration used simultaneously, as a result of which various influences intersect at different points of the design process, creating a unique response to the given design task. Given the priorities for the source of inspiration, which are usually determined individually for each design, they can be attributed to four main areas of origin:

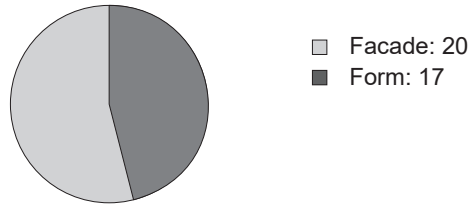
1. Inspiration is drawn from the product of the selected industry branch, including materials it is made of, its assembly method as well as the technological process involved. In this work, this category does not include placing the logo on the building's facade.
2. Inspiration comes from the context in the broad sense of the term, combining landscape, urban fabric and regional typology of architecture.
3. Another category of inspiration concerns local and global built heritage, also including industrial heritage.
4. A significant source of inspiration includes contemporary trends in architecture, structural design and finishing materials, which can be observed in diverse contemporary realisations, often situated in distinct locations, demonstrating their universal reach.

As it can be clearly divined, one project can fall into more than one category of inspiration, nonetheless there usually tends to be a prevailing one. From the number of 121 projects analysed specifically to support this paper, the largest number refers principally to the contemporary trends in architectural design, which is quite usually combined with inspirations drawn from the context. Such a set is particularly recurrent and, at the same time, the most difficult to separate. Another important source of inspiration is related to the product, while the category of heritage references is less frequent and generally limited to the situations where historical buildings are found in the location (Graph 1).



III. 1. Graph 1. Sources of inspiration used in the referred designs of industry plants

When it comes to the category of inspiration by the product, which is the main focus of this work, it can be subdivided more precisely into two groups. The first group, which can be defined as superficial, includes situations in which the author draws inspiration from the product's characteristic features, like for example the nature of its materials, its form and graphic design (the way it looks) or its assembly method, in order to design the building's facade. In the second option, the inspiration, frequently drawn from the same product's features, is used to obtain a structural effect, expressed by the building's architectural form, its layers or the bearing structure. The proportion in which this type of use of inspiration can be observed in the referred projects is almost equal (Graph 2).



Ill. 2. Graph 2. Inspiration by the industry product: its field of application in the referred designs

4.1 FRONT FACADE (SUPERFICIAL) APPROACH

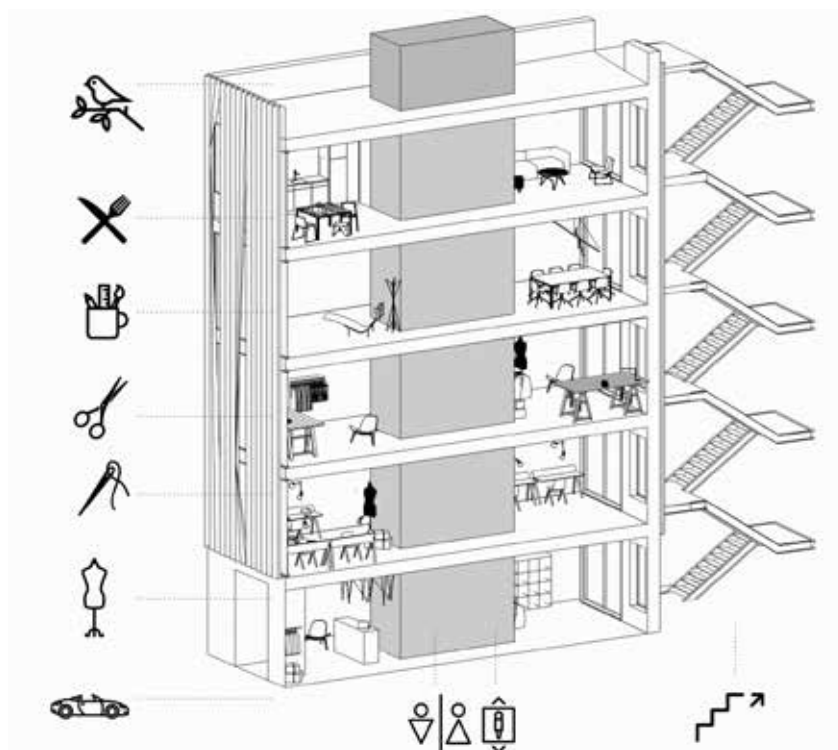
The front facade approach to design derives conceptually from the architectural model described by Venturi, Scott Brown and Izenour as the *decorated shed*,²¹ which was characterised by the emphasis placed on the front elevation and, at the same time, a completely pragmatic view on the design of the building's remaining parts. Within the framework of the discussed design studio and with regard to the use of product's characteristic features as a source of inspiration for designing manufacturing plants, the *decorated shed* approach to design translates into placing a special interest in broadcasting the identity of selected industry branch through the front facade composition. One of relevant examples illustrating this approach to architecture, although in a small scale, is the project of a fashion house, in which the main idea for the facade design consists in covering its nearly entire surface with fabrics, which was done with the intention to express the creative work with textiles that is taking place inside (Ill. 3, front facade to the left). The shield on the facade is shaped into uniform pleats and can be unveiled like a curtain so as to control the amount of direct sunlight falling into the building's interior. When stretched to the maximum coverage, the curtain works as a sun filtering screen, giving lots of natural light without the glaring effect. At the same time, the transparency of the facade plays an important role in conveying information about the building's vocation, revealing delicate shadows of its users at work, visible from the street especially after dark. In this particular project, the concept of the active facade defines the character of the entire project, being its most distinctive feature and requiring most attention from the designer so as to solve its technical details.²² On the other hand, the building's bearing structure as well as its functional layout remain in line with pragmatic guidelines. In terms of the ethical divagations, finally, the architect's intention was to express the building's function clearly but, at the same time, in a subtle way, filling the street frontage with contemporary architecture without damaging the harmony of existing buildings.

The idea of referring to the characteristic features of the product through the facade design, aimed at conveying the truth about the building's function, works equally for large scale industrial projects. Generally, this is expressed either in the facade's geometrical composition, or in the selection of finishing materials. The first situation can be illustrated by the example of a publishing plant, in which the geometrical composition of the facades is intended to resemble a bookshelf with loosely arranged books. Their appearance is transformed into the position of pillars and into the divisions of glazing. Or, another example,

²¹ *Ibidem*, pp. 88–89.

²² M. Pieczara, *Design Methods...*, *op. cit.*, p. 20.

a lamp factory where the product is used on facades as an individually designed and unique architectural detail, defining the building's identity and manifesting its function.



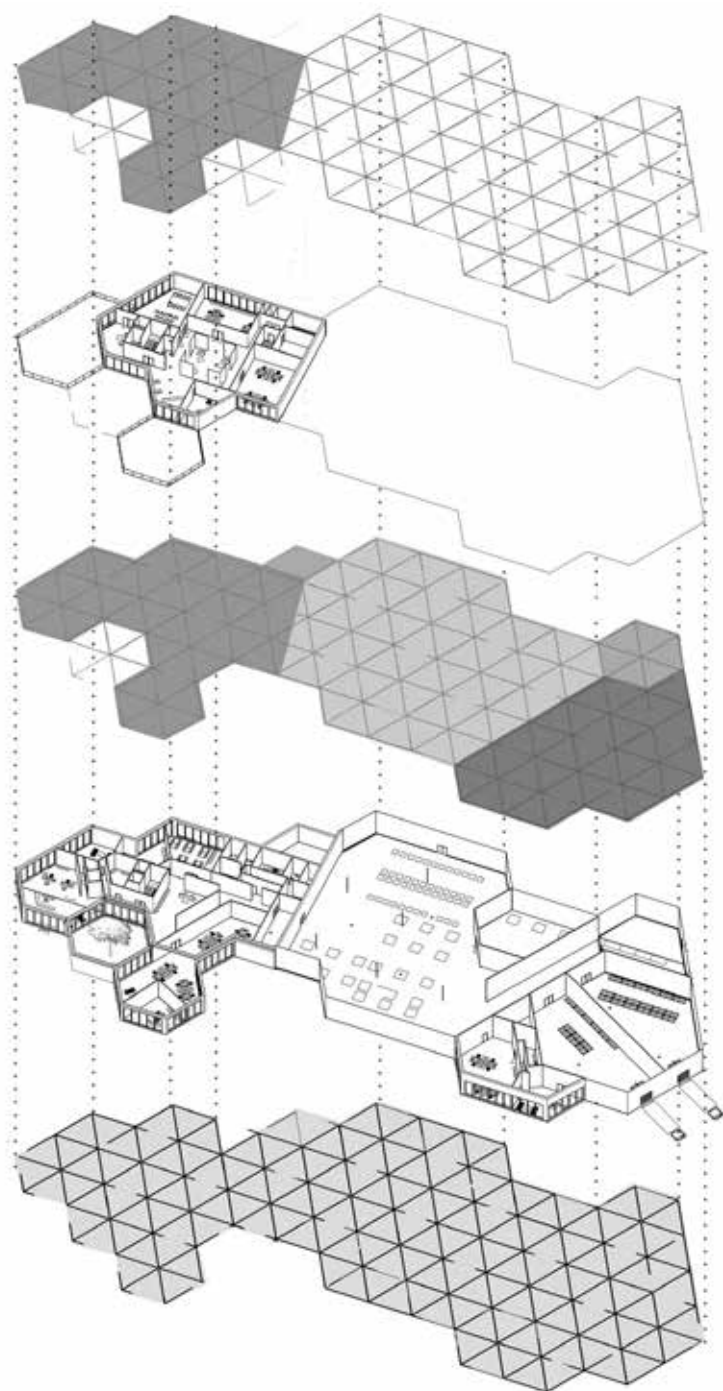
III. 3. Use of textile in the front facade of the fashion studio. Design by Kaia Korpa, 2015, PUT (Poznań University of Technology)

The second situation, in which the facade design is inspired by the materiality and the nature of the product, can be illustrated by the use of wood in furniture factories. The use of the main material the product is made of on the building's facades is quite a popular solution in the projects where the designer intended to combine these two ideas: the compatibility with contemporary trends in architecture and the will to unveil the building's vocation to the users of the public space. From the point of view of the architect's sincerity, and hence the veracity of architecture, the search for such a compromise between the firm's marketing image and the quality of public space does not impair the truthfulness of overall design. This is largely owed to the subtleness of the facade approach to design, which aims at finding an optimal balance between the will to stand out from the average and, at the same time, the ethical priority to build the spatial harmony.

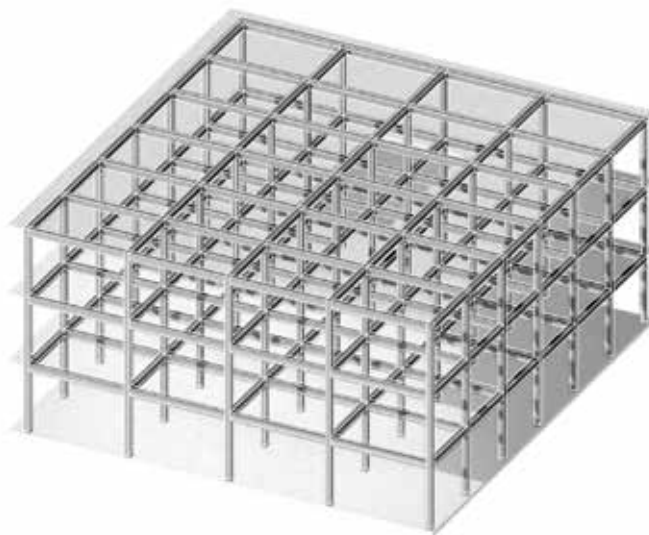
4.2 FIGURATIVE (THREE-DIMENSIONAL) APPROACH

Deriving from the architectural model described by Venturi, Scott Brown and Izenour as the *duck*,²³ the figurative approach to design is characterised by a structural way of using

²³ R. Venturi, D. Scott Brown, S. Izenour, *op. cit.*, pp. 88–89.



III. 4. Bearing structure module influenced by the idea of 3-D printed elements. Design by Hanna Zielezińska and Weronika Zywert, 2019, PUT



Ill. 5. Bearing structure concept in the chair manufacturing plant. Design by Magdalena Baraniak, 2019, PUT

the inspiration drawn from the product. The formal characteristics of the product (e.g. its form, structure, layers and assembly method) can be referred in multiple ways, for example by citing the product's shape at a different scale. Such an approach has been adopted, for example, in the ceramics manufacture project, where the shape of a cup was given to one of the buildings included on the site. It has also been adopted by the authors of the plastic blocks' factory which was given a form composed of several structural units that maintained the exact shapes, proportions and colours of the product, however at a different scale. A similar idea, concerning nonetheless exhibition and commercial functions, has recently been implemented in Billund, Denmark, which clearly shows that design methods discussed are not purely academic. Or, in another example, the characteristic shapes and broken lines of motocross bike's body found their reflection in the architectural composition of the motocross accessories manufacture.²⁴

Besides the figurative way of replicating the inspiration in architecture, a few interesting designs made an attempt to refer to the product's features through the building's spatial definition as well as through the organisation and assembly method of its bearing structure. In the 3-D printers' manufacturing plant, for example, the idea of prefabricated modular bearing structure is actually intended as making reference to the concept of three-dimensional printing (Ill. 4). The material used to realise the structure (concrete), as well as its white colour, are also in line with this intention. Moreover, so is the concept of a 3-D printed exposition pavilion placed on the site. Less obvious and less vivid than citing the exact shape of the product at a different scale, referring to its materiality and nature does also relate to the three-dimensional approach to design. Another interesting example of how the inspiration drawn from the typical material the product is made of can be used to define the building's bearing structure, is delivered by the chair manufacture project (Ill. 5). In this work,

²⁴ M. Pieczara, *Design Methods...*, op. cit., p. 19.

the wood, or the basic material the chairs are made of, is used for the bearing structure in the representative and recreational parts of the complex, whereas it wouldn't be allowed in the production area. Implementing the idea of such a structure required much attention from the project's author, who have invested time and effort to elaborate the technical details of one-level beam crossing joint.

As it can be observed from the above discussed examples, the figurative, or three-dimensional approach regarding the use of inspirations drawn from the product features has two principal aspects. The first consists in reproducing the product's shape at a different scale, often keeping nonetheless the original proportions. This aspect serves in particular the designer's intentions to draw the attention of passers-by. At the same time, however, it provides a direct association with the product itself, becoming, at some point, its advertisement. This, in turn, carries a risk of creating false references, connecting the architecture with the product's underlying concept. The second aspect consists in referring to the product's features in a less obvious way, like for example, selecting the material it is made of to define the building's structure. Usually, the designer's intentions associated with such practice are to find a compromise between the application of current trends in architectural design and the will to express the building's functionality.

5. CONCLUSIONS

As can be observed from the examples discussed above, both approaches to designing architecture of manufacturing plants based on formal inspirations by the products share an important aspect with regard to the design's interaction with the existing context. In this regard, the architect's aim is usually to provide an interesting and attractive form, which would allow to achieve the desired effect of the diversity fitted into the context. Means of expression that are usually employed in the implementation of this intention include combining contemporary architectural trends, both in terms of the aesthetics and materials selection, with an inspiration drawn from the building's function. The latter can be achieved through the building's skin transparency, unveiling its interior, but also by referring to the product's characteristic features (e.g. its shape, material, typical colour, production process or assembly method) in architecture. Such a procedure can be considered as the search for the truth about architecture, as the desire to express its authenticity, perceived individually for each building. While seeking to express the building's functionality in a subtle way, the facade approach to design has proven to be particularly appropriate for such interventions. The three-dimensional approach, as it could be observed, is divided into two different aspects. While the first of them relies on the formal inspiration used quite literally to shape the architectural form of the building, the second utilises only selected product features (e.g., material and colour) to individualise the design. Due to its thoughtful selectivity, the second aspect proves great resemblance to the facade approach, with its proper discreteness. On the contrary, the approach based on literal, figurative inspiration produces a higher risk to be utilised for marketing purposes, as its relationship with the product is often direct and therefore more legible. Moreover, the designs developed according to the figurative approach generally have a powerful impact on the existing context, which causes another risk for the quality of public space. Namely, it can create a new public space of a good quality, but it can also disturb the existing character of the location area. The risk is considerable and therefore

the requirements placed on designers are equally greater, and so is their responsibility. Using the figurative approach to design requires great consistency in its application and highly developed design skills, while the risk of architecture being dominated by the marketing interest carries the threat of it being perceived as false and pretentious, bringing to the viewer's mind something else than what it really is.

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