3D Printonomics – why we need to change the current paradigm by changing the question from “what can we do with this fabrication method?” to “how can we change this fabrication process to achieve what we need”.

DProfessor Dietmar W. Hutmacher
Institute of Health and Biomedical Innovation
Queensland University of Technology
E-mail: dietmar.hutmacher@qut.edu.au

In Additive manufacturing (AM) —the industrial version of 3D printing—is a revolutionary method which has tremendous potential in numerous applications areas in science and industry. AM allows rapid design and fabrication of highly customized parts e.g. it has been used to produce prototypes for engineers and designers, 3D printing for consumers and small business entrepreneurs has received a great deal of publicity recently. However, it is in manufacturing where the technology will ultimately have its most significant scientific and commercial impact. Many research challenges remain in translating the early promise of AM to industrial success in design & manufacturing of functional components and systems. Fabrication of high performance components using 3D printing is still a subject of intense research especially for multimaterial and multicomponent products and parts. Additive Biomanufacturing (ABM) is an emerging field within Advanced Manufacturing. ABM has unique technical needs and requirements in the bioprinting community combined with the quest for fundamental and translational research. As in the progression of many other emerging technologies, the greatest scientific advancements will come at the boundaries of fundamental material science, physics, engineering, chemistry, and biology. Significant research efforts are essential to expedite the transformation from random bioprinting to additive biomanufacture of innovative biomaterials that claim material flexibility, the ability to generate fine features, and high throughput. The primary take home message from this talk is that the biomedical 3D pinting community need to go beyond established single material bioprinting processes, and applications that exhibit conventional levels of functionality to move beyond the state of the art and to perform ground-breaking research to underpin multi-material and multifunctional ABM processes and design systems. Such highly innovative multi material & multifunctional ABM platforms will effectively allow the biomanufacturing (defined as first printing of cells in bioinks and then further in vitro and/or in vivo phase) of tissues that are not only optimised to have tissue-specific biochemical and physical properties but, critically, provide maximum biological functional utility to the user in a wide range of applications. It is undoubteldy this shift in perspective, I propose in this talk, that will be the key driving force behind the evolution and innovation of the field of Additive Biomanufacturing in the years to come.