THE DEFENCE OF BRICKS AND MORTAR RETAILING

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ABSTRACT
The traditional retailing sector is under pressure through competition from low-cost online retailers. Certain types of retailers, such as stores selling music and videos, have shrunk dramatically with the introduction of new forms of online retailing in Amazon and iTunes, while other retailers including bookstores are threatened. Yet for other products such as mobile phones, bricks and mortar stores are thriving in this new environment. We develop an agent-based model to study the effect of online retailing on bricks-and-mortar retailers and to predict the types of products most at risk of vanishing from bricks and mortar stores. We develop two factors, immediacy and post-sales service, which help predict the products which will move predominantly to online retailing. This paper also examines possible strategies that bricks and mortar retailers can use to adapt to online competition and the possible use of hybrid channels (a combination of online and offline retailers) by consumers.

Keywords: agent-based model, multi-channels, retailing, online, clicks and bricks, bricks and mortar retailing

1. INTRODUCTION

Norms abound in human society. They are strong determinants of behaviour, but at the same time they are largely arbitrary: the norms of greeting, the exchange of handshakes, hugs and kisses vary dramatically from one culture to another. Young and Burke (2009) show that a norm tends to be stable for long periods and then undergoes tipping points, or sudden transitions (Bossomaier, Barnett, and Harre 2013), to some other norm. A community will thus all behave according to the norm, even though some members of the community will be disadvantaged by it.

The norm which we address in this paper is the shift away from bricks and mortar to online retailing. Although such a shift in norm may be good for profits, it is not necessarily good for consumers. Customers gain through delivery to the door and possibly greater range. They lose through lack of pre-sales advice, after-sales service on a range of timescales, trade-in options and some less tangible sense of community from local shops. The local community loses through reduced jobs and reduced local tax revenues.

2. PREVIOUS RESEARCH ON ONLINE VERSUS BRICKS AND MORTAR RETAILING

The choice between online versus traditional retail bricks and mortar buying behavior has been a topic of much debate over the last decade (Chatterjee 2010; Dawes and Nenycz-Thiel 2014; Keen et al. 2004; Pookulangara, Hawley, and Xiao 2011; Sands, Ferraro, and Luxton 2010; Schramm, Swoboda, and Morschett 2007; Sharma and Krishnan 2002; Toufaily, Souiden, and Ladhari 2013). Essentially the research has focused on the explanation of the migration to online away from traditional retail purchases. Reasons for purchasing online rather than in-store include convenience (Rohm and Swaminathan 2004), lower prices (Junhong, Chintagunta, and Cebollada 2008) and greater choice (Liu, Burns, and Hou 2013). Factors which inhibit online purchasing are; risk of fraud (Huong and Coghill 2008), lack of trust (Toufaily, Souiden, and Ladhari 2013) and the presence of incomplete information about the retailer (Dennis, Jayawardhena, and Papamatthaiou 2010).

Because of the perceived risk of fraud, the need to develop trusting relationships with online retailers in an arena of incomplete and misleading information, consumers rely on word of mouth (WOM) and online reviews more than they do for traditional retailers (Utz, Kerkhof, and van den Bos 2012). Related to WOM, is the role of social norms of behavior. That is, consumers see online retailing as becoming more useful and easier to use, because of the beliefs and actions of others (Činjarević, Tatić, and Petrić 2011; Pavlou 2002; Pookulangara, Hawley, and Xiao 2011).

Consumers do not only decide to use one channel of distribution (online versus brick and mortar retail) for all aspects of decision making. There is emerging evidence that consumers may use some channels to search for information such as online for prices and product availability (often called 'webrooming'), see (Anderson et al. 2010; Sands, Ferraro, and Luxton 2010) and for others, use retail stores for purchases and deliveries (Chatterjee 2010; Tuttle 2013) The deciding factor whether the final purchase is made online or offline, appears to be the expertise and the fulfillment of gratification of consumers (Boyer and Hult 2006; Činjarević, Tatić, and Petrić 2011). Consumers, who use traditional retailing as delivery or purchase points, can have a faster gratification of needs and wants than consumers who have to wait for delivery, and also may have experience less risk since they are purchasing or receiving product or services through more traditional channels. There is also a risk for online retailers that a failure to deliver a product or service within a specified time can lead to greater consumer anxiety and smaller future order sizes (Rao, Griffis, and Goldsby 2011).

It is for these reasons that the death of retail as we know it may be exaggerated. Clearly, though the format of retailing is changing into a hybrid of online and offline channels. Traditional retailers in the U.S for example, have also started to embrace online and mobile marketing approaches such as using text messaging, email and availability of products for pick-up within a half an hour to bring consumers to stores (Byrnes 2007). This means that actions of retailers (online and offline) interact with consumers in a complex system, where for different retail industries different emergent phenomena (for example, the use of hybrid retail models) may form.

3. SIMULATION MODEL

This model simulates the choice of consumers whether to purchase a particular product through a bricks and mortar store or through an online retailer. For simplicity we assume that the customers make such a choice for each type of product. Different products are accommodated by altering parameters in the model to produce a prediction of the social norm for retailing choice for each product.

3.1. Customers

The customers are represented by an agent, denoted *i*. Customers are randomly connected to other customers and exchange information about their retailing experiences through these social networks. The more links within the networks of customers the more effectively information about retailing alternatives can pass through the customers. The probability of agent *i* linking to another agent is given by the parameter η, which is randomly calculated for each agent.

3.2. Customer behaviour

Each time step *t* the customer chooses whether to purchase a product from the bricks and mortar retailer (BMR) or the online retailer (OR). The retailing choice of customer *i* at time step *t* denoted $c_i(t)$ depends on its experience $x_{ij}(t)$ with the *j* being one of the categories of retailer (BMR or OR).

We assume the probability of choosing a given retailer is a logistic function of the customer's levels of past experience with the retailers. The probability of customer *i* choosing BMR at time step *t* is then

$$P\{i \text{ chooses } BMR\} = \frac{e^{\beta(x_{i,BMR}(t) - x_{i,OR}(t))}}{1 + e^{\beta(x_{i,BMR}(t) - x_{i,OR}(t))}} \quad (1)$$

This logistic equation is in common use in studying choice in economics (McFadden 1974) and in marketing. The beta parameter controls the degree of noise in the model. When beta is zero, all options have equal likelihood. As beta increases one choice (the higher experience or utility) increases in probability eventually excluding the alternative choice.

The probability function (Eq. 1) arises naturally as the equilibrium solution to a variety of equations, such as the Fokker Planck diffusion equation and classical thermodynamics (Solé 2011). It is of course the Boltzmann distribution which occurs throughout thermodynamics. In thermodynamics, beta is the inverse of temperature. As beta decreases towards zero (temperature becomes infinite), the system becomes hotter and the distribution of possible states flattens.

3.3. The retailers interaction with customers

After the customers have made their choices about which retailing alternative to use, the customers' experience is calculated. We assume that the OR is the base retailing option with the lowest price and the least level of service. The customer experience from an OR is a baseline amount (*V*) which represents the value of the product to the customer less the wholesale price of the product and the OR mark-up

$$x_{i,OR}(t) = V + \varepsilon_i(t) \quad (2)$$

and where ε represents the risk of poor service around an online purchase. This risk includes the choice of inappropriate product because of a lack of pre-sales experience with the product as well as the pre-sales

advice which may be provided by a BMR. Customers at a BMR are assumed not to bear this same risk.

Customers have the possibility of a hybrid strategy of purchasing. A customer could visit a BMR to get pre-sales experience and advice about the product, but then make the actual purchase with OR. A BMR will generally not be able to achieve an advantage over an OR with pre-sales advice for this reason, but there may be a possible advantage with pre-sales experience of a product. Even where a customer tries a product at the store, the online-purchased product may not be exactly the same as the one experienced in the store, for example the fit of a pair of shoes. We come back to this hybrid strategy for customers later in the paper.

The BMR offers higher levels of service (both before and after sales), but the BMR will have higher costs of operation which have to be recouped through a higher sales price. The higher level of pre-sales service or advice from the BMR as well as the ability to experience the product before the sale in a BMR context means that the risk of poor product choice is lower than it would be for an online transaction.

The price of a BMR product to a customer (and so also the customer's experience as price negatively affects experience) depends on the choices of the other customers as the overhead of the BMR operations have to be covered by the price premium the BMR charges. It is this network effect that creates a coordination problem for the customers and the social norm aspect of the simulation (Young and Burke 2009; Young 2011). The larger the number of customers who choose BMR, the lower the price charged by the BMR and the higher the experience of those customers.

There are other considerations that customers may take into account when comparing BMR to OR other than price and product risk. One advantage with a BMR purchase is the time between purchase and access to the product. With a BMR the customer can usually walk away with the product or have it delivered that day. Generally delayed gratification has less value to a customer. We call this the immediacy or gratification value, denoted *G*, which adds to customer experience with a BMR. The value of G would be expected to differ across goods. For some products, perhaps mobile phones, walking out of the store with that product right now might be highly desirable for a customer, while it may not be so important for other products.

Another customer advantage with a BMR is the ease and surety of post-sales service for the customer. By post-sales service we mean any interaction with the retailer occurring after the purchase of the product, which may mean replacement of a defective product, purchase of replacement parts sometime in the future or advice with some aspect of the product. The customer can simply go back to the place of purchase to speak to a store representative for a BMR, while the future existence of a website and the ease of online or telephone service for an OR may not be as convenient.

Post-sales service is not as important for some products as for others. The post-sales service for books or compact discs is minimal except for the return of a defective product. The future service and maintenance for cars is essential for the continued use of the car. We denote value of this post-sales service or future service by *F*. The post-sales service might occur much later after the purchase of product, however for simplicity we telescope all the future interactions to the present time step for the purpose of calculating the customer experience.

The customer experience with a BMR is a combination of the net value of the product less wholesale price and retailer mark-up (*V*), as well as the immediacy value, G, and the post-sales service, F. However the BMR price also has to cover the cost of operation of the bricks and mortar presence. We assume that the cost of the presence (overhead or *OH*) is spread across all the customers who purchase at the BMR that time step. The experience of customer *i* at a BMR at time step *t* is then

$$x_{i,BMR}(t) = V + F + G + \frac{OH}{N} \quad (3)$$

where *N* is the number of customers making the choice of BMR that time step.

After the calculation of all the customers' experiences, the customers then share the experiences across their social networks. To calculate the sharing of information about retailers, each agent calculates a weighted average of their own experience with each type of retailer this time step with the experience of each of their network neighbours. The weight given to the neighbours' experience is $\alpha \in [0\text{-}1]$.

3.4. Industries in transition

The simulation is run for a particular product, such as compact discs, music or high fashion footwear. Each product will have its own values for gratification (*G*) and for post-sales service (*F*). In Table 1 we present some anticipated values of *F* and *G* for particular products.

Table 1: Factors differentiating products in retailing

	Factors (out of 0..10)	
Category of product	Gratification (G)	Post-sales service (F)
CDs	2	0
Books	2	0
Hardware	5	1
White goods	4	4
Footwear and clothing	7	4
Mobile phones	8	6
Cars	6	10

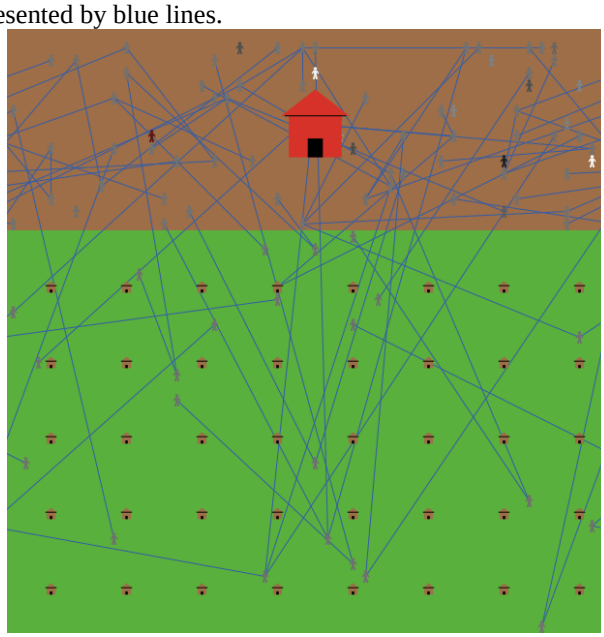
For products such as books or compacts discs, the value of immediacy would be low as would be the value of post-sales service. Hardware products would likely be purchased with a particular task in mind, so the immediacy of the purchase is importance, while post-

sales service is quite unimportant. For products such as cars the immediacy is not that valued, but the level of after-sales service and continuing maintenance is quite important. The complexity and specificity of car maintenance tools recently suggests that manufacturers may be making use of after-sales service to generate revenue for their retailers – a BMW may need to be brought to a BMW shop to be serviced properly.

3.5. The environment

The map of the simulation is a visual representation of the choice made by the customers. There are two areas on the map: one area with housing representing a choice of online retailing for that customer and one area with a large mall representing a choice of bricks and mortar retailing for that customer.

Figure 1: The environment of the model: the customers represented by figures, social networks represented by blue lines.



3.6. Method

The ABM was created in NetLogo (Wilenksi 1999). In this version the only agents are the consumers, who all buy the same product, but choose between OR and BMR.

The number of consumers is set at 100. The customers' initial levels of experience with the two categories of retails are randomized. The levels of the other parameters for the simulations are presented in Table 2.

Table 2: Model parameters and their values

Parameter	Symbol	Value
Probability of forming links with other customers	η	0.7
Degree of noise in customer decision	β	[0..100]
Importance of social network information	α	0.5
Value of product to consumer net of online purchase price	V	50
Risk of poor choice or poor experience with an online purchase	ε	[-10..10]
Importance of immediate access to customers	G	[0..10]
Importance of continuing service after sales to customer	F	[0..10]

The values of *F* and *G* enter the BMR customer experience equation in a parallel manner, thus we assume that we can examine the value of *F* + *G* for the simulations. We simulate a range of values of *F* +*G*, corresponding to the values in Table 3 which gives putative values for different products. For each such pair of values we run a behaviour space of 100 tests of a given beta parameter and determine the relative proportion of OR and BMRs. We run a series of beta values to determine at what point coordination sets in.

4. RESULTS

Table 3 shows the results of 100 simulations each of the model for values of *F* + *G* between 0 and 20 and values of β between 0 and 100. For each level of (*F* + *G*, *β*) the average number of customers (out of 100 customers in the simulation) for 100 runs is presented.

Table 3: Results of the simulations: average final number of customers for BMR for 100 runs

	β			
F + G	0	1	10	100
0	50.05	46.49	0.05	0.03
5	50.32	47.34	0.05	1.84
10	49.95	50.03	31.1	49.51
15	50.58	50.65	68.36	85.29
20	49.84	52.51	80.12	87.97

We would expect to see that for higher levels of gratification and post-sales service the average number of customers for BMR should increase. This is indeed what we see for values of β, the noise parameter in the logistic choice function, higher than 1.0. For values of β of 1.0 and below, we see that the noise dominates, and the choice between BMR and OR is essentially random.

5. CONCLUSIONS

The results of the simulation presented in Table 3 show that higher customer values for immediate gratification and of post-sales service can push customers towards bricks and mortar retailing. This finding suggests that the disappearance of categories of retailers such as compact disc or books is not a coincidence and that these sectors may continue to shrink in the future. Bricks and mortar retailers of products in these

categories will need to search for alternative strategies of attracting customers.

One possibility which bricks and mortar retailers may explore is to search for ways to increase the values of gratification and future service in order to compete better against online retailers. A first thought in response to the entry of an online retailer might be that bricks and mortars should scale back operations to cut costs and thus to compete against online retailers on price, however this is likely to be a limited strategy. It may be better for bricks and mortar retailers to go in the other direction and to invest more in their store presence to improve the store experience for customers or to improve post-sales service to provide a competitive advantage against the virtual retailers.

These simulations assume that customers have a choice of only one retailer, either BMR or OR, to purchase the product, however customers may use a hybrid strategy for purchasing (Tuttle 2013): examine the product and get pre-sales advice at the BMR and then buy the product at the lower OR price. This is, of course, a terrible outcome for the BMR, which is providing the pre-sales advice and experience but then not being able to recoup the costs of that service through a sale.

A customer hybrid strategy however makes a lot of sense for a BMR owned by the manufacturer of the product. The customer can experience the product and get pre-sales advice at the BMR owned by the manufacturer and then purchase the produce at the OR, which is supplied by the manufacturer. This strategy may explain the proliferation of producer-owned stores which we observe currently: the Apple stores, the Sony stores or the Coach handbag stores which are appearing in large cities.

The producer-owned BMR can serve two purposes for the producer. The BMR can be a portal for the provision of pre-sales advice and service to customers, as the producer-owned BMR can recoup the costs of the service through the sales of the product whether online or at the BMR. Just as importantly, the producer-owned BMR serves as a brand signal for the producer. This brand investment may explain the lavishness of BMRs such as the Apple stores, which could not possibly recoup their construction and maintenance cost through store sales.

The gratification advantage of BMRs – the ability to see and immediately purchase the product – has dwindled with the ubiquity of parcel-delivery services shortening the wait for OR customer purchases. Technology innovations such as iTunes or Amazon's Kindle along with greater availability of broadband internet have completely overcome the gratification advantage for the BMR for some types of products, as the products whether books, music tracks or movies can be purchased and downloaded almost immediately, avoiding the possibility of a trip to the BMR.

The coverage of gratification and post-sales service in the current simulation is limited, so much so that the two factors can be compressed into one dimension in these simulations. A planned extension of this research is to expand these factors to allow for a clearer differentiation of the two factors.

Other planned extensions of the simulation are to include the social or joint aspects of bricks-and-mortar retailing, including interactions with other customers, with other retailers and with BMR sales staff. Many major bricks and mortar retailers are co-located with other retailers, which allow for

- the social aspect of customer experience, where customer interaction with other customers may affect customer experience;
- the purchase of multiple products with one retailing experience for the customer; and
- the possibility of interacting with multiple retailers for a customer.

A further possible extension of the model is to examine the pricing plans of the bricks and mortar retailers. Where customers make a single trip for multiple products, bricks and mortar retailers may seek to match online retailers only on major items, but then cover their margins through mark-ups on minor items, such as power cords or on extended warranties for products.

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