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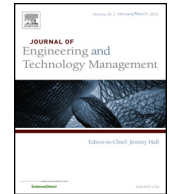
Co-creation and user innovation: The role of online 3D printing platforms

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ABSTRACT

The aim of this article is to investigate the changes brought about by online 3D printing platforms in co-creation and user innovation. As doing so requires a thorough understanding of the level of user involvement in productive processes and a clear view of the nature of co-creative processes, this article provides a 'prosumption' framework and a typology of co-creation activities. Then, based on case studies of 22 online 3D printing platforms, a service-based taxonomy of these platforms is constructed. The taxonomy and typology are then matched to investigate the role played by online 3D platforms in regard to the various types of co-creation activities and, consequently, how this impacts user innovation.

1. Introduction

Among the recent technological developments, 3D printing has been deemed as one of the most promising. For Rich Karlgraad (Forbes), 3D printing is the "transformative technology of the 2015–2025 period" (Karlgraad, 2011). For Chris Anderson (Wired), the "desktop manufacturing revolution [. . .] will change the world as much as the personal computer did" (Anderson, 2012). Finally, U.S. President Barack Obama, in his 2013 second term State of the Union address,[1] emphasised the critical role of 3D printing in strengthening manufacturing, scientific, defence and energy sectors.

One of the key reasons why 3D printing technologies are considered so promising is that they render very low volume production economical and, thereby, enable mass-customisation on a very large scale. They also create significant opportunities for co-creation between firms and their customers. Co-creation and mass-customisation are two very important vectors of user innovation, which is, itself, a critical source of radical innovation (Lettl, 2007).

Yet, while there is little doubt that 3D printing technologies will have, in the coming decades, a highly transformative effect, consumer adoption of these technologies still remains rather low. Indeed, while prices of 3D printers have considerably decreased over the past couple of years, advanced printers remain rather expensive and affordable personal 3D printers (in the $1000–2000 range) are only able to produce simple objects (one material/colour) of relatively low quality. Furthermore, 'making' an object requires more than just a 3D printer and advanced knowledge of 3D modelling (CAD) software is still often required.

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[1] http://www.whitehouse.gov/state-of-the-union-2013#webform.

Aiming to bridge such gaps, several online 3D printing platforms have appeared over the past few years. The first of such platforms, Ponoko, was launched in 2007 and there are now over 20 of such platforms operating online, the best known of which are Shapeways and Thingiverse. Just like Web 2.0 and social media, these platforms enable firms and users to engage in co-creation activities – this time around physical objects – and have the potential to be significant vectors of user innovation.

While previous ICT revolutions have enabled consumers to take an ever increasing part in production processes, 3D printing is the 'last piece of the puzzle' that enables consumers to intervene at *any* stage in the production process, from the initial idea to the fully manufactured product, and even to carry out most (if not all) of this process.

Hence, understanding the changes that online 3D printing platforms can bring about to the innovative processes requires to fully understand the diverse nature of co-creation activities and the changing role of consumers in the production process. To do so, this article provides both a framework of consumer involvement in the production process and a typology of co-creation technologies. Then, based on case studies of 22 online 3D printing platforms, the core design and manufacturing services these platforms offer are investigated. The resulting classification of platforms is then used to discuss the role played by each type of platform in regard to co-creation activities and leveraging of user innovation.

The structure of this article is as follows. The first section reviews the relevant literature on co-creation, innovation and mass-customisation. The second section is devoted to the changes in consumer involvement in production processes. The third section reviews the different forms of co-creation and provides an integrated typology. The fourth section presents the case studies and reviews the core services offered by online 3D platforms. The two final sections are devoted respectively to the role played by 3D printing platforms in co-creation and in leveraging user innovation.

2. Consumers as a source of innovation

The importance of external sources of innovation started to be emphasised by researchers back in the 1980s (von Hippel, 1988) and gained even more attention since 2003, when Chesbrough coined the term 'open innovation' (Chesbrough, 2003).

Traditionally, open innovation with consumers was mainly 'outside-in', i.e. consumers were used as a source of ideas for new products or improvements of existing products (Christensen, 1997; von Hippel, 1988). However, nowadays consumers are involved in generating ideas for new products, co-creating products with firms, testing finished products and in providing end user product support (Nambisan, 2002). Consumers are no longer simply external sources of ideas (outside-in) (Berthon et al., 2007; Bogers et al., 2010; Poetz and Schreier, 2012), but can also become external paths to market (inside-out) (Baldwin and von Hippel, 2006; Shah and Tripsas, 2007).

Co-creation corresponds to the customer-related part of open innovation: 'open innovating' with consumers necessarily implies co-creating with them. However, not all co-creation activities carried out with consumers lead to open innovation, as innovation requires successful commercialisation. Hence, suggestions submitted by consumers that are not acted upon, or a collaborative design that does not go beyond the prototype stage are examples of co-creation activities that do not result in innovation.

Co-creation can either be autonomous or sponsored (Zwass, 2010). When autonomous, consumers co-create independently (even though tools and platforms provided by the company may be used), without any incentive provided by the company. In contrast, sponsored co-creation takes place at the initiative of a company or any other established organisation.

Co-creation can occur at different stages of the production process: design stage (co-design), manufacturing stage (co-manufacturing) and distribution stage. Furthermore, co-creation can also take place between individual customer, giving raise to "communities of creation" (Sawhney and Prandelli, 2000) or "communities of co-design" (Piller et al., 2004).

Co-creation is also often associated with mass-customisation. Mass customisation relates to the production of personalised or custom/tailored goods or services on a large scale (i.e. customisation is the rule and not the exception). Although, co-creation activities increasingly result in mass-customised products, mass-customisation does not necessarily involve co-creation activities (Prahalad and Ramaswamy, 2004) or even lead to open innovation (Piller and Tseng, 2010; Chesbrough and Piller, 2012). For instance, when mass-customisation implies choosing from a set of predetermined options (e.g. colour, size, add-ons), this is not co-creation, as consumers do not provide actual input, besides choosing amongst options that were set by the firm (possibly without any customer input). Furthermore, selecting from predetermined options does not lead to innovation, as this does not provide any element of novelty (Piller and Tseng, 2010).

Fig. 1 summarises the relationship between open-innovation, co-creation and mass-customisation.

3. From consumer to 'prosumer': levels of consumer involvement

One of the most obvious consequences for businesses of the advent of Internet is the increased participation of users in the production process. This increased participation has been particularly visible since the birth of Web 2.0 technologies and for some of the most successful Web 2.0 outlets (e.g. Facebook, Instagram, Flickr, Twitter), the content provided by users accounts for most of the value of the service. This increased user participation blurs the line between consumption and production activities (Berthon et al., 2008), since users both consume and produce content. No longer 'pure' consumers, users have become 'prosumers'.