Fulcrum

ISSUE 98 - JUNE 16, 2014 - REAL ESTATE

mission critical.

factory futures

As in contemporary western cities, the factory — understood as the facility in which goods are manufactured and assembled — has given way to the so-called tertiary sector (exchanging services and knowledge). As a result, a new type of architecture is steadily imposing itself. This architecture, commonly referred to as 'Mission Critical', is the AECO (see glossary on reverse) sector dealing with technology intensive facilities which organisations across the globe are increasingly dependent on. Amongst them, hyperscale datacenters, high frequency trading platforms and supercomputing laboratories are the most famous specimens.

Indeed one could say that mission critical facilities do not need architects to come into being. Partly because these processes require a high level of expertise (one which our current educational environments fail to provide), and partly because investors see no immediate advantage in having architects involved, until now, the practice has operated in support of the engineering mission rather than in collaboration with it. Considering both the pace at which the industry has been moving and the stakeholders at play (international realty funds, technology corporations, governmental agencies), this datum should at least be called into question. As we write, paradigmatic shifts are taking place in scientific processes (E-Sciences) and industrial policies (E-Infrastructure) which are, in many ways, still foreign to our discipline's higher circles and have a strong impact on how our cities are developing.

In fact, although abstract values such as computational capacity and interconnectivity are swiftly imposing themselves as decisive parameters, space has by no means become an obsolete category. On the contrary, these processes are deeply rooted in the dynamic strategies shaping the built environment on the one hand and the real-estate market on the other, requiring both a critical and technical re-appraisal from the architectural world.

To do so, the discipline is now called upon not only for the incorporation of the standards and techniques involved, but more importantly the proposition of a new vision for this evolving sector where architectural planning, design and process optimisation can be understood as added value by stakeholders.

How?

Certainly not by writing more and more about globalisation, neoliberalism or by scripting the next software project. Rather, it is by finding a correlation between the emergent political, economic and social processes involved and certain architectural techniques, geometries, organisations.

In a world where facilities are required to run 24/7/365, where availability demands range between 99.67% and 99.99% (downtime is valued at £6,5 million per hour in the case of a financial brokerage operation), where structures need to sustain loads of up to 15 kN/sq m, where mid-size facilities with a 250kW UPS can be expected to spend £200,000 per annum on power, it is clear that we are facing extreme demands that need to be incorporated within architectural knowledge. This is the Formula 1 of the profession, to which a parametric pavilion pales as a run in the park.

The architectural opportunity lying ahead is that mission critical facilities are no longer discreetly located within the stealth architecture of stand-alone facilities, but that they are ubiquitous: whether embedded within an airport, office, factory or research laboratory and physically connected to the sub stations, grids and complexes which power them. Very soon every new build or regeneration project for a university, commercial quarter, residential neighbourhood, Business Park etc will reflect the convergence of data and energy within more conventional architectural typologies.

This will be the embodiment of what can be termed Digital Real Estate (DRE). The rise of DRE brings about new parameters for real estate success, no longer dependent on just location or proximity to transport hubs, but more often on the conscious integration of flexible building structures, landscape strategies, power generation, data storage, and brand recognition into new urban forms.

To fully understand the potential of DRE, we first need to acknowledge that both capital investment and revenues for a mission critical facility can be five or tenfold the usual rates associated with corporate office space construction and rental. This alone places these facilities as a key player in the real estate market, a factor which cannot be overlooked. Only in 2013 a total of 34,000sqm of technical space (data) has been supplied in London alone peaking at the same level as 2007 prior to the financial crisis. As the trend increases we can only foresee a future where these developments will increasingly lead corporate investment in the built environment, and in turn demand change from a regulatory framework incessantly catching up with a fast market trajectory.

Capital-intensive operations linked to the development of tech-heavy projects generate more money for national and local governments than labour intensive operations such as call centres or the general service industry. Once local planning authorities switch onto this phenomenon, rather than attempting to contain it, and re-focus their policies from mere job headcount to the creation of opportunities for highly skilled employment, we may see a further increase in technology-led development across both urban and out-of-town environments: data centres could very soon become highly sought after prospects bringing megawatts and fiber as well as millions in new tax revenues to the table, with the potential to become a catalyst for new urban relationships.

The question facing us is how can we design, regulate and service a prevalent and accessible data utility on a global scale? How do we integrate this infrastructure within our traditional productive landscape? How do we develop an adequate expression for this new breed of industrial architecture which will often cohabit with urban environments and rural settings? The answers are not evident but the opportunities could easily parallel the emergence of a general understanding of design as added value in the UK retail sector as a consequence of the transition from the suburban mall to inner city mixed use development.

Whether in a suburban business park, self reliant on its off-grid energy production and data storage (Interxion's Campus, Frankfurt), an urban development recovering energy from data furnace (Telehouse West, London), or a research campus powered by a High Performance Computing facility (MareNostrum, Barcelona) what is at stake here is the future of our productive landscapes determined by big capital investments, algorithms and efficiencies. Indeed, these facilities do not need us architects to come into being. However, by connecting practices to software labs, corporate R&D and new property markets, we could embrace the technicalities behind mission critical facilities and contribute to the progressive development a new European industrial culture.

Factory Futures is the first academi[c] industrial cooperation focusing on th[e] impact of today's data-driven econom[y] on the European built environme[nt] and energy resources. Their te[xt] is written by Tommaso Franzolini and Fabrizio Ballabio, with Iain Macdonald.

Readers (particularly those at schoo[l]) will have noticed a strange rhythm t[o] the final issues of Fulcrum. This is because the Bedford Press risograph printer has broken, meaning issues 95 and 97 are each a week late, and 98–100 have all arrived at once. They retain their original print dates, even if they were not produced at this time. Many apologies for the confusion. *Ed.*

fulcrum is a free weekly publication pursuing architecture and the third millennium. past issues online at: fulcrum.aaschool.ac.uk

GLOSSARY

AECO INDUSTRY

Architecture, Engineering, Construction and Operations (AECO) industry represents the integrated approach for project delivery across disciplines and building life-cycles.

DF

A Data Furnace (DF) is a strategy by which large amount of heat from cloud scale datacenters can be sent to homes and office buildings and used as a primary heat source. This approach implies moving storage and computation closer to the consumer to improve energy efficiency and reduce costs.

CLOUD-SCALE

When software applications are built as distributed systems (The Cloud), every aspect of its supporting physical environment – from the server design to the building itself - creates an opportunity to drive systems integration for greater reliability, scalability, efficiency, and sustainability.

COLO

A colocation centre (COLO) is a data centre where equipment, space, and bandwidth are available for rental to retail customers. Colocation facilities provide space, power, cooling, and physical security with a minimum of cost and complexity for customers.

HA

High availability (HA) is the measurement of a mission critical facility to remain accessible in the event of a system component failure (i.e. no loss of service)

DR

Disaster Recovery (DR) is the process by which a system is restored to a previous acceptable state, after a natural or man-made disaster.

DRE

Digital Real Estate (DRE) expresses the hybridization of data and energy infrastructure and corporate developments.

DOWNTIME / UPTIME

The term downtime is used to refer to periods when a critical facility is unavailable. The financial impact of a major system outage is enormous: $6.5 million per hour in the case of a financial brokerage operation, $2.6 million per hour for a credit card sales authorization system, $14,500 per hour in automated teller machine (ATM) fees if an ATM system is offline

E-INFRASTRUCTURE

The advanced computational capacity of a state, addressed as a complex system of public-private partnerships, software, hardware, networks, data storage, and skills.

E-SCIENCE

Data generation and analysis using computational methods are at the heart of all modern science and technology. E-Science can be defined as the discipline of using digital methods for generating ideas and knowledge on healthcare, biotechnology, transportation, energy, and climate modelling.

HPC

High performance computing (HPC) refers to the use of leading-edge computers for simulation and modelling and for advanced data analysis.

LATENCY

The factor expressing the connectivity speed directly dependent from the physical distance between servers. Low latency is driving major city demand localisation of data infrastructure for financial sector.

MISSION CRITICAL

The AECO sector dealing with facilities whose failure will result in the failure of the business operations.

PUE

Power Utilization Effectiveness (PUE) is the industry standard measuring unit for efficiency and expresses the relationship between the total power into a Data Center and the total power delivered at the rack.

Today we see PUE as low as 1.15. This represents a savings of 42.5% in energy consumption from previous 2.0 standards (or 1.5M in yearly electrical costs for a datacentre)

TIER

The Tier classification system was developed by the Uptime Institute and is used in assessing the availability of mission critical data center facilities. Costs increase exponentially as the probability of downtime decreases: ranging from Tier I with 99.67% availability at $9,000/kW to Tier IV with 99.99% availability at $20,000/kW (downtime 30 seconds per year)

TTM

In critical mission facilities, time to market (TTM) is the length of time required from design to construction and operation. TTM in critical facilities is important given the speed at which tech-heavy facilities become obsolescent and pushes the market towards modularization and prefabricated unit providing an engineered solution to power and cooling integrated with the hardware's environmental needs developments.