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Impact of Industrialization on the Building

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Abstract
Thispaperpresentstheissuesand the transformations in the ideologies of designing buildings post Industrial Revolution. Through the paper, an attempt has been made to portray the journey of transition in architecture - from antiquity to Industrial Age, and from Industrial to Machine age – and how they have been shaping various nuances of Contemporary architecture. These matters have been further substantiated by understanding varied perspectives of architects who molded the scenario of architecture of 20th century with their perceptions and designs of Modern Architecture.

Keywords: Industrial age, Machine Age, Antiquity, Revolution, Imitation, Innovation, Contemporary

Introduction
The Industrial Revolution was a movement that started in 19th century and lasted for about a century and half. And then, followed by the 'Machine Age' which is characterized by arrival of 'electric power from the mains and reduction of machines to human scale. The introduction of manually controlled machines such as cars, aeroplanes, vacuum cleaners and most importantly computers which marked the late decades of the 20th century for the domestic continuum of life.

The architects of the 19th century were the first ones to embrace the idea of science and technology over the cultural legacy which had been carried over last plenty of centuries. The idea of the buildings before were all static, designed for the same purpose (like taking the example of the *parish churches).* But with this upcoming of new period the demand arouse for the new building types because the needs of the user outstripped the *state of art building envelope.* Than after some decades of mutiny among the ideas the rapid string of new range of buildings came up like housing, schools, hospitals and banks. With the radical change in the impact of new technological environment the need for *serviced floor space* coincided with the upcoming contemporary age. It created the same possibilities for the architects at 1980s as it created the inventors of pre-fabricated building systems in 1930s.

Twentieth century architecture reveals aspects that are both beautiful and useful. The laws of scale, balance and harmony are applied to the entire building and, the least detail conforms to be ideal. This new architecture began towards the end of nineteenth century. Like Gothic style of architecture, it is entirely original and independent of the past. A change was overdue, as architects of the old school had grown self-satisfied and were merely copying antique styles and historical ornamentation. As Alexander Pope said in protest to the Earl of Burlington:

You show us Rome was glorious, not profuse,
And Pompous buildings once were things of use.
Yet shall, my lord, your just, your noble rules
Fill half the land with imitating fools;
Who random drawings from your sheet shall take,
And of one beauty many blunders make;
Load some church with old theatrics state,
Turn arcs of Triumph to a garden gate.

The days of the 'factory building' era virtually ended at the turn of the twentieth century. Before than the factory was a building of four heavy walls with three-foot windows about twelve feet apart, and the while covered with a slate or tin roof. There was little, if any, attempt made to design buildings for proper functioning of the machinery. Natural lighting was poor on account of the roof lights. Artificial lighting was yellow, inadequate and badly placed. Truly a dismal picture of a dismal industrial age. Nobody was happy except the owner who was making a plenty of money out of the old brick pile.

Analysis
A multitude of machines made jobs less physically demanding than they used to be. The prefabrication of the building components in factories is doubtlessly contributing to this trend. The architects' hope that industrialization would improve the quality of the building components however has sadly not been fulfilled entirely. In fact on the contrary, as a result of mass production details had to be simplified to respond to mechanical processes that would turn out to be crude and rough. The creative contribution by the skilled craftsman to the shaping of building details is diminishing at a very high pace; the creativity with all the invaluable experience handed down by generations.
Then came men of vision like John Root, who discarded decorative buildings because they were nonfunctional, and insisted on flat surfaces because they were clean and simple and Frank Lloyd Wright, who designed the first glass-wall structure. Such men discovered "industrial architecture" as opposed to "factory buildings'. There was a revolutionary period in the building world.

They love not fancies betrayed,
And artful tricks of light and shade,
But pure form nakedly displayed,
And all things absolutely made.
Clough [2]

The Crystal Palace, 1851 Sir Joseph Paxton's masterpiece of component design and project management serves as a perfect

example in terms of long spans, iron construction and use of glass. Here the fact of the project of nearly one million square feet of floor space on three floors had been completed only in nine months has been one of the major driving points why and how the prefabricated method of construction became an tool for architects for going about the buildings. Thus, taking into today's consideration of modern age structures as Richard Roger's Lloyd's building or Norman foster's Hong Kong and Shanghai Bank. Both then and now, the key to professional survival was to make these opportunities and possibilities culturally acceptable. The success rate in this aspect is however a decision which may vary from person to person. On one hand it can be seen [i]as a positive facet – as the architecture which moves forward with time, *futuristic* or on can be seen as a subject seized by the aliens outside the culture of architecture.

Figure 1: Crystal Palace, 1851 (Pre-Fabricated Technique)

Figure 2: Lloyd's Building, London - 1978-86

Figure 3: HSBC Bank, Hong Kong

By the end of nineteenth century machinery was becoming more massive and intricate; and it was fond that industrial buildings were not functional enough to cope up with the requirements of the machines. New heavy machines like dynamos, presses and turbines made a new approach to architectural design comparative. There was beauty in the lines of these pieces of machinery, and there was no suitable or efficient architecture to accommodate them. Remember that the appearance of well-installed machinery is always good salesmanship.

Men of the caliber of Albert Kahn, Van der Rohe, Le Corbusier, Gropius and Peter Behrens came into their own and constructed examples of highly efficient industrial plants. Kahn concentrated on the technical and economic aspects of factory design and planning. His structures were magnificent combinations of power and style.

Figure 4: Albert Kahn's New Centre Building

Figure 5: Peter Behrens' AEG Turbine Factory

The lines and surfaces of machinery of the twentieth century are inspiring and beautiful. Since the first decades of the twentieth century a complete change has taken place in the architectural design. The American architect Louis Sullivan was the first to conceive the idea that architecture and engineering were kindred forces. Thus function and material set a standard form and style. Hence a new style of architecture was born, and the structural scheme expressed in steel and concrete became a reality. Frank Lloyd Wright, a disciple of Sullivan and an outstanding young architect, followed up the ideas developed by his master and subsequently consolidated the hard-won ground by designing clear-cut functional homes, factories and offices.

Walter Gropius although trained to be an architect, he found interests in all crafts connected to the builder's art. He was particularly interested in pictures, furniture and machinery. Thus he returned to the mediaeval guild's ideas of the aesthetic on the one hand and to the practical guilds on the other hand. Early in 1920 Gropius gathered around him gifted men and women who were proficient in the crafts, such as

ceramics, fabrics and sculpture. Thus Gropius united all arts and crafts with the builder's art. This group was called the Bauhaus (Ger. *Bau*, building; *Haus*, a house) and become a moving force in the world of architecture. In 1926, the Bauhaus (the building housing the group) was completed in conformity with the new ideas, and the professors' and students' dwellings are still considered classics of modern architecture.

Figure 6: Walter Gropius' Bauhaus, 1926

Figure 7: Adolf Loos' Steiner House, 1910

When seen this perspective in terms of Adolf Loos condemns the idea of *imitation* which is the case prevalent these days. He condemns that how in today's context the day laborer is given preference over artist, which reflected that how working hours is being preferred over creativity. And thus, the blame for this comes over to 'MACHINE'. This results in getting artists out of the job which forces them to opt the job of the laborer and henceforth comes the situation of *faking working hours.*

He states that the problem is also with the society supporting imitation because they are not known to the fact that *elegance is independent of all sorts of luxuries* (like fur, diamond, stone palace). Hence people go for imitations like cladding of iron over copper or bronze, wall paper over wall cladding and the latest being cement over stone and stucco work. He elaborates this by giving example that when Englishman introduced the concept of wall paper to Viennese they all accepted it happily being a parvenu and that is the matter of shame for the Viennese and not the Englishman.

Something essential in man's creativity, even science may disappear when the defiantly metaphoric language of poetry gives way completely to the denatured language of the computer.

Lewis Mumford[3]

Thus, it concludes that Adolf Loos is not totally against the upcoming revolution but wants the artist not to degrade or demoralize his artistry because of the forthcoming inventions. He wants them both to go hand in hand. He wants the society to take an initiative by not craving for fancy materials and hence, not force the craftsman for imitation but to promote him for doing what art he is good at. However, at the same time one should also understand the theoretical premise of his considerations and the major issue that he has been dealing is the various expressions on how to deal with the available material.

Le Corbusier on the other hand embraced the upcoming revolution. According to him one has to move forward considering today's time and context. Sufficient ornamentation has already been done in the past and now it's time to move ahead with the new inventions in material availability and technology advancing. He admired the inventions of new machines – machines which catered to one's daily domestic needs. He believed that Parthenon represent the pure spirit of architecture as it was among the first ones to attain the absolute form and picturesque that one should proceed to attain in architecture. And thus, he compares such Roman examples with the modern machines like an airplane or an automobile.He explains that the Roman elements and quantities provide a mass of material as a basis of work and have introduced to us the equation of that result in rhythm; they speak of numbers, of relationships and of mind. These are the aspects of consideration that one should continue to carry about along with because just putting materials together is clever method of construction but when it touches heart than it is architecture with art. This is the only process from where one can proceed towards absolute architecture.

Architecture is the thing of art, phenomenon of the emotions, lying outside the questions of construction and beyond them. The purpose of the construction is MAKE THINGS HOLD TOGETHER; of architecture TO MOVE US.

Le Corbusier[4]

He refers a house as a machine. He induces the expression of precision and calibrated innovations of the machines into a house. Machines lead to both – the work and the leisure. Hence entire cities have to be constructed or reconstructed so as to provide comfort as the basic asset because if this gets once delayed it might result in disturbance and imbalance in the society. Le Corbusier also emphasizes on mathematical calculation so as to construct well and to obtain solidity and

utility in the work – another expression of the machine. It is clear that his preoccupation is not with the machine as a formal analogue for the organization of dwelling, but with the machine as he metaphor for a style uncluttered with the decorative detritus of the past. His approach is passionate, historical and pre occupied with the symbolic potential of space.

Then again, JuhaniPallasmaa has another chapter to unfold on the existential wisdom in modern architecture. Where the previous Masters of architecture conferred more on creation of absolute space, Juhaani believed in experiencing it. According to him architecture provides our most important existential icons by which one can understand both ones culture and oneself. The important works of the modernism are images of a living realty and a newly emancipated lifestyle. This is the true way to go about architecture because they are just mere discourses within the discipline without reflecting the true life style of the machine age.

The discipline of architecture has to be grounded on a trinity of conceptual analysis, the making of architecture, and experiencing – or encountering – it in full mental, sensory and emotional scope. The point that I wish to emphasize is that an emotional encounter with architecture is indispensable both for creating meaningful architecture and for its appreciation and understanding.

***JuhaaniPallasmaa*[5]**

An architectural work is not experienced as a series of isolated images as envisioned by an eye. It is touched and lived in its full and integrated material with all its essence embodied in it. An architect needs his heart to in order to imagine situations of real life and feel compassion for human destiny in order to attain the true summit of the industrial age.

The socialization primarily takes place through 'imitation' and 'identification' Imitation consists to TAKING OVER cultural elements like knowledge, beliefs, andsymbols, while 'identification, means that we come to understand and accept the mediated values, i.e., that the expectations and objects the signs designate are of different importance. The result is the common standard which gives meaning to the interaction process.

***Christian Norberg- Schulz*[6]**

Conclusion

All the new planning for the cities has to sub ordinate itself to the existing overall framework, and offer in its physical manifestation a formal answer to the given spatial conditions. However, the Urban Space has been forgotten in the twentieth century city planning. Our new cities consist of a conglomeration of free standing and isolated buildings. Then where do we find the notorious functional determinism for which the twentieth century architecture has become famous and modernism has been so commonly blamed?

The answer to it is to be found in social and political theories, whose intellectual context has made the present system in architecture towards social engineering practice. But when something is termed engineering it is responsible on how is it going to work. Thus, comes in the paradigm of machine which fills this need. From here one needs to co relate the ideas between form and function at the levels of built environment, from the dwelling to the city, passing through variable spatial configurations. However the architect/planner should realize that the effect of such spatial organizations are not in individuals, but on collection of individuals and how they relate to space. The paradigm of the machine in effect asks one to believe that the relation of form and function in architecture is passed on more from a building to the individual than the relation between space and building. It is the conception of the individual which attributes meaning to the structure in which one experiences it. Thus one should take the example of the machine which is invented to cater to the needs of human consciences and hence create *Space as the Machine.*

Buildings are thus among the most powerful means that a society has to constitute itself in space time and through this project itself into the future. The act of building is, as a consequence, inevitably a social act. As such it entails risk, risk that the forms will not be those that permit the society to reproduce its essential forms. Architecture persists both, modern society and social agencies; because society changes and must change its built world in order to perpetuate itself in a slightly different way to its predecessor. These must always experiment with the future. The real risk is in persistence of error through time, so that forms inconsistent with the perpetuation of good society becomes dominant. It is exactly from such high risks that we, today entering into the twenty-first century, seem recently to have made our escape.

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Citations:

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[2] Quotation by Clough, Architecture of the twentieth Century; Chapter 6 Industrial Architecture (Page 68)
[3] Quotation by Lewis Mumford, The Myth of the Machine; Chapter 001 architect-machine symbiosis, the architecture machine
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