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Digital Transformation and Construction X.0 – Global Trends

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Transformation of construction project implementation:
solutions and pitfalls of new models and approaches in the international arena

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Introduction

- Construction is an economic sector
  - The market sets the direction for the economy
- Construction does a lot of work for the state
  - Directions also come from there
- better to talk about
  - challenges,
  - directions and
  - trends

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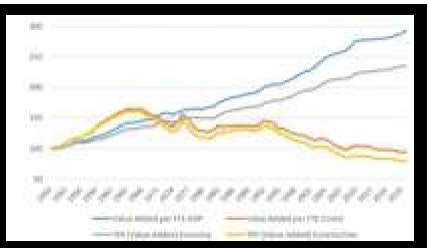
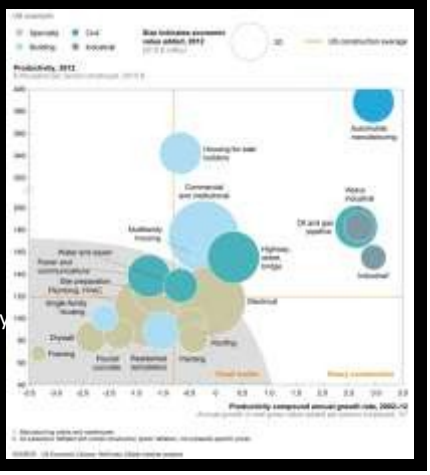
The productivity paradox

- **The challenge of stagnation**
  - Productivity in construction has historically lagged behind the manufacturing industry;
  - Despite technological advances in recent decades, it has stagnated.
- **Limitations of human capital**
  - With 25% of the EU workforce set to retire within a decade, The industry is facing an existential shortage of personnel.
- **A vicious circle**
  - The way forward requires a shift from labour-intensive craft methods to smarter, data-driven, capital-intensive investments.
  - However, these are not available because there is no growth in productivity





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Digitalisation as a solution?

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Digitisation has been the solution for 40 years!

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The real reasons for poor productivity growth

- Construction is a service activity.
  - The cost disease of services (William J. Baumol).
- Construction has many elements of craftsmanship.
  - There is no repeatability, mass production or modularity.
- Construction works on a project basis.
  - A great deal of knowledge is lost after the end of a project.
- Construction has a productivity measurement problem.
  - Productivity growth elsewhere increases wages, but not output.
  - More stringent regulation raises standards, but output remains the same.
  - The benefits of ICT are scattered, delayed or incorrectly measured. (Brynjolfsson et. al.).

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Triple transition

- **Green**
- **Digital**
- **Resistant**

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European Commission (EC) strategy

- **Vision**
  - A competitive, sovereign and carbon-neutral European construction ecosystem that leads the way in technology.
- **Objective**
  - Implementation of the "Renovation Wave" and achievement of a 16% improvement in the energy efficiency of the building stock by 2030.
- **Method**
  - Implementation of the revised Construction Products Regulation (CPR) and introduction of mandatory digital building logs (DBL).

High Level Construction Forum Strategy (HLCF)

- **Vision**
  - A collaborative, bottom-up digital transition involving the entire value chain, from SMEs to large contractors.
- **Objective**
  - Successful implementation of the "Transition Pathway for Construction" (Transition Pathway) through the commitments of various stakeholders.
- **Method**
  - Implementation of more than 80 specific measures focused on digitalisation, resilience and social dialogue with the workforce.

The ECTP (European Construction Technology Platform) strategy Platform)

- **A climate-neutral and resilient built environment**
  Decarbonisation, adaptation to climate change and increasing the resilience of buildings and infrastructure as a central objective of the European built environment.
- **Human-friendly, inclusive and healthy environment**
  The built environment must improve quality of life, health, safety and accessibility, and take into account social and cultural dimensions.
- **A competitive, digitalised and circular value chain**
  Digitalisation (BIM, digital twins, data platforms) and the circular economy as the basis for the sector's productivity and competitiveness.
- **Research and innovation as an implementation mechanism**
  Targeted R&I activities from research to demonstrations for transferring solutions into practice and onto the market.
- **Systemic integration of policies, industry and stakeholders**
  ECTP as a platform for coordinating industry, research and EU policies, particularly through the Built4People partnership.

FIEC strategy

- **1. Green transition and environment:**
- **2. Economic growth and productivity:**
- **3. Social responsibility and people:**

- **At the heart: CONSTRUCTION 4.0 (Digitalisation)**
  - Digital transformation is **a key driver** of all of the above objectives:
  - **BIM (Building Information Modelling):** Better planning, fewer errors and less waste material.
  - **Automation and robotics:** Greater worker safety and faster project implementation.
  - **Smart Cities:** Connecting infrastructure with data for a better quality of life.
  - **Innovation:** Using artificial intelligence (AI) and the Internet of Things (IoT) for advanced facility management.

EFCA Manifesto 2024

- **Infrastructure is a prerequisite for climate goals**
  Decarbonisation and resilience cannot be achieved without systematic investment in energy, water and transport infrastructure, as well as maintenance and renovation.
- **Persistence with the Green Deal and digitalisation**
  Continuation of existing policies without institutional upheaval; acceleration of the green and digital transition of the built environment.
- **Technological and material neutrality**
  Rejection of normative favouritism towards individual materials; decisions must be based on technical, functional, safety and cost criteria.
- **Completing the digital transformation and use of AI**
  Developing digital skills, resolving data sharing issues (Data Act) and removing regulatory barriers to the use of AI in engineering.
- **Reform of public procurement towards quality**
  Mandatory digitisation of procedures, more room for innovation and a shift from lowest price to value- and sustainability-oriented criteria.

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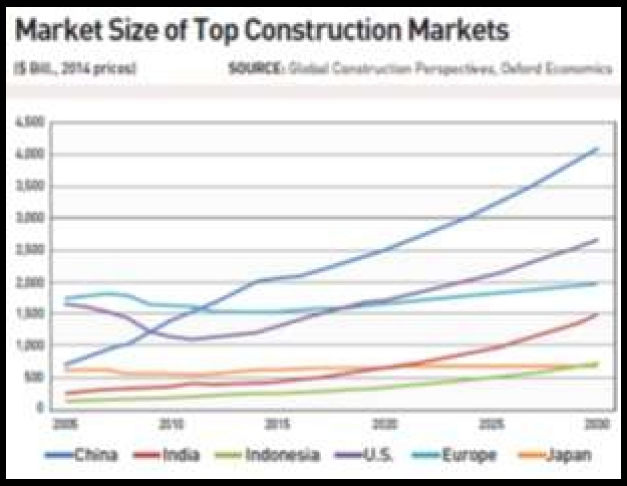
PS. Resilience and security

- **Strategic autonomy**
  - Digitisation reduces dependence on unstable global supply chains by optimising the use of local, sustainable materials.
- **Critical infrastructure protection**
  - Digital twins and shadows are no longer just a design or management tool, but are key to the security and energy management of the built environment.
- **Economic resilience (antifragile)**
  - Decentralised data systems, data-supported supply chains, pan-European markets, etc. provide the flexibility needed to absorb sudden market or geopolitical shocks.



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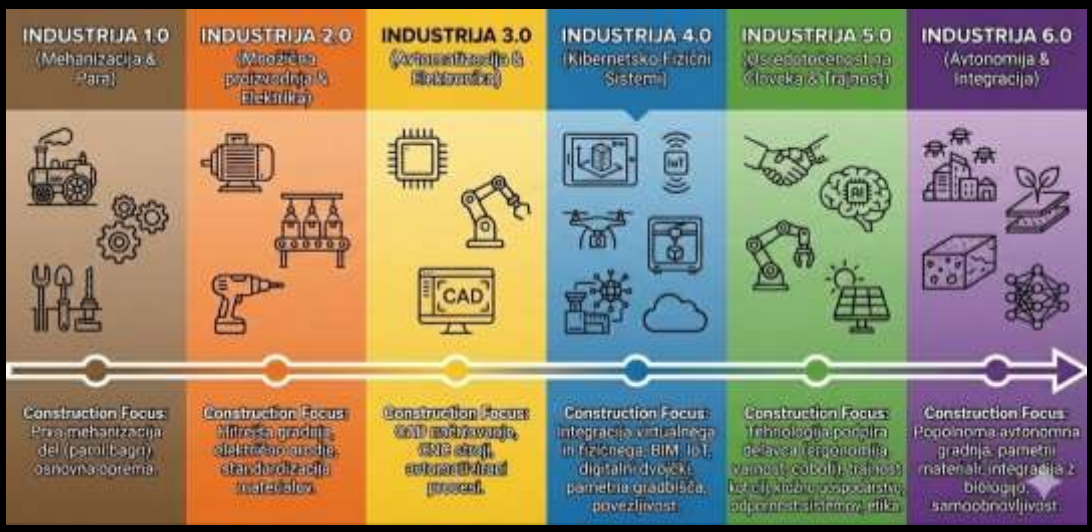
Construction industry zero point zero



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Construction even more zero

- **Cyber-physical systems 4.0**
  - **will remain a challenge for a long time to come**
- **The trap of semantic inflation**
  - The industry is flooded with new version numbers; we must give priority give priority to real results over trendy names.
- **Criticism of Construction 5.0**
  - "Focus on people" sounds nice, but everything that happens in economy has always been people-centred.
- **The hype surrounding Construction 6.0**
  - Autonomy is already covered in 4.0 cyber-physical systems.
- **Pragmatic implementation**
  - Leaders are focused on addressing the productivity gap.
  - Candidates for EU funding are focusing on "social" goals.

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Future: AI, robotics and platforms

- **Generative AI for design and planning**
  - Model makers are being replaced by artificial intelligence, just as CAD systems have replaced draughtsmen.
- **Industrialised construction**
  - Robotics is finally spreading beyond modular production outside the construction site to the construction site itself.
- **Integrated information platforms**
  - Advantages of BIM due to better information management not within but between projects
- **Integrated construction platforms**
  - Cloud-based platforms connect the supply chain with the physical construction site in real time, reducing waste and delays.

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Imposing or searching for technologies?

Technology push

- **Initiative**: Technology providers and the development ecosystem; the solution seeks the problem.
- **Motivation and logic**: Technological opportunity, demonstration of innovation, pilot projects.
- **User role**: Predominantly passive; limited authority to change processes.
- **Effect**: Partial use, parallel systems, weak impact on productivity.

Technology pull

- **Initiative**: Customers, regulations, responsibility for costs, risks and compliance.
- **Motivation and logic:** Solving specific problems; technology as a prerequisite.
- **User role:** Active decision-maker of decisions and responsibilities.
- **Effects:** Systematic introduction, standardisation, permanent change in practice.

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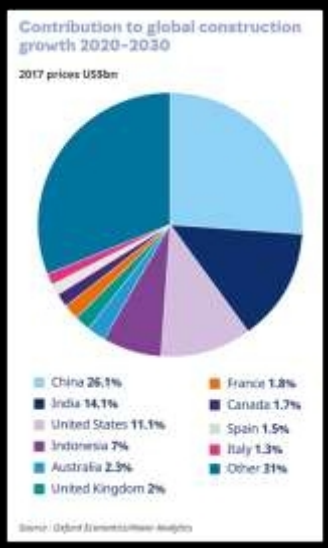

The future still needs to be build. Where exactly?

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