Industrializing additive manufacturing in concrete

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ABSTRACT

Additive manufacturing has over the last couple of years gained significant momentum globally and the growth is expected to continue. Metal and polymer additive manufacturing for medical purposes, in the automotive and aerospace industry are applied for mass production today. The use of concrete as feedstock in additive manufacturing is increasing. Concrete additive manufacturing is already recognized for the potential of cost savings in terms of labour and material and environmental benefits in academia and is slowly becoming recognized within the construction industry and different governments. Several promising solutions are under development, for instance reinforcement [1]. These are indications that additive manufacturing in construction is on the emerge to take the step from prototyping, demonstration projects and additive manufactured parts in polymer to trigger the disruptive potential for specific segments of the construction sector. Designated areas are complex designs and smaller parts as stormwater collectors, manholes, concrete forms and urban furniture. Additive manufacturing will at an early stage take market shares in areas where the traditional building sector is not suitable or profitable, such as underwater printing and for emergency accommodation [2].

By comparing the deployment of additive manufacturing in other sectors and reviewing the main commercialized producers and users of large-scale concrete printers that can print buildings and bridges, we identify the main drivers and barriers to the diffusion and implementation of additive manufacturing in construction, both at the company and societal level.

Customization and the realization of complex shapes are key drivers for implementation of additive manufacturing in construction. One of the main barriers is lack of knowledge. Potential change agents already exist inside the organizations. These are typically newly qualified architects and engineers who have strong faith and interest in the technology, but who have too little influence upwards in the hierarchy. Convincing the managers in the quite conservative construction industry is one major hurdle.

We see an increased focus on understanding how additive manufacturing affects (or disrupts) production and business models, across businesses and for individual companies. Analysing where additive manufacturing should be applied and building robust business cases for investing in additive manufacturing needs to be done at the level of individual businesses. To do this we need more knowledge and better tools and methods. We believe that it is imperative to better match customer needs with supplier capabilities for additive manufacturing to realize its full potential in terms of value and job creation, the circular economy, and responsible management of adverse consequences in construction.

REFERENCES

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