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FUTURE PROOFING ARCHITECTURE IN CHANGING TECHNOLOGICAL AND ECONOMIC ENVIRONMENT

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ABSTRACT

The fast pace of evolution of technology especially as witnessed in the fourth industrial revolution has put intense pressure on the position and function of architects and the general practice of architecture. New emerging fields in the practice of construction spurned from this technological advancement, has created areas of overlapping functions of architects that seemingly try to relegate traditional role of architects. It is indeed no longer business as usual for architects in the construction industry. The training and practice of architects have to therefore adapt and become business-like, well versed in economics, fluid, collaborative and keep up-to-date with technology to maintain its enviable and noble status in the construction industry, and to indeed future-proof the practice of architecture and architects.

Keywords: Technology, adaptation, re-training, collaboration, future-proof

INTRODUCTION

The practice of architecture and architects in particular, have since time immemorial been constantly subjected to the vagaries of evolving and changing technologies. From Vitrivius to Gropius, the metamorphosis that occurred in the architectural and construction world was largely dictated by emerging and changing technologies. Schwab, (2016) sums it up as phases of industrial revolutions. The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.Indeed, from the pyramids and sub-terranian structures in ancient Egypt, to the Greek temples, Romandomes, cathedrals and villas, to the invention of reinforced concrete, steel and glass; it can be seen that technology moved architecture and construction from antiquity to modernity, from low-rise,heavy and expensivestructures to cheaper, tall and light structured buildings.

In the same vein, the training of architects evolved from apprenticeship/on the job learning to guilds, to pupilage and now the formal structured academic learning environment, and the professional practice of architecture from small private offices to multi-national mega offices with on-line linked offices and specialities located world-wide. As Peters (2013), reiterates, technology is changing architecture. The world of computational design means architects are pursing new frontiers where architecture can be generated through the writing of algorithms and software, where interactive physical mechanisms can be built that respond to their environment. At the same time, continous specializations have spurned new disciples and professionals such as interior decorators, project managers and the likes competing for the architects former space through aggressive enterpreneural innovations. With a fast evolving technology pace and aggressive economic sharks crowding in to the sphere of architecture, it has become necessary for architects to keep adapting and evolving as necessary.The nuances of this evolution and adaptation required will be analysed in the following pages.

Technology and Architecture

Architecture and technology have always intersected at a precarious crossroads. From the early civilizations in Mesopotamia, Egypt, Greece, Roman Empire and the East, the development of architecture was to create buildings for varied purposes. Egypt's Pyramids, Greek's Temples, and Roman's Amphitheatres are just few illustrations of various functions that could be found globally.The forms, materials, tools and functions of the architecture employed in the design and construction of these monuments evolvedfrom resources that were available in the immediate environment, which greatly limitated the creation of architectural form. This constrained architects and designerschoices of available resources and this led to development of region specific architecture.

During most of the nineteenth century, building methods were as they had been for centuries and one individual equipped with a vision and knowledge of construction was able to oversee the complete design and construction of a building. The development of steel, reinforced concrete construction, often used in conjunction with modular glazing, and the invention of the elevator in the late nineteenth century freed buildings from the constraints of masonry construction (McBride, 2009).From the 1890s on, electricity and mechanical ventilation freed construction from natural light and air circulation, making it possible for architecture to seem immaterial.Electricity opened the unprecedented, magical vision of buildings fully lighted and floating, as innovative architects exploited the potential of new technologies and new materials that had been used for the first times in the new industrial and utilitarian buildings (Larsen, 1993). Indeed, the mechanization and rationalization of manufacturing served architects and everyone else as a permanent reminder of the enormous potential of mass production and standardized components. This spurned the era of modern architecture and construction.

From the twentieth century to the turn of the twenty-first century, technological advancement have evolved structural systems which can exercise complete control over space. Huge voids can be spanned, vertical spacesof any height can be enclosed. New methods of analysis have shown the way of designing structures as live structures, in which each member contributes its share to the stability of the whole and this is made with the minimum expenditure of material, without depriving modern architecture of its expression (Dighe and Subba, 1959). Stress is placed on economy of construction and a structure is designed as slender as may be consistent with strength. This effect of lightness is further enhanced by use of bright surface and smooth finishes especially glass—which modern science has made available. By the 1940s mainframe computing technology started making incursion into construction and architecture though they were so large and rudimentary they needed special skilled operators and had to share tasks will professionals (Larsen, 1993).

Computers have now evolved and reached a level of sophistication that allows them not only to perform mechanical, repetitive tasks but also operate on a higher cognitive level as software applications.Technology-driven development is rapidly changing job markets across the world. Designers are making use of advancements in 3-Dimensional (3D) printing and rapid prototyping to not only build better, more accurate design models, but are building full scale representations of their work. Entire buildings and installations are now the product of 3D printing, a system that pours concrete blocks using a giant automated extruder. It's called Contour Crafting, and it can construct structurally sound bearing walls in almost any shape in a matter of hours (Easyrender, 2018). Currently building technology and sustainable design are considered as fundamental to the growing field of contemporary architecture. Practicing architects have a challenging responsibility to design buildings that are environmentally sustainable with the change in the global concern regarding the use of energy and resources (Rashid and Ara, 2015).

Architectural Office Practice and Technology

During the mid to late nineteenth century, architectural practice was changing from the craft-oriented vocation of master builder to the professionalized occupation of architect (Woods, 1999). Professionalization of occupations was a hallmark of the latter half of the nineteenth century as the cultural elite sought to retain authority over the modernizing and egalitaria effects of industrialization.A profession was not an occupation, but a means of controlling an occupation. Specialized architectural practice that was grounded in the science of building and expertise in design and construction formed a strong basis for claims of professional recognition.Professionalization of architectural practice attempted two things: to give the architect autonomy, and to compel the public to recognize the architect"s unique claims. The architectural profession endeavored to assure the public that architects were the sole purveyors of building knowledge that the client would be unable to attain elsewhere. (McBride, 2009). The architectural office practice was organized alomg the lines of the principal and his assistants, complete with manual draughtsmen who drew on tracing paper copying edited works on bond sheets in pencil, and reproduced by ammonia laden blueprints. Most of the renowned architects were trained in the Beaux Arts Schools in Europe, and had the background of seeing Architecture as a gentlemans and noble profession, exclusive for the upper class. However, evolving technological advances placed new and complex demands on the nature of buildings and services that were incorporated into them, placing new demands on the architect in terms of the level of knowledge and skills to deal with the new challenges. The sheer information and expertise needed to design evolving complex structures required the architect to become;

1. An office manager with administrative skills running larger offices, complete with personnel other than architects and draughtmen, documentation and information management;
2. The management skills of coordinating and cooperating with specialists such as engineers , general and sub-contractors, all who had their own skills and administrative expertise;
3. a businessman to compete with the services of the engineer and the general contractor (McBride, 2009).

In addition to these skill requirement, in recent times,information technology is changing architecture. The world of computational design means architects are pursing new frontiers where architecture can be generated through the writing of algorithms and software, where interactive physical mechanisms can be built that respond to their environment, adapting and evolving as necessary.BIM (building information modeling), a sophisticated program that allows architects to collaborate better with their teams and clients with real-time design that updates and share information instantly in the cloud. It helps architects make better design decisions, alerting them to common errors such as misplaced windows before the first brick has been laid. Clients can use BIM after construction is completed to maintain and reduce running costs thanks to the information it provides. The software is even incorporating virtual reality to allow clients to walk around buildings that don't exist yet (Lago-Novás, 2017).

In a very real sense, architecture and design are applied sciences that utilize research and development in technology to propel their work to new heights, presenting buildings and products that are not only more interesting, but more responsible and useful as well over the decades. Everything from digital drawing and rendering, to construction documents and building are becoming easier to do with better results (Schwab, 2016).

Already, artificial intelligence is all around us, from self-driving cars and drones to virtual assistants and software that translate or invest. Impressive progress has been made in Artificial Iintelligence (AI) in recent years, driven by exponential increases in computing power and by the availability of vast amounts of data, from software used to discover new drugs to algorithms used to predict our cultural interests. Digital fabrication technologies, meanwhile, are interacting with the biological world on a daily basis. Engineers, designers, and architects are combining computational design, additive manufacturing, materials engineering, and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume, and even the buildings we inhabit.

Economics and Architecture

Architecture doesn't exist outside of the economy. What kind of buildings, how they are built and to what use they are put directly affects the economy of our cities. Architecture as real estate can be transformed from an inherited patrimony to a commodity. This has democratized property ownership, making it easier for people to own their own homes. It also opens real estate property to speculation. Real estate has become increasingly unreal, more abstract and volatile and at times subject to booms and busts (Gusevich, 2011). Architecture shows itself finally as a product, -a building or any other built environment. Architecture demonstrates the power of a land or a sovereign and can emphasize their economic and political position (Piatakowska, 2012). All of this makes it imperative for architects to have a certain degree of knowledge in real estate development in order to understand the whole scope of a project – from financial matters to the mechanics of the project structure.As a profession, architecture acts as the mediator between different specialties. Architect developers should For instance, know how it is possible to find and acquire land, how to assess which product will function for a specific market, and how to get project funding, the profitability, capital gains, and externalities that go along with them and understanding all the risks that can arise from a project(Uribe, 2016; Segal, 2016).

Future Proofing Architectural Practice

As architecture and architects pursue new frontiers in a more complex, integrated and competitive world, the thoughts of Raisbeck (2016), will suffice. Architecture is an endeavour focused on the creation of knowledge. Architectural knowledge is generated via the design process and then embedded in built and spatial form. This knowledge created by architects, and the professional services through which it is delivered, makes architecture valuable to society.If architects are to prosper as a discipline in the future, they need to make knowledge a central platform of their practice. In future, architects should create upstream knowledge base through research that downstream clients, and others in the industry, can utilise. Architects and architectural practice should be at the centre of creating new knowledge and managing the information across all aspects of the built environment. This knowledge will enable architects to charge more for their services in markets that have traditionally been beset by price competition, pseudo cartels and the lowest common denominator of service to clients.

In the upstream future each practice will look at advanced methods of collaboration between and across practices. Architects will no longer be bound by traditional practices centred on a 'name' or star architect. Much larger collaborations of small practices coming together with effective governance will help architects be more competitive and gain larger commissions. Moreover, architects will collaborate and form knowledge ecosystems with a full range of other consultants with specialist knowledge: engineers, academics, economists, urban planners and even financial analysts. In the upstream future architects will better understand entrepreneurship and commercialisation pathways. As a result, architects will be better able to take advantage of the opportunities that emerging technologies in data analytics, artificial intelligence, robotics, digital supply chains and advanced construction presents. In the Upstream Future architects will think strategically how to best manage the strategic, transactional and IT infrastructure within their firms.In this scenario, new professional organisations and member alliances will emerge. These organisations will better communicate to the public, promote and brand architecture in a new digital age.

Technology holds architecture in its grip and every architect has, therefore, to remain abreast of all technical developments in the matter of design, construction and materials, management, enterpreneurship, technology and economy if he has to keep himself professionally uptodate. At the last building connections congress held in Washington DC in 2017, there was a strong concensus that technology provides the opportunity for architects to resume the role of "master builder",though this role will not be freely given by the interlopers who have been trying hard over time to relegate the architect to the background. Architects need to step in and assume leadership of the design and fabrication process. This includes aggressively mastering the technology used to support these processes.

CONCLUSION

In conclusion, the essential value of architects is our ability to design—see the world creatively, synthesize disparate information, generate new and innovative ideas. Architects will not cede our authority to algorithms and lose all control and influence over the forces design. These actions listed below, as a profession, can (re)invent architects to turn these into opportunities.

Top ten actions

1. Build core capability in the profession at all levels.
2. Equip architects especially while in training school, with entrepreneurial and business training so architecture, its processes and its products can be treated and engaged in as business ventures

3. Get actively involved in the process of design procurement towards value creation.
4. Campaign for more open design competitions thatmust comply with relevant Institutes of Architects guidelines.
5. Expand service offers and capacity through collaboration and increase the quality and effectiveness of services.
6. Specialise in selected building typologies, and form collaborative networks.
7. Increase technical expertise in virtual building modelling and a range of other applications.
8. Embrace early contractor involvement to your own benefit.
9. Engage in popular design debate.
10. Engage politicians with the vision for a better built environment.

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