

Over the hill? Exploring the other side of the Rogers innovation diffusion model from a consumer and business model perspective

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Abstract

The Rogers model of innovation diffusion has long featured in accounts of the penetration of new product technologies into society (Rogers, 2003). The contention in this paper is that this model is in fact only half complete, for it deals exclusively with the uptake of new technologies rather than their retention or abandonment. Taking the Rogers model as a point of departure, this paper seeks to characterize consumers who retain technologies, then identify business models designed for those consumers.

Implicit in the Rogers model is that existing technologies become obsolete, and hence displaced by the emergent technologies. In reality, a new technology may be additional to the suite of products available to consumers, and therefore not necessarily associated with the direct displacement of an existing technology. However, much product innovation is concerned with generational improvements in technologies or with new technologies that, while having no direct equivalent in current use, do indeed displace existing solutions.

The paper therefore analyses the contribution of extended product lifetimes within circular economies. The relevance of this contribution is that product longevity is one means by which lifestyles characterised by material affluence are reconciled with resource scarcity. Product longevity has the potential to contribute to slowing down the 'velocity' of material flows within the circular economy, and hence defer the investment of further energy (and materials) into the next cycle of consumption. Bock et al. (2012) identify that there are several pathways by which business model innovation may contribute to more sustainable production and consumption.

Introduction

Bock et al. (2012) identify that there are several pathways by which business model innovation may contribute to more sustainable production and consumption. One of these pathways is to slow down the rate of consumption. In the circular economy concept there remains an environmental and economic cost to recycling products and their constituent materials, even though such recycling may reduce the net level of material consumption.

From an eco-efficiency standpoint, it is often argued that there will be a point at which the additional performance of a new product will outweigh the benefits of retaining an old product. Such debates are highly relevant in products with a rapid rate of technological improvement, and where there are incentives for users to dispose of older products. The presence of these twin characteristics is discernible in several technology categories including, for example, domestic heating systems, refrigerators, and air conditioning systems. The retain/discard debate is frequently found with respect to cars, for example, where attempts are made to quantify the 'breakeven' point of carbon emissions in new car manufacturing and disposal, against those of retaining an existing car in use, and where

successive policies of 'scrappage incentives' have been justified at least in part on environmental grounds (van Wee et al., 2011). This paper therefore takes examples and evidence from the retention of cars in use.

We argue that the retention or disposal of products is not simply a reflection of a utility-maximizing rational economic individual coming to a logical decision based on monetary or indeed environmental factors. Rather, just as the Rogers model has certain 'behavioural' traits built in, so the decision to retain complex and enduring products such as cars has social, cultural and emotional dimensions that may transcend issues of efficiency or financial prudence (McCracken 1986). That is to say, there are clearly situations in which the owners or users of products actually cherish those products, those material possessions and, from a sustainability perspective, there is value in understanding why this might be so (McCracken, 1986, 1988, 2005).

Consumers and the diffusion of new technologies

The Rogers model is usually presented as shown in Figure 1.

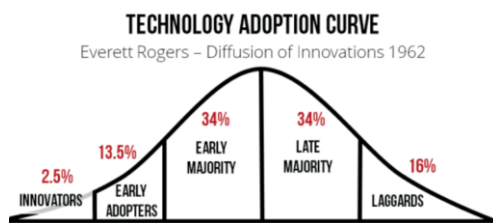


Figure 1. The Rogers Diffusion Curve.

Several criticisms can be levelled at this diagram:

- It assumes a 100% market penetration.
- It is highly ideological in the use of language with 'innovators' and 'early adopters' contrasted with those 'laggards' who presumably lack the wit and intelligence to adopt the technology in question.
- It lacks a spatial component in that innovations may be cluster adopted in a certain location, but not in others.
- It treats all consumers as equal when in many cases the innovators or early adopters are in the form of state agencies such as the military, who may also be co-creators of the technology (cf. Mazzucato, 2013).
- It fails to consider the differences in business model associated with the different phases of technology uptake.
- The question of change over time is not specified.

Notwithstanding these criticisms, we can, in rough terms, identify three phases of business model to accompany the Rogers model:

- In the early phase, the value proposition is centred on additional or unique performance benefits albeit at higher cost. The business model is dominated by close contact with the customer / user whether state, corporate, elite individual or crowd-funder.
- In the second phase, market expansion into the early majority is characterised by a transition to more stable product design, a focus on manufacturing economies of scale, reduced cost, and logistics and distribution systems to expand the volume and spatial extent of the market.
- In the third phase profitability starts to decline, and consolidation or rationalisation with cost reduction and cost competition become the predominant focus. This phase is typical of mature commodity industries.

To highlight these issues, we can present a redefined Rogers diagram in which the bell curve shape remains, but where the first half of the diagram is concerned with the adoption of a technology while the second half is

concerned with a technology being abandoned (Table 1). This version of the model therefore gives a rather different focus on the cumulative way in which a product is eventually abandoned in the market – though, as we make clear, the reality is that in many cases the product does not entirely disappear but may take on rather different socio-cultural meaning and, with this, be serviced by rather different business models.

In passing, this means that the classic 'early adopter' diagram (the Rogers innovation and adoption diagram) is incomplete as it only deals with the uptake of new technologies, rather than the discarding of existing technologies.

Upswing		Downswing	
2.5%	Innovators	16.0%	Fickle disposers
13.5%	Early adopters	34.0%	Enthusiastic followers of fashion
34.0%	Early majority	34.0%	Cautious followers
34.0%	Late majority	13.5%	Reluctant disposers
16.0%	Laggards	2.5%	Determined retainers

Table 1. Extending the Diffusion Model.

In the Rogers diagram there is an assumed end-point of 100% adoption of the technology or innovation in question. But what is the curve for the rate at which a technology is abandoned? Is it a sort of mirror image in which some are 'early abandoners' and others are 'late retainers'? Is the whole curve stretched out over a longer time period than the uptake curve with a long 'tail' over which past practices and technologies remain in use? Nostalgia is a powerful cultural force in this regard, and many practices that have apparently been consigned to history can remain as echoes of an earlier era (McCracken, 1986). Is there even some form of rebound, wherein a technology and set of practices apparently in terminal decline become resurgent again, perhaps with a new generation of 'early re-adopters'? Think in this context of the renewed popularity of vinyl records and record players for listening to music and of riding and driving steam trains. Also note that sailing and horse-riding have far from disappeared despite the fact that for most practical uses these modes have been replaced by later technologies (Geels, 2002, 2005). Instead, the determined retainers or re-adopters do so within new, leisure-oriented, business models that often involve the incorporation of new technologies in their own right; modern sailing vessels are a far cry from their 19th century predecessors, for example.

The issue is therefore to identify consumer characteristics or desires that are fulfilled by product longevity and product retention. The emotional attachment to the product may arise out of an accumulation of experiences with that product, and the associations that such experiences give rise to, their 'displaced meaning' (McCracken 1986, 1988, 2005). Hence products may be cherished to an apparently irrational degree, primarily

because of this set of associations. In addition, the ability to interact with the product (by 'tinkering' for example) may act to increase the sense of personal ownership and emotional investment that transcends a narrow economic calculation of utility (Franz, 2005; Nieuwenhuis 2014). The ability to share that emotional experience with others may act to reinforce the social value of product retention. There are some fundamental human characteristics here regarding the desire to hoard, and to catalogue, classify and itemise. Communities of interest therefore act as important mechanisms that legitimize and indeed celebrate types of product retention (Nieuwenhuis, 2008).

Such practices are a common feature of most societies, and are expressed in, for example, the existence of libraries, museums, relics, and the recurrent fascination with antiquity.

Product longevity and business models

The notion of 'built in obsolescence' reflects a view that certain products, including cars, were designed with a deliberate intention to have a shorter in-use phase than technically possible, in order to stimulate the market for replacement products; a trend resisted in the early days by Henry Ford, but very much promoted by General Motors under Sloan in the 1920s. Ford's position is set out clearly in *My Life and Work* (Ford 1924: 148-9). A far cry from planned obsolescence. Ford is challenging both his main competitors – notably General Motors – but also his own collaborators inside the company, who were pressing for replacement of the Model T which Ford himself had been planning to build essentially for ever. Sloan's contrasting approach at GM is summarized by Flink (1988: 234).

It could be argued that fashion in products acts in a similar manner, as a form of aesthetic obsolescence. In either case, the business model is predicated upon revenues derived from the sale of new products and related services (such as finance or insurance), and hence there is scant corporate interest in extending product longevity. This focus on new product revenue streams can result in design biases that result in prioritising ease of manufacture over repair, thereby further weakening the business incentive to support longevity (Chapman, 2005). Consumers are arguably 'educated' into this concept, with an acceptance that repair and re-use of many products is simply not financially worthwhile and is often technically impossible (Chapman 2005; Franz, 2005; Muis, 2006).

The mainstream literature on business models has something of a bias towards certain categories or types of business. That is to say, there is a predisposition to focusing on e.g. manufacturing business models rather than service; and those business models involving online or digital components. Research into business models and sustainability is more diffuse in character, with examples drawn from a range of sectors (e.g. clothing; food and beverage; transport) and a range of participations in the value chain (e.g. manufacturing; logistics; retail; service).

Business model innovation may contribute to enhanced sustainability in a circular economy setting in several ways. These can include:

- Supporting a new product in use by the provision of replacement parts and related services, including design for such provision.
- Increasing the 'capture' of products and materials to prevent them entering waste streams.
- Increasing the intensity with which a product is used, thereby amortising the resource investment more completely.
- Reducing the volume of new products required through sharing or multiple-use.

Examples from automobility and the automotive industry

Previous research has identified the fundamental characteristics of the automotive industry business model as it applies to contemporary mass production. This model has emerged, albeit unevenly, over time as other competing models have been marginalized or vanquished (Sabel and Zeitlin 1985, 1997). The predominant automotive industry business model has its foundations in the emergent mass production industry of North America in the early 1920s, and is defined by three main innovations: the moving assembly line along with standardized production pioneered by Ford; the all-steel body developed by Budd; and the multi division multi-brand structure along with credit finance for consumers as typified by the contributions by General Motors under Sloan (Nieuwenhuis and Wells, 2007, 2015). Ultimately, these innovations resulted in an industry business model centred on manufacturing economies of scale, centralized factories, long outbound logistics lines, independent franchised dealerships to sell the product, and revenues mostly generated by the sale of new product. The model was particularly suited to driving down the cost of production and thereby expanding the available market by reducing the price faced by consumers. In the early years of this mass industry the need for differentiation was low because consumer priorities were simply based on accessing motorized mobility.

Cars are interesting as an example of product longevity because they embody some important characteristics that speak to consumer attitudes and behaviours that were identified as significant in product retention. Over time, business models and practices have developed that seek to serve consumers seeking to retain their cars in use (Nieuwenhuis 2008, 2014). This industry – which includes the trade in classic cars, parts for these, events to enjoy them, etc. – has framed new business models around apparently obsolete products thereby belying their very obsolescence. The industry can also include vehicle manufacturers who offer parts and restoration services for older models, and for some low-volume or specialist

vehicle manufacturers this long-term relationship with their customers is a key element of securing an enduring income stream from those vehicles originally manufactured. Interesting UK examples are Morgan and Bristol.

Conclusions

The aim of this contribution has been to show that Rogers' iconic diffusion model is too simplistic and partial to reflect reality and that there is, therefore, a strong case to be made for extending it to include not only the full process of the adoption of new technologies, but also the persistence in many cases of those very technologies they seek to replace. Not only do such technologies often persist, they become core to new business models and subject to new innovation development paths. These new insights can form the basis of a new way of thinking

about the obsolescence of displaced products, which, in reality, may be nothing of the kind. This in turn can lead to developing and promoting more durable products, supported by new and novel business models in the quest for more sustainable consumption and production in the context of the move towards more circular economic models. The classic car phenomenon, whereby cars are retained in some form of use well beyond their planned lifespan, is used as an example where this development can already be observed today. Though in many respects obsolete, many such cars remain in regular use – sometimes daily use – and a significant support sector has grown up to enable this development. In the process, new business models have been developed that instead of supporting new products, support and incorporate such obsolete products, albeit in a manner different from the business models that supported these products when new.

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