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The Influence of Firm Owner Characteristics on Internet Adoption by Independent Retailers: A Business Survey

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Abstract: While most studies concerning Internet adoption by retailers primarily focused on multiple retail organisations, this paper investigated domain name registration and Web site adoption by independent retailers. While controlling for organisational variables, we scrutinised the explanatory value of firm owner characteristics that so far received little attention in the retail literature. Data analysis of a business survey among 686 independent retailers in the Netherlands showed that firm owners and their family/friends play an important role in developing and managing the Web site of independent retail businesses. Results further indicated that age, ethnic background, personal Internet experience, and perceived competitive pressure of the firm owner are important explanatory variables for domain name registration and/or Web site adoption among independent retail organisations.

Keywords: Internet adoption, firm owner (CEO) characteristics, networks, retailing, (small) independent retailers, the Netherlands

Introduction

Until recently, the Internet was largely the domain of virtual retailers and major mail order companies of which the latter ones could easily adopt the new technology because the process of selling over distance was already part of their routines. To date, many virtual retailers have exited the market because they were unable to achieve profitability. As the Internet matures, a growing number of traditional retailers discover the advantages of the Web, pursuing a multichannel strategy by operating an online store alongside their existing network of stores (Burt & Sparks, 2003; Schmidt, Stark, & Döbler, 2001; Wrigley, Lowe, & Currah, 2002).

To date, there is a growing interest in the retail and marketing literature into the factors that determine Internet technology adoption among brick-and-mortar (store-based) retailers. Few exceptions aside, the majority of these studies primarily focussed on (large) multiple retailers. As such, there are so far only few empirical studies concerning the diffusion of Internet technologies among independent retailers. An independent retailer is usually defined as “a retail outlet, store or shop owned and run by a sole trader, an independent individual, a family or a company. Also termed single outlet retailer. A multiple retailer with fewer than 10 branches falls into the same category” (Yadin, 2002, p. 184). Since independents make up a large proportion of all retail outlets and are important for the identity (and attractiveness) of shopping locations it is surprising that they received little

attention in the literature on Internet adoption by retailers. In the Netherlands, for example, independent retailers own approximately 56% of all retail outlets (Hoofdbedrijfsschap Detailhandel [HBD], 2004).

Independent retailers may experience more difficulties in developing and maintaining a Web presence as they usually have fewer resources (time, money, knowledge, etc.) at their disposal as compared with multiple retailers. In small (retail) firms the owner to a large extent determines the company's policy. Not only does the owner make the decisions about investments in new technologies, but he/she may also be the primary user. Decisions as whether or not to develop a Web site may, therefore, be subject to the characteristics of the firm owner (Brock, 2000; Culkin & Smith, 2000; MacGregor & Vrazalic, 2007; Palvia & Palvia, 1999; Stockdale & Standing, 2006; Thong & Yap, 1995).

The goal of this paper is to provide more insight in the adoption of domain names and Web sites by independent retailers and the role of the firm owner in the adoption process. Both individual characteristics of the owner as well as his (personal) network are taken into account. Based on a business survey of 686 independent retailers at eight city centres in the Netherlands, we estimated whether firm owner characteristics matter for Internet adoption, while controlling for other factors.

Literature review

Internet technology adoption by retailers

Since the 1990s scholars empirically investigated the uptake of Internet technologies among retailers (see Table 1). Several conclusions can be drawn from this body of literature. First, most studies found evidence that the firm characteristics such as retail category, firm size and operational structure affect Web site adoption. In particular retailers selling items that are well suited for e-commerce such as books, CDs, software, or electrical appliances are more likely to have an active Web site and to sell online (e.g., Ellis-Chadwick, Doherty, & Hart, 2002; Hart, Doherty, & Ellis-Chadwick, 2000; Morganosky, 1997; Weltevreden & Atzema, 2006; Weltevreden, De Kruijf, Atzema, Frenken, & Van Oort, 2008).

With regard to firm size, most studies found a positive relationship, that is, large(r) retailers have a higher chance of Web site adoption than small(er) retail businesses. Even among single outlet retailers size matters (e.g., Weltevreden et al., 2008), reflecting the differences in the available resources necessary to develop a Web site among small businesses. Several measurements of size are used in the literature: number of outlets (e.g., Ellis-Chadwick et al., 2002; Marciniak & Bruce, 2004; Weltevreden & Atzema, 2006), floor space (Weltevreden et al., 2008), number of employees (e.g., Julien & Raymond, 1994; Steinfield, Adelaar, & Liu, 2005), and sales volume (e.g., Morganosky, 1997; Steinfield et al., 2005).

Looking at operational structure Marciniak and Bruce (2004) found that multiple retailers, mail order companies and fashion designers more often had an active Web site, as compared to independent retailers. Weltevreden, Atzema, and Boschma (2005) and Weltevreden and Atzema (2006) concluded that retail outlets that are part of a franchise organisation are more likely to have an information Web site (no online sales) than stores belonging to independent retail businesses. This was also supported by Julien and Raymond (1994) who found that retailers making little or no use of (information) technologies are least likely to be affiliated to a retail cooperative.

Second, a fewer number of studies also showed that geographical features influence Web site adoption. According to Weltevreden et al. (2005) and Weltevreden and Atzema (2006), retail outlets in large and attractive city centres are more likely to have an active Web site than shops in small, less attractive city centres. Furthermore, Weltevreden et al. (2008) found that independent retailers in large cities are more likely to have a Web site than their counterparts in small cities. They also found that independents in highly urbanised regions have a higher probability to adopt the Internet than shops in the periphery. Finally, they concluded that independent retailers located at shopping centres at the top of the retail hierarchy (city and village centres) are more likely to follow an Internet strategy than their counterparts located at lower order centres (e.g., neighbourhood and convenience centres). Thus, geography matters for Internet adoption reflecting agglomeration economies retailers can benefit from when adopting this new technology.

Table 1
Empirical Studies that Investigated the Factors that Determine Internet Adoption by Retailers

Study	Methodology	Type of analysis	Dependent variable	Independent variables
Julien & Raymond (1994)	Survey ($N = 79$); Small retailers in the food, hardware, and ladies' garment sectors.	Multivariate (regression & discriminant analysis)	IT adoption	Retail category, operational structure, firm size, decentralization, bureaucratization, strategic proactiveness and future-orientedness
Morganosky (1997)	Content analysis ($N = 100$); Large/multiple retailers	Descriptive	Web site adoption	Retail category, firm size
Hart, Doherty, & Ellis-Chadwick (2000)	Content analysis ($N = 1,099$); Large/multiple retailers	Descriptive	Web site adoption	Retail category, firm size
Kotzab & Madlberger (2001)	Content analysis ($N = 50$); Large/multiple retailers	Descriptive	Web site adoption	Retail category
Runge & Lee (2001)	Survey ($N = 71$); Independent retailers	Multivariate (regression)	Number of Internet technologies used	Owner self efficacy, Product innovation, Administrative innovation, Relative advantage, Social pressure, Competition
Ellis-Chadwick, Doherty, & Hart (2002)	Content analysis ($N = 933$); Large/multiple retailers	Descriptive	Web site adoption	Retail category, firm size
Lewis & Cockrill (2002)	Survey ($N = 25$); Independent retailers	Descriptive	Use of e-commerce (incl. Web site adoption)	Firms size, retail category
Worzala, McCarthy, Dixon, & Marston (2002)	Survey ($N = 388$), US and UK retailers (incl. independents)	Descriptive	Web site adoption	Firm size
Doherty, Ellis-Chadwick, & Hart (2003a)	Survey ($N = 164$); Large/multiple retailers	Descriptive	Web site adoption	Customer characteristics
Doherty, Ellis-Chadwick, & Hart (2003b)	Survey ($N = 164$); Large/multiple retailers	Multivariate (discriminant analysis)	Web site/online sales adoption	Internet strategy, Internet target segment, Infrastructure & development capability, Market development opportunity, Internet market place, Internet communications, costs of Internet trading, Internet cost opportunity, Concerns, Consumer preferences
Marciniak & Bruce (2004)	Survey ($N = 990$); Fashion retailers (incl. independents)	Descriptive	Web site adoption	Organisation type, operational structure
Mhango, Marcketti, & Niehm (2005)	Survey ($N = 123$); Small retailers	Descriptive	Integration of e-commerce technology	Internet use by the owner/manager for private and business purposes
Steinfeld, Adelaar, & Liu (2005)	Content analysis ($N = 978$); Large/multiple retailers	Multivariate (regression)	Click and mortar intensity	Retail category, firm size, firm age, operational structure, IT-infrastructure
Weltevreden, Atzema, & Boschma (2005)	Content analysis ($N = 2,797$); Retail outlets at city centres	Multivariate (regression)	Web site adoption	Retail category, firm size, operational structure, geographical factors
Weltevreden & Atzema (2006)	Content analysis ($N = 2,801$); Retail outlets at city centres	Multivariate (regression)	Web site adoption/in-store Web site promotion	Retail category, firm size, operational structure, geographical factors
Weltevreden, De Kruijf, Atzema, Frenken, & Van Oort (2008)	Content analysis ($N = 11,627$); Single outlet retailers	Multivariate (regression)	Domain name registration/ Web site adoption	Retail category, firm size, geographical factors

Third, a small number of studies found a relationship between Web site adoption and other characteristics of retail organisations. Runge and Lee (2001) found that two factors significantly influenced the number of Internet technologies within the firm, that are, relative advantage of information technology and social pressure. According to Doherty, Ellis-Chadwick, and Hart (2003a) retailers that mainly target a customer base, which has a higher proportion of male customers, younger customers, and customers with a high economic status, are most likely to adopt the Internet. Although many empirical studies so far have investigated the adoption of Internet shopping by consumers (see Cao & Mokhtarian, 2005 and Chang, Cheung, & Lai, 2005 for a review of the empirical literature), Doherty et al. (2003a) were one of the first to link consumer characteristics to Web site adoption by retailers.

Furthermore, a discriminant analysis conducted by Doherty, Ellis-Chadwick, and Hart (2003b) showed that the following factors significantly influenced Web site adoption among UK retailers: Internet strategy (represents variables related to strategic vision and willingness to develop a Web site), Internet target market (includes variables about customer and product characteristics), Internet development resources (includes variables associated with a firm's readiness and ability to exploit the Internet), market development opportunity (constitutes of variables associated with the Internet's ability to foster the development of new markets), and Internet marketplace (includes variables concerning a firm's perception of the Internet market).

Mhango, Marchetti, and Niehm (2005) found that firm owners/managers who use the Internet for purchasing personal items are more likely to use the Internet for business purchasing of products and services. This indicates that personal Internet experience of the firm owner may influence the uptake of Internet technologies by retailers. However, while the abovementioned studies provided new insights in the factors that determine the uptake of the Internet among retailers, they did not control for demographics of the firm such as size and operational structure. Thus, it remains unclear whether these outcomes still hold when controlling for important firm characteristics.

Fourth, the majority of the studies listed in Table 1 focused on large, multiple retail organisations. For example, Morganosky (1997) studied the Web site adoption of the top 100 US retailers (by sales volume rank). A similar kind of research was conducted by Kotzab and Madlberger (2001) who scrutinised the online presence of the top 50 retailers in Austria. A number of UK studies also focussed on the leading retailers (multiple retailers and those retailers with a turnover greater than 5 million pounds) in this country (see Doherty, Ellis-Chadwick, & Hart, 1999, 2003a, 2003b; Ellis-Chadwick et al., 2002; Hart et al., 2000). Others included both independent and multiple retailers (e.g., Marciniac & Bruce, 2004; Steinfield et al., 2005; Weltevreden & Atzema, 2006; Weltevreden et al., 2005). Studies that primarily focused on independent retailers (e.g., Julien & Raymond, 1994; Runge & Lee, 2001; Weltevreden et al., 2008) are scarcer.

Fifth, more than half of the studies in Table 1 are descriptive. This is not surprising given the preliminary state of empirical research on this topic. Nevertheless, it is not clear whether the outcomes of those studies hold when one controls for other features. However, there seems to be a trend towards the use of multivariate analysis. The more recent studies employed discriminant analysis (Doherty et al., 2003b) and (logistic) regression (Steinfield et al., 2005; Weltevreden & Atzema, 2006; Weltevreden et al., 2005; Weltevreden et al., 2008) to scrutinise the factors that determine Web site adoption by retailers.

Finally, there is a clear distinction in research methodology among the empirical studies presented in Table 1. Approximately half of them were based on survey data while the other half used content analysis as the data collection method. With regard to our topic surveys and content analyses both have their own strengths and weaknesses. The main advantage of content analysis is that the research is not dependent on the willingness of retailers to participate in the research. As such, the outcomes of this type of research are hardly affected by (low) response rates and response biases (representativeness). One should note that (very) low response rates are quite common among studies on the technology adoption of retailers. In addition, since the data is provided by the researcher and not by a person working in the retail organisation, problems of interpretation/definition among respondents are absent.

However, content analysis is bound to existing data sources that can be accessed without permission of the retailer such as company Web sites, annual reports, and retail directories. As such, the number of independent variables in this type of research is usually smaller than in studies based on business surveys. Furthermore, content analyses often have to deal with the issue of inter-coder reliability, that is, coding differences among various coders.

The major advantage of business surveys is that they are not bound to existing data sources. Researchers have the opportunity to ask all the questions they need for their study. However, the quality of their data depends on the response rate, the extent to which respondents understand the questions, the number of missing values, and

biases in the response population, etcetera. While both methodologies have their own strengths and weaknesses it is through business surveys that we really can enhance our understanding of the factors that determine Web site adoption of retailers.

Summary

From the review of the literature it becomes clear that firm characteristics, customer characteristics, and geographical features significantly influenced Web site adoption among retailers. As such, one needs to control for these factors when assessing the impact of other variables. Few exceptions aside (e.g., Mhango et al., 2005; Runge & Lee, 2001) most scholars neglected characteristics of the firm owner/manager such as sociodemographics and attitudes towards e-commerce when studying Web site adoption by retailers. Especially within (small) independent retail organisations owner characteristics may largely determine the choice of going online or not. The fact that many empirical studies conducted thus far focussed on large, multiple retail organisations may explain this gap in the literature. In addition, many researches employed content analysis as the data collection method. This also makes it difficult to include firm owner characteristics as these are often not available via existing (and public) data sources.

The goal of this paper is to provide more insight in the explanatory value of firm owner characteristics for Web site adoption by independent retailers, while controlling for other features. As such, we address the need for more multivariate analyses concerning this topic that have more explanatory value than descriptive analyses. In the following, we present our research model and our hypotheses.

Research model and hypotheses

The process of innovation adoption in organisations is much more complex than innovation decisions made by individuals, because with the implementation of a new technology in an organisation, often many people are involved (Rogers, 2003). However, in small (retail) firms the owner to a large extent determines the company's policy. Not only does the owner make the decisions about investments in new technologies, but he/she may also be the primary user. Investments in new technologies such as the Internet are, therefore, subject to the characteristics of the business owner (Brock, 2000; Culkin & Smith, 2000; MacGregor & Vrazalic, 2007; Palvia & Palvia, 1999; Stockdale & Standing, 2006; Thong & Yap, 1995). Besides personal characteristics of firm owners we also look at their networks, as many of them do not have sufficient knowledge about developing and maintaining a Web site (Stockdale & Standing, 2006). As such, they may rely on others for this information.

For the development of our research model we not only draw upon the retail literature, but also on the more general small and medium sized enterprise (SME) literature on (Internet) technology adoption. This is because there are no retail studies that explore the relationship between owner characteristics and Web site adoption, at least to our knowledge. The research model is presented in Figure 1. A definition of the dependent and independent variables in this figure can be found in Table 2. The '+' and '-' in Figure 1 and Table 2 indicate a positive and negative relationship, respectively, between the dependent and independent variable.

Firm owner characteristics

Palvia and Palvia (1999) presented the following owner related factors that can influence Internet adoption in SMEs: age, gender, ethnicity, education, and computing/Internet skills. Besides these five factors, we distinguish two other owner related factors: entrepreneurial skills (Lefebvre & Lefebvre, 1992) and perceived competitive pressure (Runge & Lee, 2001). The relationship between those features and Internet adoption will be discussed in the following.

First, the age of the firm owner can affect the way decisions are made within small (retail) firms (Culkin & Smith, 2000; Palvia & Palvia, 1999). Older firm owners may be more conservative and risk averse than their younger colleagues leading to a lower chance of embracing a new technology such as the Internet. In addition, older owners may also lack the necessary skills and/or knowledge to develop and manage a Web site, since they have not grown up with this technology (Brock, 2000; Palvia & Palvia, 1999). This leads us to hypothesise that: *firms led by older owners registered a domain later and are less likely to have a Web site than firms led by younger owners (H1).*

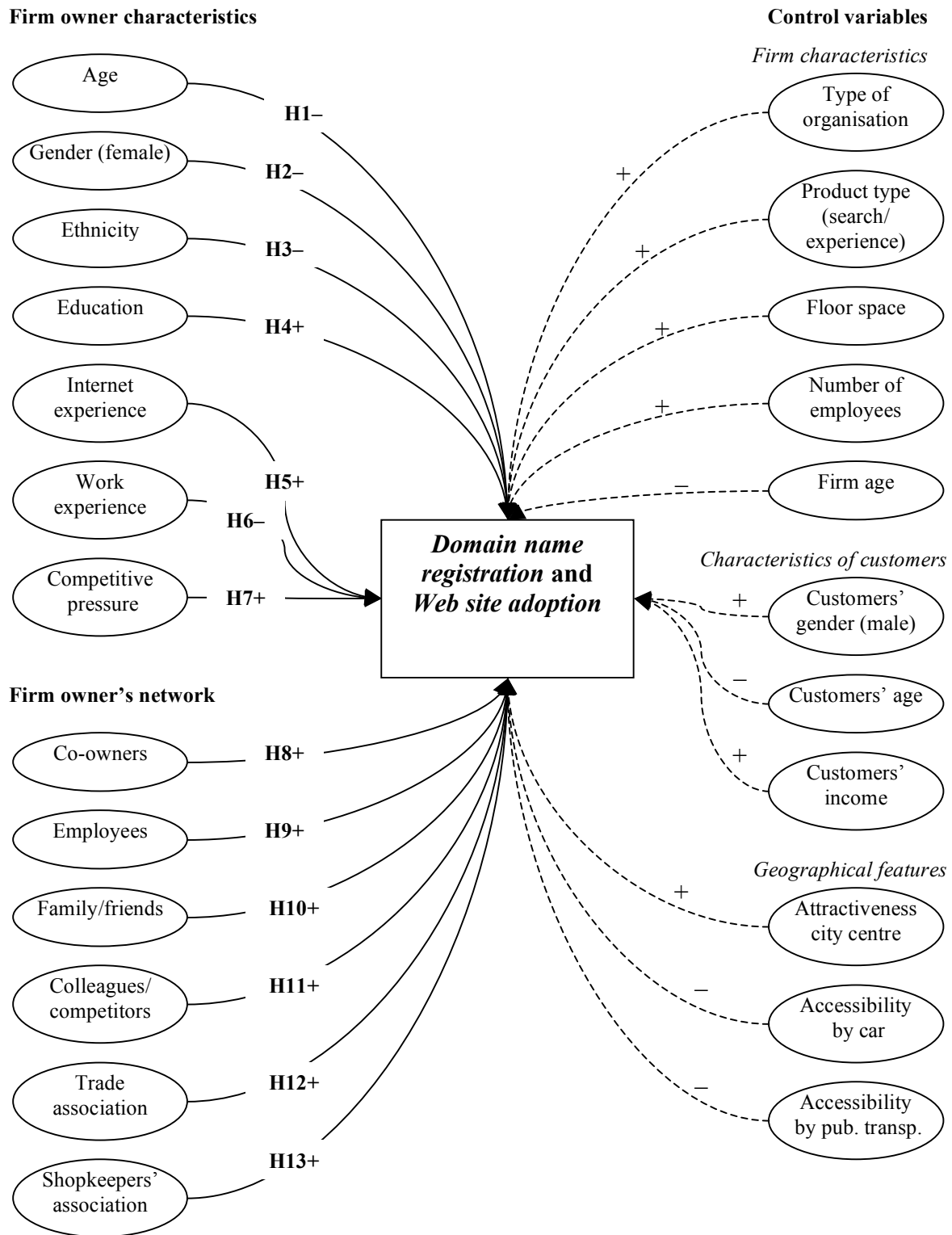


Figure 1. Hypothesised relationships for domain name registration and Web site adoption by independent retailers.

Second, the gender of the firm owner may influence the decision to adopt the Internet (Culkin & Smith, 2000; MacGregor & Vrazalic, 2007; Martin & Halstead, 2003). Many consumer studies reported that women usually are slower in adopting Internet activities, such as online shopping, than males (Cao & Mokhtarian, 2005; Chang et al., 2005). As such, MacGregor and Vrazalic (2007) contend that male firm owners may be more open to e-commerce adoption since they are more willing to engage in Internet activities as consumers. Thus, *firms led by female owners registered a domain later and are less likely to have a Web site than firms led by male owners (H2).*

Table 2

Description of Variables and Expected Relationships with Domain Name Registration and Web Site Adoption

Variable name	Variable description	Expected effect
Dependents		
Domain name	The number of years a firm has a domain name (reference date: 01-09-2004)	N.A.
Web site	Distinguishes between firm with (1) and without (0) a Web site	N.A.
Independents		
Age	The age of the firm owner in years	–
Gender (female)	Distinguishes between female (1) and male (0) firm owners	–
Ethnicity	Distinguishes between ethnic minority (1) and Caucasian (Indo-European) (0) firm owners	–
Education (average)	Distinguishes between firm owners that are medium educated (1) and those that are not (0) ^a	+
Education (high)	Distinguishes between firm owners that are highly educated (1) and those that are not (0) ^a	+
Internet experience	The number of years the shop owner uses the Internet for private purposes	+
Work experience	The number of years the owner is working in the firm	–
Competitive pressure	Measures the owner's perception of whether the Internet increased (1) or did not increase (0) competition	+
Co-owners	Distinguishes between firms led by two ore more owners (1) and a single owner (0)	+
Employees	Measures the importance of employees for the owner's knowledge about e-commerce on a scale from 1 (not important) to 10 (very important)	+
Family/friends	Measures the importance of family/friends for the owner's knowledge about e-commerce on a scale from 1 (not important) to 10 (very important)	+
Colleagues/ competitors	Measures the importance of colleagues/ competitors for the owner's knowledge about e-commerce on a scale from 1 (not important) to 10 (very important)	+
Trade association	Distinguishes between firms that are member of a trade organisation (1) and those that are not (0)	+
Shopkeepers' association	Distinguishes between firms that are member of a shopkeepers' association (1) and those that are not (0)	+
Type of organisation	Distinguishes between pure independents (0) and those that are part of a franchise organisation/retail cooperative (1)	+
Product type (experience goods)	Distinguishes between firms selling experience goods (1) or other items (0) ^b	+
Product type (search goods)	Distinguishes between firms selling search goods (1) or other items (0) ^b	+
Floor space	Measures the total floor space of all outlets of the firm ^c	+
Number of employees	The firm's fulltime equivalent number of employees ^c	+
Firm age	The number of years the firm exists ^c	–
Customers' gender	Measures the share of male customers of the firm	+
Customers' age (< 25)	Measures the share of customers under the age of 25 of the firm ^d	+
Customers' age (≥ 55)	Measures the share of customers of 55 years and older of the firm ^d	–
Customers' income (medium)	Distinguishes between firms of which the majority their customers have medium incomes (1) and those that have not (0) ^e	+
Customers' income (high)	Distinguishes between firms of which the majority their customers have high incomes (1) and those that have not (0) ^e	+
Attractiveness city centre	Distinguishes between firms (mainly) located in highly attractive city centres (1) and firms (mainly) located in less attractive centres (0)	+
Accessibility by car (average)	Distinguishes between firms that have an average accessibility by car (1) and those that have not (0) ^f	–
Accessibility by car (good)	Distinguishes between firms that are a good accessible by car (1) and those that are not (0) ^f	–
Accessibility by public transport (average)	Distinguishes between firms that have an average accessibility by public transport (1) and those that have not (0) ^f	–
Accessibility by public transport (good)	Distinguishes between firms that are a good accessible by public transport (1) and those that are not (0) ^f	–

^aAs compared with the reference category, that is low educated firm owners. ^bAs compared with the reference category, that is convenience goods. ^cWe took the logarithm of this variable, as the original measure was skewed. ^dAs compared with the reference category, that is the share of customers between 25 and 55 years old. ^eAs compared with the reference category, that is firms with mainly low income customers. ^fAs compared with the reference category, that is firms that have a bad accessibility by car or public transport.

Third, the ethnic background of the business owner may also affect the decision to adopt the Internet. Foley and Ram (2002) found that ethnic small businesses have less access to the Internet and also have a lower propensity to develop a Web site, compared to non-ethnic small businesses. According to Allinson et al. (2004), most ethnic minority business owners have limited personal knowledge of ICT. In addition, cultural factors could hinder the uptake of the Internet among ethnic shop owners. For example, preference for trust relationships based on face-to-face communication, family structures, conservatism, and respect for seniority limiting the input of the younger generation into decision-making processes, have been identified as limitations for adopting Internet technologies among ethnic minority businesses (Allinson et al., 2004). Furthermore, the shopping preferences of their customers generally do not justify a Web presence. In general, ethnic consumers have lower rates of Internet use, compared to non-ethnic consumers (c.f., Hoffman & Novak, 1998; Ono & Zavodny, 2002). As such, *firms led by ethnic minority owners registered a domain later and are less likely to have a Web site than firms led by Caucasian (Indo-European) owners (H3)*.

Fourth, the level of education of the firm owner may influence the decision to adopt this technology in her/his organisation (Culkin & Smith, 2000; MacGregor & Vrazalic, 2007). While controlling for firm size, Davis and Harveston (2000) found that education of the entrepreneur had a significant positive effect on the sales growth of family owned business (including retailers). They also found a significant positive relation between businesses' degree of internationalization and the owner's level of education. This leads us to hypothesise that: *firms led by low educated owners registered a domain later and are less likely to have a Web site than firms led by highly educated owners (H4)*.

Fifth, computing/Internet skills of the business owner are considered to affect Internet adoption (Chen & Small, 1994; MacGregor & Vrazalic, 2007; Mhango et al., 2005; Thong & Yap, 1995). According to Chen and Small (1994) an IT knowledgeable owner is more involved in the technology diffusion process. Thong and Yap (1995) found that small businesses with innovative CEOs, who are knowledgeable about IT and have a positive attitude towards IT adoption, are most likely to adopt the Internet. Therefore, we hypothesise that: *the more personal Internet experience the owner has the earlier the firm registered a domain name and the higher the likelihood that it has a Web site (H5)*.

Besides education and computing skills, the entrepreneurial skills (or work experience) of the firm owner may also influence the adoption decision. The capability to make strategic decisions may depend on the years one is entrepreneur and the years one is working in the organisation. These are in fact proxies for the competence and experience of the business owner. However, Lefebvre and Lefebvre (1992) found that the number of years a CEO is working in the sector negatively influences the innovativeness of a small business. This can be explained by the fact that "a longer tenure in a particular sector would correspond to more habit formation, greater reluctance to alter established policies, and thus less likelihood to activate changes of a more radical nature" Lefebvre and Lefebvre (1992, p. 262). As such, *the longer the owner is working in the firm the later the firm registered a domain name and the lower the likelihood that it has a Web site (H6)*.

Finally, perceived competitive pressure will be positively related to the decision to adopt the Internet (Dholakia & Kshetri, 2004; Runge & Lee, 2001). The Internet is a disruptive process innovation (Burt & Sparks, 2003; Wrigley et al., 2002; Schmidt et al., 2001) that increases competition within the retail sector for two reasons. First, Internet facilitates selling over distance. As a result, retailers currently not only have to deal with local, but also with national and even international competition. Second, the Internet induced the rise of new players in the retail arena, that is, virtual retailers, such as Amazon.com. While many virtual retailers had to exit the market due to lack of profitability, a few have become large and successful, threatening traditional retailers. In the Netherlands consumers prefer to purchase online from retail organisations that are different from traditional retailers (Weltevreden, 2007a). Thus, *firms led by owners who experience increased competition from the Internet registered a domain earlier and are more likely to have a Web site than firms led by owners who do not experience increased competition from the Internet (H7)*.

The firm owner's network

As said before, the majority of the firm owners only have limited information about the possibilities the Internet provides for his store(s) and how to set up and manage a Web site. Therefore, business owners may depend on other people and organisations for this knowledge. Within the organisation firm owners could draw on the knowledge of their employees (Culkin & Smith, 2000; Martin & Halstead, 2003). Furthermore, in the case of more than one owner they could draw on the knowledge of their partner(s) (Martin & Halstead, 2003). According to King and Gribbins (2002) the availability of a knowledgeable IT staff can be a key determinant for organisations' adoption decision. One should note that due to their small size independent retailers usually do not have an IT staff. However, the knowledge of employees and co-owners about the Internet and

developing/managing a Web site may still be an important factor for the firm owner's decision whether or not to establish a Web presence. This leads us to hypothesize that:

- *Firms that are led by two or more owners have registered a domain name earlier and are more likely to have a Web site than firms led by a single owner (H8).*
- *The more important employees are for the owner's knowledge about e-commerce the earlier the firm registered a domain name and the higher the likelihood that it has a Web site (H9).*

Besides internal sources of knowledge firm owners can also draw on external sources. As such, networks could be important for the adoption of domain names and Web sites by independent retailers (MacGregor & Vrazalic, 2007). Shaw and Conway define small firm networks as “the composite of the relationships in which small firms are embedded which serve to link or connect small firms to the environments in which they exist and conduct their business” (2000, p. 369). To acquire necessary information to make the decision whether or not to adopt the Internet, independent retailers could first draw on business related contacts. According to Woolgar, Vaux, Gomes, Ezingard, and Grieve (1998), SMEs relate most closely and intensively with their suppliers, customers, and to a lesser extent with their competitors. They have also connections with the trade press, trade associations, business associations, et cetera. These actors are all potential sources of knowledge that can influence the owner's decision to adopt the Internet.

According to Culkin and Smith (2000) there is much dialogue going on between small businesses that are in competition with each other in a certain area. Furthermore, Stockdale & Standing (2006) concluded that local community sites run by local councils and business associations can be an important motivator for a firm owner's decision to establish an online presence. Currently, many Dutch trade associations (e.g., HBD, Hoofdbedrijfschap Ambachten, Mitex) are concerned with the possibilities and threats the Internet provides for their members. Many have developed policies to inform their members about e-commerce. Thus, being member of a trade or shopkeeper's association may positively affect the firm owner's attitude towards e-commerce. Besides the business related network mentioned above, the shop owner could also use informal sources, such as ICT-knowledgeable family and friends (Brock, 2000; Culkin & Smith, 2000; Stockdale & Standing, 2006). Furthermore, family and friends can also help the business owner in developing and managing the Web site (Stockdale & Standing, 2006). This leads us to hypothesize that:

- *The more important family and friends are for the owner's knowledge about e-commerce the earlier the firm registered a domain name and the higher the likelihood that it has a Web site (H10).*
- *The more important colleagues and competitors are for the owner's knowledge about e-commerce the earlier the firm registered a domain name and the higher the likelihood that it has a Web site (H11).*
- *Firms that are member of a trade association have registered a domain name earlier and are more likely to have a Web site than firms that are not member of a trade association (H12).*
- *Firms that are member of a shopkeepers' association have registered a domain name earlier and are more likely to have a Web site than firms that are not member of a shopkeepers' (H13).*

Control variables: firm, customer, and geographical characteristics

To assess the impact of the characteristics of the firm owner and its network on the likelihood of adopting the Internet, one needs to control for other features that are of influence, that are: firm, customer, and geographical variables (see Figure 1).

As shown in Figure 1 we have included five firm characteristics in our model. *First*, operational structure (organisation type) may influence Internet adoption. Retail type classifications can be based on size (e.g., independents versus multiples), level of corporate control (e.g., corporate chains versus franchisors), or operational structure (e.g., traditional versus catalogue) (Marciniak & Bruce, 2004; Weltevreden & Atzema, 2006). In our case, organisation type is less relevant since we only deal with independent retailers. However, we can make a distinction between independents that are member of a franchise organisation or other form of retail cooperative, and those that are not.

Second, we control for the type of product a retailer sells. We distinguish between frequently purchased convenience goods (e.g., groceries and personal care goods), and shopping goods, which are further divided into search (e.g., books and CDs) and experience goods (e.g., clothes and shoes) (Copeland, 1923; Nelson, 1970, 1974). According to Klein (1998), it concerns particularly search goods for which the Internet has the potential to provide information in a more accessible, less costly and more customizable way. Experience goods are goods for which full information on dominant attributes cannot be known without direct experience, and therefore less suited for e-commerce than search goods. For convenience goods, which are frequently purchased and are part of consumers' daily routines, the Internet is least suitable. It takes more effort to acquire information about those products online than a daily trip to a neighbourhood or convenience centre.

Third, we included the size of the retail organisation as a control variable that – according to the empirical literature – positively influences Internet adoption. Since we focus on small, often single outlet retailers number of outlets is not a good discriminator. As such, we use number of employees and floor space as size variables.

The *final* firm characteristic we control for is age. Older organisations may find it harder to incorporate a new technology in their existing set of routines than younger businesses, since it does not fit with the corporate culture (Dixon, Thompson, & McAllister, 2002; Kaarts-Brown & Evaristo, 2001). Therefore, the age of the organisation may negatively influence Internet adoption.

For SMEs with a high percentage of customers online, not being on the Internet is a competitive disadvantage (Poon & Swatman, 1999). In our analyses we control for three customer variables which may influence Internet adoption by retailers: gender, age and income (see Figure 1 and Table 2). As said in the preceding, Doherty et al. (2003a) showed that having a high proportion of male, young, and high income customers positively influences Internet adoption by retailers. These factors are also reported as important predictors in studies concerning consumers' adoption of Internet activities, such as online shopping (Cao & Mokhtarian, 2005; Chang et al., 2005).

Previous empirical studies have shown that Internet adoption may differ among retailers in different urban settings (due to agglomeration economies) and shopping centres (due to site characteristics such as foot fall, accessibility, etc.). Including geographical variables can be difficult when retail organisations have more than one outlet. In other words, how can one include geographical variables if a retailer is present in more than one of the locations under investigation? Weltevreden and Atzema (2006) and Weltevreden et al. (2005) solved this problem by taking individual shops as the unit of analysis instead of the retail organisation they belong to.

In this paper, however, we were able to take the retail organisation as the unit of analysis, as well as include spatial variables. This is because we deal with small independent retailers. Approximately 80% of all retailers in our sample have one outlet, or only shops in one city centre. In the rare situation that a retailer had outlets in more than one of the eight city centres under investigation, we assigned retailers to the city centre where their main outlet is located (often this was the city the shop owner lives or works). The following geographical variables are included: attractiveness of the city centre in which the (main) outlet(s) are located and the business owner's perception of the accessibility of his shops by car and public transportation (see Figure 1 and Table 2).

Research design

In order to scrutinise the explanatory value of firm owner characteristics for Internet adoption by independent retailers data were collected as follows. First, from October till November 2003 we examined the retail composition of eight Dutch city centres (i.e., Alkmaar, Almere, Amersfoort, Haarlem, Hilversum, Purmerend, Utrecht, and Veenendaal)¹ by counting the number of shops in each city centre and recording the sector and address of each individual shop, which resulted in a file that consists of data of 3,369 retail outlets. The eight city centre shopping areas were defined by using a list of the shopping streets that belong to each centre, provided by Locatus, the leading agency in retail data collection in the Netherlands (Locatus, 2003). The type of business of each outlet has been recorded by using a sector classification of 135 different categories based on classifications drawn up by Locatus (2002a, 2002b).

Second, we used retail guides to obtain the type of organisation and the total number of outlets of each retailer (i.e., First Formula, 2003; Locatus, 2002b). In addition, the floor space of the retail premises in our dataset was drawn from the 2004 Retail Location Database (Locatus, 2004). Furthermore, we searched the Internet for the Web address or domain name of each retailer.

Third, from December 2003 through February 2004 we visited each retailer in the eight city centres to verify the results obtained via the Internet and the retail guides and to determine the extent to which retailers promote their Web site in or around their store. Since we approached the store personnel directly and our interviews did not last more than a minute, almost every retailer cooperated. Note also that our questions were very simple (e.g., 'Does your business have a Web site or domain name?', 'Is it correct that your business has four outlets?', etc.) so in most cases the store personnel could answer them. This resulted in a dataset about the Web site and domain name adoption of 3,274 retail outlets in eight city centres, a response of 97.2 percent.

¹ These city centres have been selected, as they widely differ in terms of attractiveness and because each case represents a specific type of city centre in the Netherlands (see Weltevreden, 2006).

Fourth, from May to early August 2004, all 1,954 independent retailers² that are present in this dataset were asked to participate in a telephone survey. The goal of this survey was to provide more insight into the factors that determine the Internet adoption of independent retailers. Each telephone interview took about 15 to 20 minutes. The survey eventually resulted in 753 usable responses, which is a response of 38.5%. In this paper we only included the 686 cases in which the owner or co-owner personally participated. This is because, among other things, we wanted to scrutinise the influence of personal characteristics of the (co-)owner on the Internet adoption of independent retailers. Of the 686 retail businesses in our sample 16.9% had more than one owner.

Since some respondents were too busy or reluctant to participate in the telephone survey, a paper and e-mail version of the questionnaire were also available. To ensure the reliability of the data, open questions in the telephone survey were also open questions in the other versions. In total, 82.5% responses were received by telephone, 14.0% by mail, and 3.5% by e-mail. The e-mail questionnaire was a simple Microsoft Word form that respondents received by e-mail. After filling in this form respondents were asked to send it by e-mail as an attachment.

We used chi-square and ANOVA tests to investigate whether there were significant differences in the characteristics of respondents that participated by e-mail as compared to those that participated by telephone and mail. Results showed that respondents that participated by e-mail were more likely to be male, $\chi^2(2, N = 686) = 7.03, p < .05$, to have a larger number of employees, $F(1, 686) = 7.55, p < .01$, to be part of a franchise organisation/retail cooperative, $\chi^2(2, N = 686) = 9.22, p < .01$, and to have an active Web site, $\chi^2(2, N = 686) = 11.30, p < .01$, than those that participated by telephone and mail. Other characteristics such as age, education, ethnicity, Internet experience, floor space, and firm age did not significantly influence the preference for the e-mail questionnaire.

Since our sample was drawn from a larger database, which already contained important company information (e.g., retail category, Internet strategy, and geographical features) of each retailer in the population, we were able to test the reliability of our sample. Two chi-square goodness-of-fit tests concerning the distribution of product types and Internet strategies were conducted. Via a chi-square goodness-of-fit test one can investigate whether a sample fits the frequency distribution of the total population (McGrew & Monroe, 1993).

Results indicated that the distribution of retailers by main retail category³ in our sample fits the distribution in total population of independent retailers in the eight city centres: $\chi^2(11, N = 686) = 14.05, p < .05$. However, the chi-square goodness-of-fit test for Internet strategy distribution showed that our sample does not fit the distribution of Internet strategies in the total population: $\chi^2(1, N = 686) = 8.16, p < .05$. More specifically, there is a small under representation of independents with no Web site, while independent retailers with a Web site are over represented. A plausible explanation is that retailers with a Web site are by and large more interested to participate in a survey concerning Internet adoption. The reader should take this into account when interpreting the descriptive results presented in the following.

Sample characteristics

The descriptive statistics of the variables in our dataset are displayed in Table 3. It should be noted that all the discrete variables on a nominal or ordinal level were turned into dummy variables for the multivariate analysis. As shown in this table the average age of the firm owners in our sample was 45.4 years. On average they had been working in the firm for 14.6 years. Approximately one third of the business owners were female and two thirds were male. Ethnic firm owners made up only 3.9% of our sample. Partly because of the small number of ethnic firm owners in our sample we could only differentiate between adopters and non-adopters of Web sites and not between adopters of various types of Web sites (i.e., informative Web sites and online sales)⁴. Furthermore, 29.7% of the business owners were highly educated, while 48.7% had an average education. On average firm owners in our sample have been on the Internet privately for more than 5.8 years and about 31.8% stated that the Internet has increased competition for their business. Table 2 further showed that family/friends are more important for the firm owner's knowledge about e-commerce than employees and

² Note that the number of retailers in the dataset is smaller than the number of outlets, as some retailers have more than one outlet.

³ Main retail categories: daily items, clothing & accessories, shoes & leather goods, jewellery & optical goods, household & luxury goods, art & antiques, toys & sporting goods, hobby goods, media goods, bicycles & car accessories, furniture & do-it-yourself items, and other items.

⁴ This is also due to the limited number of firms selling convenience goods, the limited number of retailers that belong to a franchise organisation, and the limited number of businesses that primarily have low income customers (see Table 2).

colleagues/competitors. In addition, almost half of the independent retailers in our sample were member of a trade association (49.4%) and shopkeepers' association (45.5%).

Table 3
Descriptive Statistics of the Dependent and Independent Variables

Variable name	Variable type	Min.	Max.	Mean	SD	N
Dependents						
Domain name	Continuous	0.00	9.06	3.76	1.90	413
Web site	Binary	0	1	0.45	-	686
Independents						
Age	Continuous	21	92	45.41	10.41	686
Gender (female)	Binary	0	1	0.33	-	686
Ethnicity (ethnic minority)	Binary	0	1	0.04	-	686
Education (average)	Binary	0	1	0.49	-	686
Education (high)	Binary	0	1	0.30	-	686
Internet experience	Continuous	0	20	5.84	3.41	686
Work experience	Continuous	0.10	58	14.60	11.29	686
Competitive pressure	Binary	0	1	0.32	-	686
Co-owners	Binary	0	1	0.17	-	686
Employees	Continuous	1	10	3.19	2.83	686
Family/friends	Continuous	1	10	5.47	3.07	686
Colleagues/competitors	Continuous	1	10	3.13	2.47	686
Trade association	Binary	0	1	0.49	-	686
Shopkeepers' association	Binary	0	1	0.45	-	686
Type of organisation	Binary	0	1	0.07	-	686
Product type (experience goods)	Binary	0	1	0.60	-	686
Product type (search goods)	Binary	0	1	0.28	-	686
Floor space	Continuous, logarithm ^a	1.15	3.93	1.91	0.35	686
Number of employees	Continuous, logarithm ^a	-0.30	1.78	0.40	0.32	686
Firm age	Continuous, logarithm ^a	-0.30	2.22	1.07	0.50	686
Customers' gender (male)	Continuous	0	100	41.47	26.46	686
Customers' age (< 25)	Continuous	0	100	20.63	17.48	686
Customers' age (≥ 55)	Continuous	0	100	21.60	15.13	686
Customers' income (medium)	Binary	0	1	0.53	-	686
Customers' income (high)	Binary	0	1	0.43	-	686
Attractiveness city centre	Binary	0	1	0.58	-	686
Accessibility by car (average)	Binary	0	1	0.30	-	686
Accessibility by car (good)	Binary	0	1	0.38	-	686
Accessibility by public transport (average)	Binary	0	1	0.29	-	686
Accessibility by public transport (good)	Binary	0	1	0.59	-	686

^aRecall that we took the logarithm of this variable, as the original measure was skewed.

Results

In this section we present the estimation results of the impact of firm owner characteristics on domain name registration and Web site adoption by independent retailers, while controlling for other organisational features. Before turning to the multivariate analysis, we will give some insight in the uptake and diffusion of domain names and Web sites among independent retailers and the role of firm owners in developing/managing the Web site.

The uptake of the Internet among independents

As shown in Figure 2, by 2004 60.2% of the independent retailers in our sample had a domain name, while 44.6% (see also Table 2) of the independents also had a Web site. These figures are low as compared with figures of Internet adoption by multiple retailers. According to Weltevreden and Boschma (2005), by 2004 approximately 95% and 82% of the multiple retailers in the Netherlands had a domain and a Web site. Thus, with regard to Internet adoption independent retailers are lacking behind as compared with multiple retailers in the Netherlands. So what are the main barriers of establishing a Web presence for independent retailers? The main reasons mentioned by firm owners for not going online were a lack of time, knowledge and interest (see

Table 4). These reasons have also been reported in other studies on e-commerce adoption by SMEs (see MacGregor & Vrazalic, 2007).

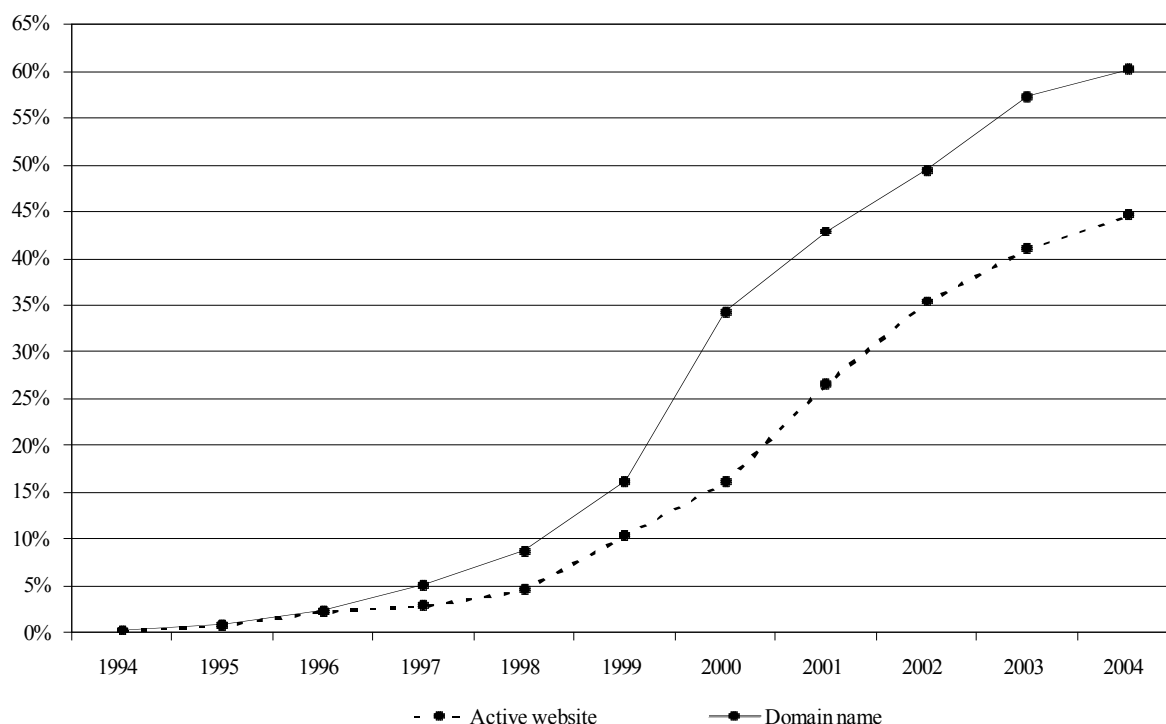


Figure 2. Cumulative adoption of domain names and Web sites among independent retailers in %, 1994-2004.

However, more than two thirds of the non-adopters indicated that they would like to have a Web site in the future, which implies that the level of Internet adoption among independents can move up to around 80%. Nonetheless, there is a huge gap between current Internet penetration and future prospects that needs to be overcome before these high adoption levels will become reality. In the following section we will determine the profile of independent retail organisations and their owners that so far have (not) established a Web presence.

Advertisement/exposure, service improvement, and attracting more customers were the main motivations why independent retailers have developed a Web site (see Table 4). These outcomes correspond with findings of other studies (for a review of the literature see MacGregor & Vrazalic, 2007). Moreover, it has been shown that these motivations are also the main benefits of going online (Weltevreden & Boschma, 2008).

Table 4
Reasons for (Not) Having/Developing a Web Site

Reasons for <u>not</u> having a Web site (N = 339)	Percentage ^a	Reasons for having/developing a Web site (N = 342)	Percentage ^a
No time to develop a Web site	32.7%	For advertisement/exposure	61.7%
No knowledge about developing a Web site	21.8%	To provide additional services	37.4%
Not interested in developing a Web site	21.2%	To attract more customers	21.3%
A Web site is too expensive	15.9%	Internet has the future	14.9%
My customers don't need a Web site	10.3%	To gain more revenues	12.0%
No time/difficult to manage a Web site	8.0%	To keep up with/to stay a head of my competitors	9.9%
My products are not suitable for e-commerce	5.3%	Customers asked for a Web site	4.7%
Other reasons	35.4%	Other	14.6%
Don't know	2.7%	Don't know	1.2%
Number of reasons	535	Number of reasons	608

^aPercentages do not add up to 100% as respondents were allowed to give three reasons maximum

Given the fact that many non-adopters stated that they lack the skills and resources to develop a Web site, it is interesting to examine who developed and manages the Web sites of the current adopters. This also gives us a first indication of the firm owners' role in implementing this new technology in their business. As shown in Table 5 43.1% of the Web sites of independent retailers have been developed by Web design agencies. This is significantly lower as compared with multiple retailers, where Web design agencies built 72% of the Web sites (Weltevreden & Boschma, 2005). Furthermore, approximately 20% of the Web sites of independents have been developed internally, either by the firm owner or the employees. Moreover, almost a third of the Web sites have been developed by family or friends of the firm owner. Thus, for the development of a Web site independent retailers rely much more on internal competences and social contacts as compared with multiple retailers.

Table 5
Developer and Manager of the Web Site of Independent Retailers (N = 343)?

Developer	Percentage	Manager	Percentage
Web design agency	43.1%	Web design agency	21.9%
Family or friends	32.7%	Family or friends only	21.9%
Firm owner	14.6%	Firm owner only	28.3%
Employee(s)	5.2%	Firm owner and others	10.5%
Others	4.4%	Employee(s) only	7.9%
		Employee(s) and others	2.6%
		Others	2.9%
		No one	4.1%
Total	100.0%	Total	100.0%

For Web site management the role of internal actors and social contacts is even bigger (see Table 5). In approximately 39% of the cases the firm owner is (one of the actors) keeping the Web site up-to-date. In addition, family/friends and employees remain important, while Web design agencies are significantly less involved in managing the Web site. These outcomes indeed stress the importance of the firm owner and his social network for Internet adoption by independent retailers. The regression results in the following section will ultimately reveal the role of the firm owner in the uptake of the Internet by independents.

Results of the regression analyses

In this section we scrutinise the influence of the characteristics of the firm owner and its network on domain name registration and Web site adoption by independent retailers, while controlling for other characteristics of firms. Linear regression was chosen for domain registration, as it is a continuous variable that measures the number of days that independent retailers have had a domain name (see Model 1 in Table 6). For Web site adoption we used binomial logistic regression (see Model 2, Table 6). Binomial logistic regression is used when the dependent variable is dichotomous (in our case: having a Web site or not). Binomial logistic regression applies maximum likelihood estimation after transforming the dependent variable into a logit variable (i.e., the natural log of the odds of the dependent occurring or not; Wrigley, 1985). The descriptive statistics of the independent variables introduced below were presented in Table 3. All predictors have been tested for multicollinearity. Furthermore, we checked for non-linear effects of increasing age of the owner and the firm, by including the squared value of both variables in the regression models.

Firm owner characteristics

Of the seven firm owner characteristics that are included in our analyses, four significantly influenced Internet adoption (see Table 6). Thus, firm owner characteristics matter for Internet adoption by independent retailers. Hypothesis 1 was partly supported by our data, as the age of the firm owner negatively influenced Web site adoption among independent retailers. However, the number of days independent retailers have had a domain name was not significantly affected by it. Hypothesis 3 was also partly supported by our data. Firms led by ethnic minority owners were less likely to adopt a Web site than firms that were managed by Caucasian (Indo-European) owners. Ethnicity, however, did not significantly influence the number of days independent retailers have had a domain name. Furthermore, we found a significant positive association between the personal Internet experience of the firm owner and domain name registration and Web site adoption. This is in line with Hypothesis 5. Hypothesis 7 was also fully supported by our data. Firm owners that experience competitive pressure from the Internet registered a domain name earlier and were more likely to have a Web site than business owners that did not experience competitive pressure from the Internet.

Table 6

Regression Models of Domain Name Registration and Web site Adoption by Independent Retailers

Variables	Model 1: Domain name registration (in years, <i>N</i> = 413) ^a			Model 2: Web site adoption (<i>N</i> = 686)		
	<i>B</i>	SE	<i>Beta</i>	<i>B</i>	SE	Exp. <i>B</i>
Constant	1.84 **	0.28		-3.65**	0.85	0.03
Firm owner characteristics						
Age				-0.03**	0.01	0.97
Ethnicity (ethnic minority)				-1.32*	0.52	0.27
Internet experience	0.07**	0.03	0.12	0.14**	0.03	1.15
Competitive pressure	0.41*	0.17	0.10	0.47*	0.19	1.59
Networks						
Co-owners				0.55*	0.23	1.73
Employees	0.08**	0.03	0.13	0.12**	0.03	1.13
Trade association (member)	0.34*	0.17	0.09			
Firm characteristics						
Type of organisation (franchise)	2.35**	0.27	0.38			
Floor space				0.68**	0.26	1.97
Firm age	0.58**	0.16	0.15			
Product type (search goods)				0.59**	0.20	1.81
Customer characteristics						
Customers' gender (male)				0.01**	0.00	1.01
Customers' income (low)	-0.91*	0.45	-0.09			
Customers' income (medium)				1.11*	0.50	3.03
Customers' income (high)				1.54**	0.51	4.64
Location						
Attractiveness city centre				0.35*	0.18	1.42
F	22.37**					
Chi-square				146.29**		
-2 log likelihood				799.46		
R square	0.28					
Adjusted R ²	0.27					
Nagelkerke R ²				0.26		

^aIncludes only the firms that registered a domain name (both with and without an active Web site)

p* < .05. *p* < .01.

Table 7

An Overview of the Accepted and Rejected Hypotheses

Hypothesis	Variable (expected relationship)	Model 1: Domain name registration	Model 2: Web site adoption
1	Age (-)	Rejected	Accepted
2	Gender (female) (-)	Rejected	Rejected
3	Ethnicity (ethnic minority) (-)	Rejected	Accepted
4	Education (+)	Rejected	Rejected
5	Internet experience (+)	Accepted	Accepted
6	Work experience (-)	Rejected	Rejected
7	Competitive pressure (+)	Accepted	Accepted
8	Co-owners (+)	Rejected	Accepted
9	Employees (+)	Accepted	Accepted
10	Family/friends (+)	Rejected	Rejected
11	Colleagues/competitors (+)	Rejected	Rejected
12	Trade association (+)	Accepted	Rejected
13	Shopkeepers' association (+)	Rejected	Rejected

As shown in Table 7 the Hypotheses 2, 4 and 6 were not supported by our data. Thus, the gender, education and the work experience of the firm owner did not significantly influence domain name registration and Web site adoption by independent retailers.

The firm owner's network

As shown in Table 6 and 7, firms led by two or more owners were more likely to have a Web site than those led by a single owner. However, there was no significant difference between both types of firms with regard to the number of days they have had a domain name. As such, Hypothesis 8 was only partly supported. The fact that we included the characteristics of only one co-owner in the case of firms with multiple owners, may distort the outcomes of our analyses presented in Table 6 and 7. Therefore, we also conducted two regression analyses in which we only included the firms with a single owner (83.1% of our cases). These analyses (not shown in this paper), however, did not yield different outcomes than the results presented in Table 6 and 7. This may be due to the fact that only a small proportion (16.9%) of our cases were firms with two or more owners. Nevertheless, future empirical studies that investigate the influence of firm owner characteristics on Web site adoption by SMEs should be aware of this possible distortion.

The outcomes in Table 6 and 7 also indicated that the more important employees were for the firm owner's knowledge about e-commerce the earlier independent retailers registered a domain name and the higher the probability that they have a Web site. Thus, Hypothesis 9 was fully confirmed by our data. Besides internal sources of knowledge, membership of a trade association positively influenced the number of days that independent retailers have a domain name. Since there was no significant relationship between this variable and Web site adoption Hypothesis 12 was only partially supported.

The other network variables did not significantly affect domain name registration and Web site adoption (see Table 7). As such, Hypothesis 10, 11, and 13 were not supported by our data. Despite the fact that family/friends are highly important for developing and managing the Web site, their value for providing knowledge about the Internet and/or a Web site was not a significant predictor for domain name registration and Web site adoption. This is because family and friends are equally important as a source for information about e-commerce for both independents with and without a Web site. Therefore, it largely depends on the characteristics of the firm owner and the organisation if their expertise is used to develop a Web site.

Control variables: firm characteristics, customer characteristics, and geographical features

We close this section with a brief description of the results for the control variables in the models in Table 6, which to a large extent supported the findings of previous empirical studies concerning the Internet adoption of retailers.

With regard to characteristics of firms there were four variables that significantly influenced domain name registration and/or Web site adoption. First, franchisees registered a domain name earlier than pure independent retailers. However, contrary to Weltevreden and Atzema (2006) we did not find a significant relationship between the type of organisation and Web site adoption. Second, like Weltevreden et al. (2008) we found that the total floor space of the firm positively influences Web site adoption among independent retailers. However in contrast to Weltevreden and colleagues we did not find this relationship for domain name registration.

Third, we found a positive association between the age of the firm and the number of days it has a domain name. This outcome did not correspond with the literature which contends that older organisations are less likely to adopt the Internet than younger firms. However, this outcome can be explained by the fact that in general the number of days a retailer has had a domain name was lower for young firms than for older firms simply because the former were more recently established. After we added a control dummy to the domain name registration model⁵ that distinguished between firms that were established before and after 2000, the positive effect of firm age disappeared. Fourth, the results indicated that independent retailers that sell search goods are most likely to have a Web site as compared to their counterparts that sell experience and convenience items. This is in line with findings of other empirical studies (e.g., Weltevreden et al., 2005; Weltevreden et al., 2008).

Concerning customer characteristics there were two variables that had a significant relationship with domain name registration and/or Web site adoption (Table 6). First, a larger share of male customers significantly increased the probability of having a Web site. Second, independent retailers with mainly medium and high income customers were more likely to register a domain name early and to have a Web site than their counterparts with largely low income customers. These outcomes were in accordance with the descriptive results of Doherty et al. (2003b), who found that retailers mainly serving customers that match the profile of (frequent)

⁵ Not displayed in Table 6.

Internet users are more likely to establish a Web presence. Thus, customer characteristics are important explanatory variables that should be taken into account when studying Internet adoption by retailers.

With regard to geographical features results indicated that independent retailers located at attractive city centres were more likely to have a Web site than their counterparts at less attractive city centres (Table 6). This outcome is in line with the findings of other empirical studies (e.g., Weltevreden & Atzema, 2006; Weltevreden et al., 2005). Retailers' perception of the accessibility of their shop(s) by car and public transport respectively did not significantly influence domain name registration and Web site adoption. Thus, geographical differences within a shopping centre hardly affected Internet adoption among retailers (see also Weltevreden et al., 2005).

Discussion

The goal of this paper is to provide more insight in the adoption of domain names and Web sites by independent retailers and the role of the firm owner and its personal network in the adoption process, which so far received little attention in the retail literature. The outcomes of the multivariate analyses indicate that while controlling for characteristics of the organisation, firm owner characteristics such as age, ethnic background, personal Internet experience and perceived competitive pressure matter for the adoption of domain names and Web sites by independent retailers. In addition, results show that firm owners play a key role in keeping the Web site up-to-date. As such, future empirical research should take this into account when assessing the factors that determine Internet adoption by (independent) retailers.

Furthermore, the outcomes reveal that for the development of a Web site independent retailers rely heavily on internal competences, such as co-owners and employees, and social contacts. In contrast, multiple retailers more frequently use Web design agencies for the development of their Web site (see Boschma & Weltevreden, 2005). The fact that independent retailers on average have fewer resources (in particular time and knowledge) at their disposal may explain why they frequently use informal sources of knowledge, as compared with multiple retailers. In particular, family and friends of the firm owner play an important role in the development process of the Web site. Moreover, they are also important for keeping the Web site up to date. Given the fact that family and friends are equally important for non-adopters and adopters of e-commerce, it largely depends on the characteristics of the firm owner and the organisation if their expertise is used to establish a Web presence.

To date, not being on the Internet is a competitive disadvantage (Burt & Sparks, 2003; Wrigley et al., 2002). While most multiple retailers are already online many independent retailers have still not established an online presence, although our data indicate that the majority of the non-adopters would like to have a Web site in the future. Our results further show that for independent retailers a lack of time and knowledge are currently the major barriers to establish an online presence. However, these barriers may also be important impediments for becoming/remaining successful on the Internet. Since many independents state that they lack the time to develop a Web site – where can they find the time to keep their Web site up to date and to, for example, (quickly) respond to inquiries of online (potential) customers? Research by Weltevreden (2007b) showed that about 26% of the Web sites of independent retailers in the Netherlands do not function properly (e.g., text, pictures, general terms & conditions, and order/payment information are frequently missing). Given their limited resources independent retailers that want to develop a Web site should, therefore, carefully consider what kind of Internet strategy they would like to follow.

So far many (local) governments and trade associations have been concerned with the (slow) uptake of the Internet by SMEs, including independent retailers. They have developed many initiatives to encourage the use of Internet technologies by SMEs (Fuller & Southern, 1999; Beckinsale & Ram, 2006). Our data show that independents that are member of a trade association registered a domain name earlier than their counterparts that are not member of a trade association. This indicates that trade associations indeed facilitate the uptake of the Internet among independent retailers. However, membership of a trade association does not significantly affect Web site adoption by independents. In future ICT support programmes for independent retailers attention should be given to the role of the firm owner and its network in strategic decisions such as if and how to develop a Web site. In addition, special attention should be given to independents led by old(er) and ethnic minority owners, as they are least likely to have a Web site.

With regard to firm characteristics such as size, product, organisational structure, our research mainly confirms the findings of earlier empirical work on the Internet adoption by retailers. Furthermore, we find that all else equal serving mainly male customers and customers with a medium or high income increases the probability of having a Web site. As such, customer characteristics form a valuable contribution to the literature that need to be taken into consideration when studying Internet adoption by retailers.

The main contribution of this study to the retail and SME literature is that we empirically showed that firm owner characteristics matter for Internet adoption by independent retail organisations. Yet, the study also has some limitations. First, we used cross-sectional data to scrutinise the influence of firm owner characteristics on Internet adoption by retailers. For certain characteristics of firm owners such as personal Internet experience and perceived competitive pressure the direction of causality is unclear. For instance, does the personal Internet experience of the firm owner influence Web site adoption, or does having a Web site affect the owner's personal experience with the Internet? That is a question that cannot be answered with cross-sectional data. As such, it is necessary to compile longitudinal data on the relationship between firm owner characteristics and Internet adoption by retailers.

Second, our sample only includes a limited number of firms led by ethnic minority owners, firms with mainly low-income customers, franchisees, and firms selling convenience goods. As such, we could only differentiate among adopters and non-adopters of Web sites. However, retailers can follow various Internet strategies when establishing an online presence (Weltevreden et al., 2005) and the benefits of an online presence vary from Internet strategy to Internet strategy (Weltevreden & Boschma, 2008). Future research should therefore attempt to explore the impact of firm owner characteristics on the type of Internet strategy that independent retailers have adopted. This may further enhance our knowledge of the factors that determine Internet adoption by retailers.

Third, the independents in our survey are all Dutch city centre retailers. Future research should, therefore, include retailers situated at other locations since adoption levels and barriers may differ among shopping centres, cities, regions, and countries (MacGregor & Vrazalic, 2007; Weltevreden et al., 2008). Moreover, a cross-country comparison would be interesting to explore the impact of cultural differences among firm owners on Internet adoption by retail businesses.

Acknowledgements

We would like to thank Ulf-Dietrich Reips and the two anonymous reviewers for their valuable comments on earlier drafts of this paper.

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