

Industrialize the Architectural Profession at Last to Revitalize It and Make It up to the Urgent Needs of Our Era

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Abstract: The architectural profession operates in an extremely competitive environment today - and more and more evidence arises showing it cannot cope. The consequence is socio-economic problems for architects, the devastation of the branch, and substandard performance that affects the protected interests of individuals and the public interest, including urgent goals of sustainable development efforts. Obviously, any of the consequences is worth to eliminate; to turn the attention to the problems and contribute to launching the needed changes is the objective of the paper. Putting the realia of topic area into the industrialization's theory framework, the paper puts the hypothesis that a persistence of the architectural profession in pre-industrial, medieval-guild paradigm is the cause. Further, the explanations of particular, today-frequented cases of the counter-productivity and, in today's social and economic conditions, the unsustainability of the processes and acts by which the profession is practiced that are based on Toynbee's theory discuss, test, and verify the hypothesis. Virtual public space and, in particular, virtual reality environments and technologies are bringing the architectural profession to the brink of a revolution. It promises to optimize the processes of architectural design and the planning of the building that makes architecture material and to upgrade the level of quality of the results achieved. Is the profession ready for such a revolution; is it ripe for it? Is it coping with the current situation, which is different from the conditions and environment in which the architect was the sovereign creator of the summum templum architecturae? Can it use the technological revolution to overcome the long-standing problems and establish a new professional paradigm that renders necessary for the regeneration of the profession, for its performance in terms of securing the protected interests of individuals and the public interest, and for promoting the sustainability of life on Earth? Finally, the paper proposes a positive conclusion – conditioned by industrializing the profession at last; as the prerequisite and the path, the paper suggests mastering the virtual reality environments by the architectural profession and utilization of its technologies.

Keywords: Architecture, Architectural Competition, Industrialization, Industrial Competition, Public Space, Virtual Reality

1. Introduction

Virtual public space and especially virtual reality environments and technologies bring the architectural profession to the threshold of a new revolution. Indeed, the description of current virtual reality technologies as immersive is apt: they allow viewers to truly "immerse" themselves in a virtual space and perceive the virtual twin of as yet unbuilt architecture as realistically as ever before. They allow a shared perception - a shared walk through the future building (or future public space, future landscape) for multiple "stakeholders" in one moment. During such a

"visit", the "stakeholders" can communicate with each other, show each other what they are interested in, discuss. There is already an elementary interactivity: "Don't like the colour of the wall or the designed furniture? Never mind, let's choose another solution from the library... well, here it is: what do you think?" In addition, fully interactive tools are already in development, allowing you to create architecture in virtual reality in an immediate, authentic way - from and in space. The next step will be to transfer the virtual twin of the future architecture thus created into the parametric environment of standard BIM¹ programs for structural design.

¹ Building Information Management

The revolution of qualitative transformation of the architectural craft promises to optimize the processes of architectural design and the planning of the building that will materialize the architecture and increase the quality of the results achieved. Is the profession ready for such a revolution; is it ripe for it? Is it coping with the current situation, which is obviously different from the conditions and environment in which the architect was the sovereign creator of the summum templum architecturae [1]?

2. Method, Hypothesis, and Its Verification

The architectural profession operates in a competitive environment today. Perhaps since the end of the so-called long (19th) century, [2] since the peak of architectural modernism perhaps, probably combined with architecture's loss of its status as *summum templum*, and certainly in connection with the mass spread of university education, the profession of architecture has lost (its kind of) exclusivity. Deprived of its former uniqueness, the branch has adopted the prospect to join the modern professions - fields of business to whose marketability, the competitiveness is an existential attribute. Three quarters of a century (at least) have passed since then: how is the architectural profession faring in the new conditions? Has it been able to adapt to them, does it cope with them, or is it encountering obstacles that prevent it from achieving optimal results? Or does it even encounter existential problems?

2.1. Competition, Guild Regulation, and the Free-Lance Profession²

In 1884, Arnold Toynbee explained that *the essence of industrialization was the substitution of the medieval regulation of production and distribution by competition*. [3] Toynbee's brilliant and valuable insight has never received the attention it deserves: yet many fields of business since the 19th century have operated faithfully in his spirit. But not architecture: the architectural profession did not accept the new conditions in the 19th century and failed to adapt to them even after the loss of exclusivity after the mid-20th century. The practice of architecture has not yet managed to industrialize, and more than a century after the publication of Toynbee's *Lessons on the Industrial Revolution*, it remains a medieval craft. Computers on architects' desks do not change this: the paradigm of guild organization binds their craft. It is a paradigm both unconscious and denied, to some extent inevitable within contemporary techniques and processes of 'good practice', and to some extent supported (in most countries) by statutory regulation given the forecast of the considerable impact of the practice of architecture on publicly protected interests.

The assumption of graving and irreversible consequences of the profession's performance in the area of individual and

social interests together with the requirement of high erudition usually acquired through university education, previous practice under the supervision of more experienced colleagues and an additional examination before the commission of a self-governing professional organization, places the profession of architect among the so-called *freelance professions*³. At the same time, the condition of exercising a freelance profession only after passing the 'journeyman's examination', after previous practice under the supervision of a 'master' and finally after passing the 'master's examination' before the committee of the self-governing professional organisation is reminiscent of the guild regulations [4, 5]: not by chance.

2.2. Freelancing or Goods

Similar to architects, also lawyers, auditors and tax advisors, physicians, dentists, veterinarians and pharmacists, liquidators, notaries, bankruptcy trustees, and bailiffs practice their profession as a freelance profession. Their 'artisanal product' generally, albeit to varying degrees from profession to profession, lacks the nature of a commodity. It is also generally not considered by the markets to be either a commodity or an economic service⁴: unlike the architect's product! The fact that public insurance remunerates freelance performances only exceptionally - the customer pays for them directly as a rule - does not change this. In some cases, the service is used so rarely that the average consumer will welcome the first provider he can find. In other cases, the choice is based on recommendation, trust, and the (often mistaken) assumption that the price of the service is more or less the same whether it is provided by one or the other. The

³ The *freelance profession* is a well-established designation in public policy, economics, law, and ethics for a profession whose practice can have a significant impact on individual and publicly protected interests. It is therefore conditional on a high level of erudition, usually acquired through university study, and on experience under the supervision of a more experienced colleague; successful completion of practice, as well as competence to supervise practice, is usually demonstrated by examination before a committee of a self-governing professional organization.

Public interest promotes the development of society and addresses its real problems; in general terms, it relates to the general good, the well-being of society, and its sustainable development.

As a rule, self-governing professional organizations are established by law by the state based on the assumption that the verification of the competence and erudition necessary for their exercise is so demanding that the state is not capable of it [sic!] itself and therefore delegates an appropriate part of its sovereignty to a body that declares [sic!] that it has such capacity. To such an entity the state then also entrusts the administration of the internal affairs of the profession, the relations between the persons who practice the profession and who are, as a rule, allowed to practice it only if they are members of the association, and to a certain extent the relationship of the profession to the national economy and society. Thus, for the exercise of most professions that are conceived as a freelance, the law establishes chambers, which are public corporations like municipalities [8].

⁴Historically, there have been different approaches in this regard worldwide. In the common consciousness, the commercial conditions of health care in the United States contrast with those of the European welfare state model [9]. Globally, however, conditions have been converging towards the European model in recent decades. Representative of the trend is the US *Affordable Care Act* [10], popularly known as Obamacare. This convergence reinforces the perception of medical care as an entitlement public service, outside market conditions, and is not limited to it: it seems to apply to the freelance professions universally.

² *Profession libérale* in French and in the Francophone economic area

client-customer-patient-mandate does not perceive or expect competition between members of the freelance professions - except for architects!

Opposed to services of lawyers, tax advisors, notaries, or physicians, the market perceives the professional performance of an architect not only as a commercial service, but even as a goods [6]: the client receives from the architect a representation of the future architecture in a documentary, i.e. material form - which he considers to be a property that he has bought and which has become his property, he can dispose of it more or less without restrictions, he can store it, and its form remains once and for all given, he can divide it into parts, and he can even resell it. And this property includes the creative aspects of architectural design - the poesis of building, the poetics of future architecture, [which] one is only able to [receive] when one has already built, is building, and remains committed to building differently [7]. The fact that this is a product of a freelance profession, that is, a product characterized by the special competence and general responsibility of its "producer," is most often unconcerned by the market - if it is even aware of it.

Among the freelance professions there are also freelance (civil) engineers, more often referred to as chartered engineers, in a similar situation. The product of a (civil) engineer "is a commodity" no less than that of an architect. Visually, both products are similar - in both cases, they are a set of documents with a graphic representation of the future building or architecture: even among professionals, few can distinguish that in one case it is a representation of future building structures, while in the other case it is a representation of structures whose decisive aspect is space and poiesis [11, 12]. Perhaps only that the "architectural commodity" tends to be more visually appealing - its images intuitively better understood - while the "commodity" delivered by the (civil) engineer is more "technical" - understanding its message cannot be done without the knowledge of a specific graphic "language". This is related to the practice of a blurred, in the general perception in some respects "non-existent" boundary between the disciplines of architecture and civil engineering⁵ and consequently between architectural design and planning of constructions. However, the professional environment, at least its good practice, perceives and respects at least the interface, the working relationship between one profession and the other. Its principle is the precedence of architecture as a spatial concept and poetics over its (building) materialization. The

master-builder only sets to work when the architect challenges him: this does not imply the superiority of one profession over the other. It is a question of a legitimate working procedure that is not straightforward. The architect and the master-builder, or the planner - [freelance] engineer, pass the "baton" to each other in the feedback loops of a complex process. However, the process always begins with the architectural concept and the architect's work always "starts" the next round of concept development up to the detailed design of the architecture and construction solution.

2.3. Architectural Competing

Today, the architect enters the market usually by presenting a comprehensive concept to the client, the owner-builder, who has been taught by the market that he can choose from a wide range of goods to meet his expectations, and he carries this formula over into his relationship with the architectural profession. It is called architectural competition: few labels are more misleading. An architect's 'commodity' is always, by its very nature, a unique 'bespoke' product. If the architect does not sell it to the client to whom he presents it, it will remain unsold once and for all, and all the effort and expense the architect has spent to create it will have been wasted. Among the freelance professions (not to mention the other crafts), he is the only one who does this. He is the only one that the market expects to offer a comprehensive, unique and "one-use" product in free competition in a market that has no ability to make rational decisions because it is objectively unable to recognize the qualities of the product and evaluate it. Remember: the state itself has decided that the profession of architecture is so demanding that it is not in the power (even!) of the state to distinguish who is qualified for it and who is not. Making a decision on the quality of the specific performance of such a profession is undoubtedly even more demanding.

It is not only the owner-builder who decides on the most suitable (which, by the way, does not mean the best) architectural design. More and more influence is assumed by the public. Is there something like participation or lay approval in the case of legal services and their selection? Does the community of loved ones have multiple doctors present diagnoses and treatment options and decide (by voting) which alternative to approve for the patient in their midst? Yet the situations of architecture and medicine are so similar: from its documentation, the effect of the intended intervention is largely a matter of faith in authority for a layperson - in fact, a layman knows almost nothing. He learns something after the intervention is implemented, something after it has worked for some time, something he learns only in a roundabout way - if he learns the context of side effects - and something he never learns: this does not mean, however, that in these respects the intervention does not work, does not affect a person's life. Informed consent changes the situation little - and participation or public approval of an intervention is certainly not its equivalent.

Of course, an owner-builder, a client can choose an architect based on trust, based on knowledge of the

⁵ The basic "material" of architecture is space, not structure or material. It is the space in which we live, which passes from the landscape inhabited by man into the public space of towns and villages; it passes inside buildings through their facades, which articulate the public space and give it meaning and form. By exposing itself in public space, the building becomes architecture: the space that architecture is about is above all public - whether directly or vicariously. This is the theory; the practice, however, is that architects usually regard themselves as master-builders in one way or another, and as master-builders, perhaps with an aesthetic sensibility, they are seen by virtually everyone else. It is of little use that the Encyclopedia Britannica explicitly distinguishes between building and architecture: architecture, the art and technique of designing and building, as distinguished from the skills associated with construction [13].

architect's past performance. However, it is the transformation of conditions in this respect that today problematizes the practice of the architectural profession and systematically undermines the results of its performance in general. Conditions have changed as the architectural profession has lost its exclusivity and as markets have become dominated by a wave of assertiveness that treats architects' performance as goods - even though it is not and cannot be goods. Before this change, the rule was to choose an architect based on knowledge of and confidence in his previous production or even just based on belief in his competence, given by his training. In this respect, the role of architectural competitions was only complementary: their frequency could not threaten the economy of individual architects, let alone the economic basics of the profession as a whole. Today, everything is the opposite, or at least distorted: public clients do not want to choose an architect other than by competition; often they are even not allowed to do so; the question is which is worse - an architectural competition or a competition for the most favourable conditions for the supply of goods.

Since the 1960s at the latest, communities of practicing architects worldwide have set and maintained fundamentally biased conditions of practice that are economically and in terms of reputation destructive to the profession as a whole and individual architects. They both lead and force their members to acquire, at great expense, highly complex products that the market, by definition incapable of making objective decisions, decides on in terms of acceptance and perhaps - not always! - an adequate pricing. Exceptions and deviations from such a model are rare and usually based on the exercise of monopoly power or patronage. Self-governing chambers of architects in most European countries, in the Czech Republic markedly and undoubtedly are in essence guilds⁶, which favor their more deserving members in access to commissions and convince the less deserving ones that it is right to work for free in architectural competitions that have little in common with Toynbee's industrial competition. Neither the blindfolded shooting at a moving target that is the principle of public architectural competitions, nor the irrational relationship between the price of risk and the amount of potential profit, has any place in the latter: with few exceptions, even the first prize in an architectural competition does not cover the cost of producing the competition design. The ability of anyone other than licensed

architects to judge the entries of competitors in architectural competitions has been rejected by both the state and the representatives of the self-governing professional organizations - the chambers of architects - by agreeing on the status, competencies, and mission of these organizations. The presumption of the competence of the lay members of the competition committee is an obvious and insurmountable contradiction in this context: it is not clear, however, which of the presumptions is to be reconsidered. If the lay members can 'look after' the individual and public interest in the practice of the profession of architecture, the professional self-government, endowed with extensive powers to interfere in the exercise of the freelance profession of architecture, loses its justification.

The objectivity, and thus the quality of the decision-making of competition committees cannot be ensured even by the mandatory representation of so-called independent members of the committee from among authorized architects - "guild masters". First of all, the quality of architecture is inherently poetic [11] - inevitably subjective. Competition juries do not hesitate to subscribe to subjectivity in specific cases [14]: but in doing so, they overlook the fact that poetry [, or architecture for that matter] is only authentic if the poetry is shared poetry. [12] Second, it is a proven fact that power corrupts [15]. The power within a closed - for example, professional - community corrupts doubly. The contribution of this phenomenon to the stagnation of guild crafts in the Middle Ages is well-known and proven. The conflict of interest of a member of a competition committee, which is a member of a competing profession, is not an individual failure but a systematic threat, the fulfillment of which by a protégé's decision is the rule rather than the exception. It is not necessarily just the tendency to favor related parties: the tendency to exclude other than the usual 'tried and tested' solutions is equally counterproductive⁷. Lastly, a commercial competition for the lowest price cannot be regular when, in the case of both architectural and design work; it is essentially a case of 'selling a pig in a poke'. An unambiguous price is inevitably opposed by a vague specification of the 'goods' or performance. Neither the bidder, let alone the client, knows what quality of the final product - the built environment entity - one will eventually create and the other will obtain; neither can control the parameters of the product in the process of its conception and

6 In favor of their existence and the compulsory membership of freelancers, and in favor of the extensive competences at their disposal generally, the self-governing professional chambers in many countries are successfully arguing by the protection of the serious interests of individuals and the even more serious public interest within the exercise of the extremely demanding freelance profession of architecture. The example of Norway does not show any negative consequences of keeping the profession of architecture among the ordinary 'trades'. In Norway, the practice of architecture is not a bound freelance profession, its exercise is not constrained by any additional rules and conditions, and yet there are no signs of increased negative impacts of the exercise of the profession on the protected interests of individuals or on the public interest. Similarly, it is not considered in professional discourse that Norwegian architecture is in a bad shape.

7 On 18 September 1829, the locomotive Rocket, designed by the son and father Stephenson, won the competition to provide freight car transport on the Liverpool and Manchester line, exceeding the specified transport parameters by 40% and doing better than its competitors in this respect. At the same time, its performance proved the leading transport authorities of the day wrong when they recommended that the traffic should be provided by twenty-two stationary engines. Can we imagine what the outcome of the competition would have been if a jury of leading transport experts, and perhaps even locomotive designers of the time, had decided on the basis of the design documentation submitted as the 'competing solutions'? Can we imagine not only the implications for the client, who was transporting freight between Liverpool and Manchester with an inefficient and uneconomic technology, but also for the development of rail transport in general? This is the kind of decision-making that is typical of contemporary architectural competitions.

creation; nor can they measure its final quality.

The architectural profession remains the only one among the freelance professions - among all professions! - which secures its market by submitting a comprehensive product in competitions decided in a biased manner not as a result of individual, discrete failure, but systematically by the nature of the task; the costs of this competition are usually disproportionately high compared to the value of the marketing opportunity that the winner of the competition can obtain.⁸

The freelance profession of architecture is exposed to economic conditions even more challenging and less predictable than those prevailing in the free market: is this not a contradiction - another of the contradictions that accompany the exercise of a profession which, as a freelance profession whose performance and efficiency affect the quality of our environment, should rather be protected? It is not easy to find the cause of this state of affairs, which would lie in legal regulation: perhaps it does not even exist; perhaps it lies only in "good practice", in the established habits of the general and professional public, which considers the materialized output of the performance of an architect as a commodity, whilst the architect is expected to defend the public interest in his work - to defend it regardless of his economic interests. For this, society should presumably protect him in his profession - but it does not. And vice versa: society uses his competence, which it respects as exceptionally high, only haphazardly, not systematically, to protect the public interest. Everyone has heard or read about the institution of "counsel ex officio": to ensure the fair administration of justice, the state provides a qualified defense attorney - a lawyer - to a criminal defendant whose financial circumstances do not permit him to pay for his counsel. The building authority, on the other hand, does not examine why a builder applies for a building permit based on a design and project documentation that has not been prepared by an authorized architect: it is satisfied with documentation prepared by an authorized engineer, i.e. a person with a competence fundamentally different from that of an architect. [13] Or is there an 'architect ex officio'? And it is not only chartered engineers - after all, also members of a freelance profession, albeit with a different competence - who are allowed by public and state administrations and legislation in the field of construction law to interfere with the competence of architects: think of energy and environmental specialists, activists and the general public.

2.4. Freelance Profession Versus Free Trade

The statutory regulation of the exercise of a freelance profession is *lex specialis* that confers extensive powers on self-governing professional chambers. From a practical point

of view, this means that the special regulation given not only by the (special) law, but also by the conditions set "on their own" by the self-governing professional chambers, takes precedence over the general legal regulation of business activity. For the exercise of the architectural profession in the practice of designing, planning, and implementing buildings this means additional complications and disadvantages for architects in the performance of contractual obligations.

Among the conditions of the practice of the architectural freelance profession set by the self-governing professional chamber are, among others, quite strict ethical rules. As the author of the architectural concept and architectural design, the architect enters into relationships and a series of negotiations with other participants in the process of preparation and implementation of the development of the built environment, the construction of architecture: project managers, professional specialists (planning specialists, designers of technical equipment of buildings), cost controllers, representatives of investors, advisors for whatever you can imagine, contractors. The merits of these relationships and the subject of the negotiations are authorial, but always also technical and economic: the acquisition of buildings is a costly affair - the commercial aspect of the negotiations and relationships is an inevitable consequence. And the architect is generally in the uncomfortable position of a participant, constrained by a series of strict ethical rules, in confrontation with the chartered engineers, for whom their self-governing professional chambers have set much more benevolent rules. Moreover, the vast majority of the architect's counterparties are professionals whose work is not a freelance profession and who are therefore constrained only by general legislation. Only a member of a specific freelance profession may design the architecture of a building, bound by extremely strict ethical rules - while his counterparts in the process of preparing and implementing the construction are limited only by criminal law!

This is not just an ethical dilemma: the paradox is primarily a competence situation. Architects obtain authorization i.e. the right to design architecture and plan buildings and structures, only after completing a five- or more often six-year university course, after subsequent practice under a "master" and after passing an additional "master" examination. In the process of preparing and implementing architecture and buildings, they are confronted by functions that not only manage and control the time and financial aspects of the project but also have the right to intervene in the material, structural and spatial design and layout of the project: project managers, builder's representatives, marketing specialists, price controllers, and general supervisors: usually without a 'masters' examination, often with a lower level of education.

The same is true of the composition of the juries - the committees of architectural competitions and tenders and - especially - the invited consultants. The "smarter" architects soon find out, often while still studying, that more comfortable and lucrative than the author's creativity is consultancy of all kinds - from placemaking to ESG

⁸ He can - perhaps - but often he does not: many competitions do not ultimately result in a design contract, which is the actual economic benefit of winning and the motivation for participating in an architectural competition. The prizes, the premiums for success in the competition, often do not cover the costs of developing the winning competition entry.

(Environmental, Social, and Governance) agenda to organizing architectural competitions, "creative dialogues" and holding positions in their bodies and management. As "invited experts", they then evaluate the work of authorised architects without having comparable training and experience, thus influencing the decision and selection of the "most appropriate" design; the most appropriate in what terms, according to what criteria [14]?

A thorough and comprehensive analysis of the causes and context of the current situation of the architectural profession is beyond the scope of this paper and the competence of its author. However, the realities of the profession that are fundamentally different from all other freelance professions demonstrate sufficiently that the situation is unfortunate. Architectural competitions - a unique specificity of the architectural profession that no other profession knows - have been recalled. A constant care for the merits of the profession - care, if not concern, to have something to work on - accompanies a typical architectural praxis. No other liberal profession knows such care, let alone a concern: a physician does not fear that he has no one to treat, a lawyer is not 'allowed' similar concern by the state, among other things, thanks to his *ex officio* service, nor is a notary, a pharmacist, a bailiff, or a receiver. And even if any of them were to be affected in an isolated case, he cannot imagine addressing it by marketing his comprehensive and unique performance in a hope that someone would choose him and pay for the efforts eventually.

Architects have been facing poor and deteriorating conditions in their profession for seventy years. The guild paradigm of the profession is to blame, obscuring the condition and not allowing architects to acknowledge it. Self-governing professional organizations - "guild boards" - do nothing to help rank-and-file architects in these respects - on the contrary, they claim that "it's the way it should be," objectively flawed conditions and relationships foster and perpetuate and exacerbate the problems. The situation is becoming untenable, and rank-and-file architects have no choice but to admit that they are wage labor rather than members of a freelance profession [17, 18]. They go on strike [19], and form unions [20]. Keller Easterling [21] places the architectural profession in the ranks of the *cognitariat* [22] and characterizes the choice of the profession as harming the vested interests of own family.

3. Under-Investment of the Profession as a Result

Awareness of the dire conditions described above is beginning to emerge: so far, however, it relates mainly to the socio-economic conditions of the profession. The public, municipal, and state administrations are unaware that they result in economic losses and, worse, substandard shaping of public space and built environment development: ultimately, sustainable development is torpedoed. The public administration should therefore have a fundamental interest

in rectifying the situation of the architectural craft - finally, after seventy years of a trend that has been damaging the protected interests of individuals and the public interest.

The problem of freelancing seems to relate to the economic paradigm of the profession. From time immemorial until today, the capital of an architect has been his imagination and creativity combined with technical and organizational knowledge and skills. Everything was in his head: it is hardly possible to invest in such "technology" directly. This makes architectural practice the most under-invested among fields of activity that have both daily and long-term, immediate and conveyed, graving impacts on the people, communities and municipalities, and whole society.

Such a statement is likely to elicit raised eyebrows, if not disapproval, "and what about all those autocads, revits, archicads, and also 3D maxxes, lumions⁹,...?" First, these are tools for designing structures to materialize architecture, not architecture itself - this has already been pointed out. Moreover, the whole field of "computer-aided design" (CAD) was developed in the first place for the needs of mechanical design and engineering, this field has long been the driver of demand for software development, and together with product design, which joined later, still dominates today. This "origin" still influences the functions of Revit as much as Archicad: the latter can model structures, but they are not interested in space, and their parameterizing paradigm often harms architecture more often than it benefits it. And Lumion? The latter, in turn, is a „side-business" of the game software industry, which could no longer look past the clumsiness of CAD visualization programs.

The fact is that the contribution of existing computer technology to the design of buildings and their imaging is, to a decisive extent, only quantitative, not qualitative; it is even less than the discovery of the construction of perspective views [23-25] in the 15th century. The architect must - as he did ten thousand years ago - first draw a plan diagram and a diagram of the vertical sections of the structures that are to materialize the architecture, and only from these can a perspective image of it be constructed and provided with photorealistic structures. Thus, from the 15th to the end of the 20th century, architects, if they wished to present their plans, worked first with rulers, compasses, and strings, and then drew the constructed perspective representation. In the last decade of the 20th century, computers and computer programs digitized this work, making it faster and adding new graphic effects, but they did not change its essence. And so architects - often without realizing it - design structures that are meant to materialize architecture instead of designing spaces that are the essence and basic material of architecture; architectural space is then left between the structures, and architects believe that their experience will allow them to design the structures so that the space they imagine is left between them. With or without a computer, it is still the same

⁹ computer programs for planning constructions and photorealistic imaging of the buildings

clumsy method of "trial and error - new trial - perhaps a smaller error...". Only virtual reality offers an environment in which architects will design architecture directly, not only employing a representation and mediation; hopefully, it will come soon.

4. Discussion

The underinvestment of architecture stands out in the context of the wave of start-ups and angel investing, which compares to the beginnings of industrialization in the 18th and early 19th centuries, and which has so far left architecture "sitting in the corner". In the 1990s, the dot.com era was changing people's lives and the world economy: and it was far from being the work of computer enthusiasts, programmers, and engineers alone: without trillions of dollars of investment, the dot.com bubble would not have inflated, but more importantly, once it burst, computers, programs, applications, social networks and information, and communication technologies would not have become an integral part of the economy and our lives.

A decade later, clean and renewable energy enthusiasts have managed to make their way into investors' sights: and again, thanks to a combination of technicians and big money, photovoltaic plants of all sizes are now as commonplace as heat pumps, wind farms, biomass incinerators and the like. This time, public resources - state, European, Norwegian, Swiss,... - joined private equity: the reason is obvious, we don't want to "choke" or freeze when the coal and oil run out...

Coincidentally, just "before COVID" thousands of experienced "start-ups" started to reorient their businesses. "Clean-tech", clean and renewable energy became "business as usual" and the opportunities to build "unicorns" moved into the "climate-tech" sphere. Under the banner of climate change mitigation, an era of decarbonizing everything has emerged: from sneakers made from coffee grounds to textiles and leather substitutes produced by micro-organisms to low-carbon cement or steel made without fossil raw materials. The experience of astronomical profits from past eras of start-ups merged with the almost universal acceptance of the threat of climate change. Another round of the race 'who as the first, who more - with higher profit' has begun - and we all benefit from the race.

The COVID-19 pandemic has shown that public space and structurally resilient built environments are something we desire perhaps even more than saving the planet. The current brutal war of Putin's Russia against Ukraine has not sidelined either of these themes: the need to do without Russian natural gas and oil is emphasized by the European Green Deal, public space is the site of all forms of aggression and resistance, and its renewal is not only an acute but also a crucial issue in the context of the future functioning of society at all levels. Here we are the global challenge - the public is beginning to understand that it can and should demand more from architects than it has so far imagined - and virtual reality "coincidentally" shows the way to respond to it as good as possible. Welcome to the "architecture-tech" wave!

4.1. Architecture-Tech

First, architects must show that "their" problem of outdated, unproductive, and inefficient working tools is a matter of public interest. They must show that in a virtual reality environment they will be able to design, create architecture and public space more efficiently, more productively and in a way that best meets the needs of not just a devastated Ukraine, not just 8 billion of their end clients, not just a climate change threatened planet. Presentations of not-yet-built architecture in virtual reality and in a real movement of multiple interacting "visitors" together, which represent the cutting edge of development in this regard, have not yet met this task.

Public support is an alternative to the wave of angel investment in "architecture-tech". However, either option of investment in the field and the profession has so far been hampered by the fact that architects (some) know that the sustainability of life on Earth stands and falls with the sustainability of the built environment, that public space is the backbone of the built environment both in the historical sense and in terms of the vitality of the built environment, and that public space is the central motif of architecture. But the rest of society is unaware of this - most even believe that architects are only interested in "beauty and exhibition" and that if the building is to be sustainable, the architect must be "tamed" in this obsession by an energy specialist or an environmentalist. Regardless of the demonstrable economic benefits, "architecture-tech" represented by the (so far) experimental use of virtual reality in architectural design is a textbook "new potential market that is expensive to enter and whose future returns are uncertain and contingent on information" [26]. Thus, architects have no choice but to convince public administrations to invest in a sustainable future (too) through knowledge of the potential of architecture, education, and new architectural design tools. The common interest of sustainable development will thus benefit twice: directly and through the revival of the profession itself, which will renew the "old" and acquire new competencies and effectiveness in the new appropriate conditions. At the most general level, perhaps this is how architecture finds a way to fulfill its part of Heidegger's task of "die Grundzüge des erst beginnenden technischen Weltalters denkend zu erfahren" [27] - *to grasp by thinking, to experience the basic features of the yet-to-be-begun technical age*. In addition to the artisanship of the technological base, it is necessary to grasp by thinking the fact that this technology does not threaten creativity, does not consign it to *the shadow of production* [28]. On the contrary - it allows the creative potential, the creative abilities of the architect to be unleashed, removing the limits and constraints to which he has been subjected in his work so far, whether it was the reduction of the three- and multi-dimensional object of architecture to the two dimensions of available means of expression, or the counter-productive software tools that tracked structures and their properties, not the architecture as such.

4.2. A Platform for the Industrialization of the Field and the Development of the Creative Potential of the Profession

The virtual twin of future architecture, a building, an entity of the built environment, also equipped with a complex of building information management parameters, can eliminate or at least reduce the uncertainty and insecurity inevitably associated with existing forms of communication of architectural concepts and designs, eliminates unknown risks - both quantitative and qualitative, poetic-architectural, artistic, aesthetic - by the fact that early in the process of preparing a building and architectural plan the builder, investor, administrative authorities and the public can understand the future architecture, know the future building almost perfectly. Regardless of who bears the risk, today, the uncertainty has the dimension of direct and related costs of acquisition and of the subsequent duration of the building substance and environmental intervention, too: virtual reality can reduce the risk to the value of the design and its "materialization" in virtual reality. For the architect, the risk is still great - disproportionate to the scale of the studio's economy as much as to the potential revenues. For the owner-builder, for the investors, it may be a unit of one percent of the cost of the whole project: perhaps they could assume such a risk? Or it could eventually become acceptable to the architect: firstly because virtual reality will help, among other things, to make competitions and the market, in general, more objective, and secondly because the architect's work will start to be honored by market prices articulated by real industrial competition instead of the hidden (and concealed) paradigm of guild regulations. The argument that the public and the community should "have a say" when intervention in the built environment is an intervention in a public space that "belongs" to them as well certainly has merit - but it does not change the fact that established and codified medieval processes are wrong and counterproductive: it is time to substitute them with communication in virtual reality.

5. Conclusion

The technology of immediate and authentic architectural designing in virtual reality, intertwined with parametric tools for implementing architectural design into architectural materialization, offers more than a helping hand in this context. It offers a platform for the industrialization of the architectural profession. An objective, realistic view of the recent situation of the profession and the field, together with the preliminary knowledge [29], the basic outlines of which this thesis has presented, allow us to pronounce a hypothesis: Architecture, as a profession and as a discipline, has fallen behind in the paradigm of medieval guild regulation because it could not find its way to Toynbee's industrial competition. Today's architectural competitions lack the basic characteristics of industrial competition, miss the potential of its benefits, destroy the profession, and harm society and

individuals with substandard production that impacts the protected interests of individuals and the public interest. They can be seen as an attempt to industrialize the profession of architecture in the Toynbee's, positive sense, which was doomed to failure and counterproductive until there was a platform and a known model for a productive industrial competition of architectural creativity. Now such a platform - virtual reality and its associated virtual public space - is on the horizon, and this paper presents an initial sketch of a model of industrial competition. It is time to develop one and the other, bring it to an "operational", "user" level, and put it into practice. This is the only way to verify the hypothesis. However much effort and resources may be required, the promised, realistically expected benefits are worth it. Not only are they worth it: we need them badly: ultimately, it is about the sustainability of life on Earth, now that we know that its constituent is not only coping with climate change and halting the devastation of biodiversity, but also the sustainable development of public space and the built environment.

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