Publication date: February 2017
Source: Technological Forecasting and Social Change, Volume 115
Author(s): M. Despeisse, M. Baumers, P. Brown, F. Charnley, S.J. Ford, A. Garmulewicz, S. Knowles, T.H.W. Minshall, L. Mortara, F.P. Reed-Tsochas, J. Rowley
The circular economy (CE) aims to radically improve resource efficiency by eliminating the concept of waste and leading to a shift away from the linear take-make-waste model. In a CE, resources are flowing in a circular manner either in a biocycle (biomass) or technocycle (inorganic materials). While early studies indicate that 3D printing (3DP) holds substantial promise for sustainability and the creation of a CE, there is no guarantee that it will do so. There is great uncertainty regarding whether the current trajectory of 3DP adoption is creating more circular material flows or if it is leading to an alternative scenario in which less eco-efficient localised production, demands for customised goods, and a higher rate of product obsolescence combine to bring about increased resource consumption. It is critical that CE principles are embedded into the new manufacturing system before the adoption of 3DP reaches a critical inflection point in which negative practices become entrenched. This paper, authored by both academic and industry experts, proposes a research agenda to determine enablers and barriers for 3DP to achieve a CE. We explore the two following overarching questions to discover what specific issues they entail: (1) How can a more distributed manufacturing system based on 3DP create a circular economy of closed-loop material flows? (2) What are the barriers to a circular 3D printing economy? We specifically examine six areas—design, supply chains, information flows, entrepreneurship, business models and education—with the aim of formulating a research agenda to enable 3DP to reach its full potential for a CE.

Read Full Article