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An Analysis of the Factors Affecting the Adoption of the Internet in the UK Retail Sector

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Abstract: *A multitude of opinions has been propounded to explain how the Internet can be exploited by commercial organisations. For the most part they are speculative, visionary or promotional. This work seeks to redress the balance by reporting on an empirical research project that has recently been conducted into the adoption of the Internet within the UK retail sector. More specifically, the research reports on the application of multi-variate statistical techniques to a set of questionnaire responses, with a view to critically evaluating the factors that affect the adoption of the Internet. It has been shown that certain factors are far more significant than others, in influencing the adoption decision. In particular, it has been demonstrated that operating in an appropriate market sector and having a positive view of the viability of the Internet are of particular significance. Furthermore, the importance of developing a coherent and integrated Internet strategy, the need for senior management commitment, and the presence of an appropriate infrastructure and development capability are also highlighted*

1. Introduction

From its humble beginnings as a communications tool for use by scientists and academics, the Internet has grown exponentially in terms of both size and usage. Whilst, the growth of the Internet has already impacted upon most sectors of the economy, for example defence, banking, manufacturing, healthcare and education, it is within retailing that the most significant impact of the Internet is likely to be experienced. The Internet can be harnessed by retailers for the provision of information, the facilitation of two-way communication with customers, the collection of market research data, the promotion of goods and services and ultimately the on-line ordering of merchandise. In particular, this new communications medium offers the opportunity for retailers to expand into global markets, or to enter completely new market segments. According to Pyle (1996), the Internet's *'global connectivity opens up new avenues for business in a manner that traditional commerce conduits cannot match'*.

Since business organisations first started to experiment with the Internet for commercial applications, speculation has been rife about its potential as a new marketing medium. However making accurate predictions is extremely difficult. For example, whilst Field (1996) predicted global Internet commerce to reach \$6.6 billion by 2000, recent research (Economist, 2000; p 5) suggests that business to consumer transactions for 1999 were already \$20 billion, in the USA alone. In the United Kingdom, estimates about the rate and extent of its adoption have also varied greatly. At the optimistic end of the spectrum, Pavitt (1997) suggested that *'by the year 2005 it will capture between 8 and 30 per cent of the UK retail market'*. By contrast other commentators have been more cautious: *'it will be 30 years before 30% of consumer activity takes place online'*. (Economist, 1997; p 17). Despite the optimistic tone of some of these predictions, there is little evidence to suggest that many UK-based retailers have unreservedly embraced the Internet. Indeed, a recent study by Doherty et al (1999) concluded that only 10% of the UK's retailers had established a website, and only 3% had commenced on-line trading. Given the dynamic nature of the UK's retail sector and its normal inclination to be technologically innovative, it is unclear why so few retailers have adopted this new channel, and what factors have influenced their decision.

The research presented in this paper critically evaluates the factors that affect the adoption of the Internet, through the application of multi-variate statistical techniques on a large set of questionnaire responses. The following section of this paper discusses the adoption of Internet as it is portrayed in the literature, before establishing the research objectives for this project. The development, validation, targeting and distribution of a postal questionnaire survey are described in section three. The research results are presented in a series of tables that are discussed in the fourth section, whilst their importance and strategic implications for the retail sector, is assessed in the concluding sections.

2 Factors affecting the adoption of the Internet: current perspectives and research objectives

This section seeks to review the work of previous authors who have conducted studies of the factors likely to influence Internet adoption, and in so doing, define the research objectives that guided the execution of this research study. Teo *et al.* (1997) examined the factors affecting

Internet adoption amongst large business, based in Singapore, using a contingency model. The work concluded “*that organisational and technological factors were more important than environmental factors in the adoption of the Internet*”. In particular, aggressive technology policy, compatibility of the Internet with organisational culture and infrastructure, and top management support were the most significant contingency factors affecting Internet adoption. Relative advantage was also considered to be important but to a lesser extent. Vadapalli and Ramamurthy (1997) explored underlying motivations of business adoption of the Internet based on their study of large US-based, communications companies. They found some support for their proposition that organisational boundaries, transaction costs, economics and organisational cognition were determinants of business adoption of the Internet. In addition, they suggest the inherent self-fulfilling characteristics of the Internet affect levels of use: the greater the benefits the greater the level of use of the Internet. Furthermore, adopters need to perceive the potential value of the technology positively before they will adopt. O’Keefe *et al*, (1998) examined small business adopters (mainly retailers) of the Internet seeking to identify factors which, affect successful performance of Web-sites. They concluded that: the opportunity to expand markets could be affected by the *fit* between product and Internet demographics, perceptions related to the cost of doing business on-line (e.g. low cost and low risk) and consumer concerns (i.e. security, credit risks). These determinants affected whether a business would realise the opportunities offered by the Web. However, product type and company size were not seen as differentiating characteristics of companies likely to perform well on the Internet but the extent of interactiveness of their Web offer appeared to affect the overall success.

The recently published works of Teo *et al* (1997); Vadapalli & Ramaurthy (1997) and O’Keefe (1998), each of which targets a different organisational sector, provide evidence to suggest that there are a number of different factors affecting Internet adoption. However, there appears to be relatively little agreement, between these three pieces of work as to the identity of such critical factors. Consequently, given the global nature of the Internet phenomenon, it is increasingly important that further sector and country-specific studies are undertaken, so that experiences can be shared and objective comparisons can be made. To this end, an extensive research study was

initiated that sought to explore the factors affecting the adoption of the Internet, amongst UK-based retailers. The specific objectives of this research were as follows:

1. To derive a number of distinct factors that are likely to affect the adoption of the Internet.
2. To establish current levels of Internet adoption amongst the UK's leading retailers.
3. To explore the nature of the relationship between each of the derived factors and the resultant level of Internet adoption.
4. To evaluate which of the derived factors is most influential in determining the resultant level of Internet adoption.

It was envisaged that by addressing these four objectives, important insights into how retail organisations should approach the task of developing an Internet strategy might be generated. Furthermore, the experiences of retail companies in the UK would allow objective comparisons to be made with studies from a variety of other countries and sectors. The following sections of this paper describe and discuss the primary research that was undertaken to explore the four research objectives.

3. Research method

The aim of this research is to build upon the finding of previous exploratory, qualitative research, which identified a number of critical factors affecting Internet adoption, based upon a sample of twenty retailers (Doherty et al, 1999). The chosen research instrument was a questionnaire as it offers the maximum potential to produce results, which are generalisable in terms of the population (McGrath, 1982). Whilst the rigorous process by which the questionnaire was designed, pre-tested, piloted and ultimately distributed is summarised in table 1, the aim of this section is to focus in particular on the content of the questionnaire and the mechanisms by which it was ultimately targeted and distributed.

*Insert **table 1** about here*

3.1 Content of the Internet retailing questionnaire

In order to address the four research objectives highlighted in section 2 it was necessary to develop a series of measures that would adequately describe an organisation's level of Internet adoption and the factors that that had been influential in its adoption. The research questionnaire was

developed through an iterative process of review and refinement, and it was ultimately divided into three major sections, each of which is briefly reviewed below:

1. Respondent classification: The first section records company details and information specific to the respondent's position and role. This section also sought to classify the company's product activity sector and the size of the organisation in terms of number of outlets, recorded job title of respondents, and level of management responsibility.

2. Scale of Internet adoption: The second section of the questionnaire explores current levels of Internet activity. This issue is tackled in two ways. Firstly, following the lead of Teo et al (1997) respondents were asked to describe their general progress in developing an active web-site, using a five-item scale ranging from '*no plans to develop a web-site*' through to '*active web-site in existence*'. Whilst this approach was important as it allows comparisons with previous studies, it was recognised that item '*active web-site*' could cover a very wide variety of different functions. Consequently, an additional more specific measure of Internet adoption was also required. Griffiths and Krampf (1998) have previously suggested that the web's ability to process sales orders is probably the '*most compelling reason*' for adopting the Internet. It was, therefore, decided to also measure the retailers' progress in the adoption of on-line sales, using a four-item scale ranging from '*no activity planned*' to '*already active in web-site*'.

3. Factors affecting Internet adoption: In order to explore the factors affecting levels of Internet adoption, respondents were questioned on their perceptions of the facilitators, inhibitors, advantages and disadvantages of Internet adoption. Whilst the set of 37 distinct adoption factors was derived primarily from the exploratory qualitative research, many of the issues have also been mentioned in the literature. Each factor was explored using a five-point Likert scale to ascertain the extent to which the factor was perceived to have influenced the adoption decision. Table 2 provides a full list of the questions relating to the inhibitors and facilitators of Internet adoption, whilst table 3 focuses upon the Internet's comparative advantage.

Insert tables 2 and 3 about here

3.2 Targeting and execution of questionnaire

The primary objectives of the targeting exercise were to determine which types of individuals, in which class of companies to target. The Business Monitor (1996; p 27) concludes that '*multiple*' retailers (at least ten branches) account for 68% of the UK's retail sales. Consequently, whilst '*multiple*' retailers were an obvious starting point for the sampling frame, organisations with a turnover in excess of £5million were also targeted to ensure that influential single-store retailers, such as Harrods and Selfridges, and mail order companies were not excluded from the study. The sample of 1099 organisations was ultimately drawn from the Healy and Baker Retail Directory (1997), which contains a comprehensive list of the UK's retailers. With respect to the choice of individual to target, the qualitative research had indicated that the employee with responsibility for Internet development was most likely to be a manager working in the marketing department, or in a smaller number of cases a manager from the information systems (IS) group. Consequently, the questionnaire was targeted at the most senior marketing executive, as listed in the Healy and Baker Directory (1997). This individual was invited to either complete the questionnaire, if they were responsible for their organisation's Internet activities, or forward it to the manager who has the most direct responsibility. In the minority of cases where no marketing executive was listed in the Directory, a senior information systems manager was selected as an alternative. The mailing ultimately resulted in the receipt of 164 useable replies, and the return of 159 envelopes marked '*addressee not known*', giving an overall response rate of 17.5%.

To ensure that the respondents to the survey were not systematically different from the non respondents, a set of telephone call back interviews were conducted. A random selection of 200 non-respondents were telephoned and asked to comment on whether they had received the questionnaire, and to explain their subsequent course of action. In the majority of cases (59%), the reason for non-response, such as: '*company policy*', '*respondent too busy*' or '*personal policy*' did not indicate any systematic bias in attitude to the Internet. In a further 35% of the cases, the respondent was found to be '*ineligible*' (Churchill, 1995; p 662) because either: '*the organisation was no longer trading*', '*the individual had left the company*' or '*the individual had moved within the company and not received the questionnaire*'. This finding is important because, used in conjunction with the response rate calculation proposed by Churchill (1995; p 663), it suggests that

the underlying response rate is 25%, rather than 17.5%. Finally, in only 6% of the sample was there any reason for not responding that might be due to their personal or company attitude to the Internet. Consequently, it can be concluded that if there is any bias, it is minimal, and will not unduly affect the generalisability of the results, within the confines of the sampling frame.

4. Research Results

This section presents a discussion of the research results relating to the four specific research objectives proposed earlier.

4.1 The Identification of Internet Adoption Factors

Given the high number of variables, identified in tables 2 and 3, that might influence Internet adoption, factor analysis was used to establish whether this data could be consolidated into a smaller number of distinct factors. Factor analysis is a means of summing information contained in a large number of variables into a smaller set of new composite factors with a minimum loss of information (Hair *et al*, 1997; p 90). To simplify interpretation, independent factor analyses were run on each of the two variable sets. The ratio of the number of variables to the sample size is an important prerequisite for factor analysis success. Hair *et al*, (1997; p 98) suggest that the minimum for an acceptable ratio is at least five observations for each variable included in the analysis. In this study, the ratios of respondents to variables were 8.2:1 for set 1 and 9.1:1 for set 2. Furthermore, it was established that the measure of sampling adequacy (MSA) scores (set 1 = 0.712; set 2 = 0.834) were appropriate. Consequently, factor analysis is an appropriate tool in these circumstances.

Principal components factor analysis, with a varimax rotation, was the chosen method for the factor analysis, as it is easier to interpret the results Hair *et al*, (1997; p 106). The application of the 'Scree' test and a review of the 'Eigen' values was used to determine the most statistically significant number of factors for each of the variable sets. Ultimately, four factors were identified from the twenty variables inhibitor / facilitator variables, whilst six distinct factors were identified from the seventeen comparative advantage variables. The factor loadings, and associated 'Eigen' values, for both variable sets are presented in Appendix A. Having arrived at a satisfactory number

of statistically significant factors, the aim of the remainder of this section is to determine appropriate names for each factor. Each of the ten derived factors is briefly reviewed and named below:

1. The first factor has six significant factor loadings, all of which are positively correlated. The '*Internet access of the respondents target audience*' is the most highly correlated variable followed by '*level of Internet awareness*' and '*computer literacy*' of the responding organisations target audience. The '*gender*' and '*age*' of the existing target audience are followed in terms of significance by '*suitability of current product range*' for Internet retailing. This factor is named the **Internet target segment** because the contributing variables emphasised issues associated with target market and segmentation issues for Internet consumer markets.
2. This factor consists of 5 significant variables, three of which have a strong strategic focus, namely '*Senior management support*', '*management vision of the usefulness of the Internet*' and '*company's Internet development strategy*'. Additionally, the availability of resources, in terms of both the level '*funding*' and '*human resources*', contributed significantly to this construct. Ultimately, this factor is named **Internet strategy**, as all five variables relate to the organisations strategic vision and willingness to provide appropriate resources to support its implementation.
3. Three of the variables, in this factor, focus strongly on issues relating to the organisation's perception of the Internet market, namely the '*size*' and '*maturity*' and '*other retailers' on-line activities*'. As the fourth variable '*technical reliability of the Internet*' also relates to the perceived viability of the Internet market, this factor is named **Internet market-place**.
4. The final factor from set 1 consisted of five variables: '*company's technological infrastructure*', '*company's logistical infrastructure*', '*web design skills*', '*web developer's promotional offers*' and '*outsourcing of functions*'. The factor is named **infrastructure and development capability**, as all five constituent variables are associated with an organisation's readiness and ability to exploit the Internet.
5. The first factor from set 2 consists of four variables; '*method of communication with customers*', '*expanded customer services*', '*speed of communication with customers*' and '*means of collecting market research data*'. These variables form a coherent group, all of which have a strong focus on the Internet's ability to facilitate communications between the retailer and their customers. Consequently, this factor is named **Internet communications**.

6. The '*cost of logistics to support the on-line operation*' is the most significant variable in this factor. Two additional variables, namely the '*cost of supporting two different channels*' (direct sales via the Internet and fixed retail store operation), and the '*cost of restructuring the organisation*', also contributed. This factor is named **cost of Internet trading**, given its emphasis on the cost associated with Internet retailing.
7. This factor also has three constituent variables, all of which are associated with the financial potential of the Internet; '*low running costs of on-line operations*', '*low set up costs of on-line operations*' and a '*reduction in need for future investment in fixed location store development*'. The factor is named **Internet cost opportunity** because the underlying variables suggest that there is an opportunity to derive commercial advantage by maximising immediate and mid-term cost saving offered by the Internet.
8. The three variables in this factor are all associated with the Internet's ability to foster the development of new markets; namely '*increased access to global markets*', '*increased access to niche consumer markets*' and '*increased trading hours*'. Consequently, the factor is named **market development opportunity**.
9. The ninth factor contains only two variables; '*media reporting of the negative aspects of the Internet*' and '*concerns about on-line security*'. Accordingly, the factor is named **concerns**, as both the variables are associated with negative aspects of the Internet, which have been widely reported in the literature.
10. The final factor also consists of just two variables; the '*consumer's perceived preference for going shopping*' and the '*Internet's inability to convey all of the different types of sensual information*'. Consequently, this factor is named **consumer preferences**, because of its focus on perceptions about consumer behaviour focus.

Having demonstrated that each of the ten derived factors form coherent groups of associated variables, which can be given appropriate names, it is also important to test their validity and reliability. The internal reliability of each factor was, therefore, examined using Coefficient '*alpha*' (Hair et al, 1997; p 118). Ideally, alpha scores should exceed 0.70, although scores of 0.60 and above are acceptable DeVellis (1991). In this instance, six of the factors can be classed as '*ideal*'

(factors: 1-3 & 4-6), two can be classed as 'acceptable' (factors: 4-5), whilst the two remaining factors (factors: 9-10) have alpha scores marginally under the minimum cut-off value of 0.60. However, as this research is of an exploratory nature these two factors (factors: 9-10) were ultimately retained, in the interests of completeness.

4.2 Current Levels of Internet adoption

As noted in section 3.1, the extent of Internet adoption was measured in two ways. Respondents were firstly asked about their general progress in adopting the Internet and then asked about their plans specifically with respect to using the Internet as a channel for on-line sales. The results presented in tables 4 and 5 demonstrate that the adoption of the Internet amongst the UK's leading retailers is still relatively modest.

Insert tables 4 & 5 about here

The findings are of particular interest and significance when set alongside comparable figures for Internet adoption amongst US retailers. For example, whilst this study has found that only 37% of the UK's leading retailers have established an active web-site, a comparable study by Griffith and Krampf (1998) indicates the level of uptake in the US is already 64%. Similarly, whilst this study found only 18% of UK retailers were engaged in on-line selling, a recent Ernst and Young (1999) study reported that 39% of U.S retailers were already engaging in on-line sales. Consequently, given the global nature of the Internet, many UK retailers might find themselves at a competitive disadvantage, with respect to their US counterparts.

4.3 The Relationship between Individual Factors and the Level of Internet Adoption

Having identified ten distinct and meaningful factors, it is possible to explore the relationship between each of these and the level of Internet adoption, measured both in terms of the creation of an interactive web-site in general terms and its use for on-line sales, in particular. These relationships were explored by conducting an analysis of variance (ANOVA), to determine whether observed differences among sample means can be attributed to chance or whether statistically significant differences exist (Freund *et al.*, 1993: pp 525-540). The results of this analysis are

discussed with respect to both the adoption of an active web-site and its application for on-line sales.

The adoption of an active web-site: An inspection of the data, in table 6, suggests that levels of Internet adoption are significantly influenced by all the factors, with the exception of '*concerns*' and '*Internet cost opportunity*'. To interpret the mean success scores, it must be remembered that the higher the score, the more strongly a particular factor influenced an organisations level of Internet adoption, and *vice versa*. Bearing this in mind, the three following distinct types of relationship, are identified:

- 1. Positive Influences:** This group of factors (1, 2, 3, 4 & 7) is characterised by a fairly steady rise in mean values from '*non-adopters*' through to the adoption of an '*active web-site*'. The implication of this pattern is that these five factors all exert a positive influence on an organisation's adoption of the Internet. Consequently, as an organisation makes progress in the adoption of an '*active web-site*', there is an increasing recognition of the importance and influence of factors, such as the availability of an appropriate '*infrastructure and development capability*' and an '*Internet strategy*'.
- 2. Negative Influences:** Two of the factors, '*cost of Internet trading*' and '*consumer sensitivity*' are exerting a negative influence. It can be seen that there is a steady decline in mean values from '*non-adopters*' through to '*active web-site*'. The implication of this pattern is that both these factors have strongly influenced the '*non-adopters*' to refrain from investing, but the influence of the 'cost of Internet trading and consumer sensitivity gradually weakens as an organisation progresses to an '*active web-site*'.
- 3. Variable Influences:** One of the nine significant factors, '*Internet Communications*' displays a distinctly different pattern to the others. Whilst its influence rises steadily from the '*non-adopter*' through to the '*active planning*' phase, it then starts to decline as the organisation progresses through '*active development*' through to '*interactive web-site*'. The implication of this is that whilst the Internet's ability to facilitate communications strongly influences an organisation to commence an Internet project, once the project is underway, its perceived importance gradually diminishes.

Insert table 6 about here

An inspection of the F ratios in table 6 also indicates that it is two of the *'positive influences'* that are exerting the strongest influence: 1) the presence of an *'Internet strategy'*; 2) the availability of an appropriate *'Internet target segment'*.

The adoption of on-line sales: This section examines the effect of the ten critical factors on the extent to which the Internet is used as a channel for on-line sales. Table 7 shows the results of a one-way ANOVA for these variables. As for the adoption of an interactive web-site, an inspection of the data indicates that, all the significant relationships (all factors other than 6 & 9) can be classed as either having a positive, negative or variable influences. More specifically, it can be seen that all the factors are exerting the same style of influence, as they were for the adoption of an *'interactive web-site'*, with the exception of factors 1 and 7 that have both moved from a *'positive'* to a *'variable'* influence. This suggests that the factors affecting the adoption of an on-line sales facility are not dissimilar to those influencing the development and implementation of an *'active web-site'*.

Insert table 7 about here

An inspection of the F ratios in table 7 indicates that it is two of the *'positive influences'*, once more, that are exerting the strongest influence: 1) the belief that there is a viable *'Internet market-place'*; the availability of an appropriate *'Internet target segment'*.

4.4 The Relationship between All Factors and the Level of Internet Adoption

Whilst ANOVA is a very useful tool for exploring the relationships between each of the ten individual factors and specific dependent variables, it does not provide a holistic picture of the relative importance of the factors. Consequently, stepwise discriminant analysis, which is used to explore statistical relationships between a number of metric independent variables and a single categorical dependent variable, was used to provide a more holistic picture. Whilst discriminant analysis can cope with a dependent variable representing two or more groups, for the purposes of this study, the multiple groups were collapsed into two, to ensure that none of the minimum group membership criterion were broken (Hair et al, 1997; p 282). Consequently, the analysis was designed to discriminate between those organisations already using, or planning to use the Internet, as opposed to those who aren't. The remainder of this section presents the results of the application of

discriminant analysis to explore the relationship between the ten factors and firstly the adoption of an '*interactive web-site*', and then for the uptake of '*on-line sales*'.

The adoption of an active web-site: Having undertaken the analysis, the tests, suggested by Crook et al (1992), were successfully used to confirm the statistical validity of the discriminant model. For the purposes of interpreting the discriminant model, Hair et al (1997; p294) suggest that '*all variables entered into the function, and generally any variables exhibiting a loading of ± 0.30 or higher are generally considered substantive*'. Consequently, it can be seen from the results, presented in table 8, that the two variables entered into the discriminant function, namely the presence of an '*Internet strategy*' and an appropriate '*Internet target market*', are the most important discriminators of the level of Internet adoption. However, three other factors ('*Internet development resources*'; '*market development opportunity*'; '*Internet market-place*') are also important discriminators, as their loadings values are greater than 0.3. Furthermore, it can also be seen that these five variables also have the highest univariate F ratios, which reinforces the discriminatory importance of these variables. Consequently, it is these five factors are the most important and should be given the highest priority when assessing the feasibility of a web-site project.

*Insert **table 8** about here*

The Adoption of on-line sales: A discriminant analysis was conducted to establish the relative importance of the ten factors in influencing the adoption of an on-line sales facility. Once more, Crook et al's (1992) tests were applied to ensure the statistical validity of the discriminant model. It can be seen from the data, presented in table 9, that the two factors entered into the discriminant function ('*Internet target segment*' and '*Internet market-place*') are the most important discriminators for the adoption of on-line sales. However, three other factors ('*market development opportunity*'; '*Internet communications*'; '*Infrastructure and development capability*') are also important discriminators. Furthermore, it can also be seen that these five factors also have the highest univariate F ratios, which reinforces the discriminatory importance of these variables. It can, therefore, be concluded that it is these five factors that should be given the highest priority when evaluating the viability of an on-line sales initiative.

Insert **table 9** about here

5 Discussion: factors affecting the adoption of the Internet in the UK retail sector

Having identified the major factors affecting the adoption of the Internet amongst the UK's leading retailers, it is important to review the findings and contextualise them within the relevant literature. Furthermore, the implications of this study, both for the retail practitioners and researchers, are reviewed, as are the study's potential limitations. When interpreting the results with respect to the factors affecting Internet adoption, it is clear that all factors, other than '*concerns*' are exerting a significant influence on the decision to adopt web-site technology. Furthermore, it can be seen that it is the factors associated with potential inhibitors and facilitators (1-4), as opposed to the relative advantage factors (5-10) that are exerting the strongest influence. In particular, the marketing oriented factors ('*Internet target segment*'; '*Internet market-place*'; '*Market development opportunity*') have strongly influenced organisations, with respect to both the adoption of an active web-site, and its use for on-line sales.

It is also interesting to compare the factors that are affecting the adoption of active web-sites, in general, as opposed to on-line sales, in particular. Whilst there are many similarities between the two sets of factors, there are some important differences in emphasis. For example, whilst the key drivers for the development of an on-line sales facility are primarily concerned with marketing oriented factors (3, 4 & 7), the motivation for the provision of an active web-site is more dependent upon the strategy, commitment, infrastructure and capabilities of the host organisation (1 & 2). This latter finding aligns reasonably well with the work of Teo et al (1997) who have also identified the importance of factors such as technological policy, senior management commitment and an appropriate infrastructure, in influencing the adoption of the Internet. These findings are also consistent with previous work assessing the diffusion of technological innovations (e.g.: Grover, 1993; Zmud, 1984). By contrast, the identification of the importance of marketing factors, in particular, operating in an appropriate '*Internet target segment*' and a belief in the viability of the '*Internet market-place*', especially with respect to the adoption of on-line sales, is an important new contribution to knowledge.

These findings offer a number of important implications for managers within the retail sector. The most important factor, in this context, is probably the '*Internet target segment*'. More specifically, any organisation operating in an appropriate '*Internet target segment*', that is reluctant to invest in Internet technology and develop a web presence, faces the threat of having their customers aggressively targeted by their more technologically innovative competitors. Additionally such organisations will probably need to educate their managers on the viability of the '*Internet marketplace*' and take steps to develop an '*Internet retailing strategy*' and acquire an appropriate '*infrastructure and development capability*'. For those organisations not operating in an appropriate '*Internet target segment*', the pressure to develop an on-line sales capability is perhaps less acute. However, in such circumstances an '*Internet strategy*' should still be developed to help them explore the merits of developing an active web-site offering the ability to communicate, and develop long-term relationships, with their customers. Furthermore, as the commercial importance of the Internet grows, companies not operating in an appropriate '*Internet target segment*' might be advised to reposition their goods and services to meet the needs of the Internet consumer.

Previous research (Doherty et al, 1999; Evans & Wurster, 1997; Hart et al, 2000) has highlighted the pressing need for organisations to be provided with guidance on the development of a coherent Internet strategy. Consequently, a further benefit of this study, to a business audience, is that it provides some important insights into the areas that should be addressed when a retail organisation develops an Internet strategy. It should also be noted, that given the importance of the marketing and market-oriented factors, any such Internet strategy must be fully integrated with the retailer's overall marketing and corporate strategies. Furthermore, this research provides useful insights with respect to the issues that should be addressed when a retail organisation is evaluating the viability of, and risks associated with, future Internet investment proposals. More specifically, it is envisaged that the taxonomy of 37 individual influencing variables, grouped into the ten factors, could be used as the basis for an evaluation framework; highlighting the potential areas where competitive advantage might be attained and identifying the set of actions necessary to facilitate Internet adoption. Ultimately, this research should also be of interest to the researcher, as it has identified and validated many new variables, in addition to the ten distinct factors, associated with the adoption of Internet, all of which might be usefully incorporated in future research.

Research into the adoption of innovative technology, within the organisational context, is an ambitious undertaking, and therefore contains a number of inherent limitations. In particular, the adoption of the survey format restricts the range of issues and constructs that can be explored, the selection of a very narrow sampling frame reduces the generalisability of the results and finally there is potential response bias associated with the 'single-informant'. Whilst the study provides many interesting and novel insights, these limitations do highlight the need for follow-up studies to be conducted employing different methods, and target different populations.

6 Concluding Remarks

This empirical study has applied rigorous statistical methods in the development of a taxonomy of distinct and meaningful factors that have the potential to influence the uptake of the Internet within the retail sector. More specifically, it has been shown that that operating in an appropriate market sector and having a positive view of the viability of the Internet, when coupled with an appropriate strategy, level of commitment, infrastructure and capability, have the greatest influence on Internet adoption. Such insights are of particular importance at this period of time, when many organisations are making the transition from a relatively limited to a more extensive web presence. Whilst the findings will be of most significance to those organisations operating within the UK retail sector, it is likely that they will also be of interest to companies in other countries that have still to establish a significant web presence. Finally, given that the Internet is an increasingly important, highly dynamic and global phenomenon, it is important that a variety of follow-up studies are conducted. In particular, it is important that similar studies are conducted in a range of sectors, within a variety of countries to identify areas of commonality and variation, in terms of the factors influencing Internet adoption.

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Table 1: Summary of Research Method

Phase	Purpose and Outcomes
Literature Review	Literature reviewed to gain insights into the factors that might affect Internet adoption. The work of Teo et al [1997] was particularly helpful in this respect.
Qualitative Research	In-depth interviews were conducted to determine the factors that were perceived as being influential in determining the level of Internet adoption. In all interviews were conducted with the manager responsible for Internet development in twenty UK-based retail organisations, which were specifically chosen so that they formed a representative cross section of the retail sector.
Instrument Development	Integration of the interview findings and the literature provided the necessary material for the development of a draft questionnaire.
Pre-testing	<p>Pre-testing (Reynolds et al, 1993) was conducting as a mechanism for both refining and validating the research instrument. The pre-testing was conducted in the following three phases:</p> <ol style="list-style-type: none"> 1. Group of 16 appropriate individuals, including academic experts and retailers. Each completed the questionnaire and then participated in de-briefing interviews. 2. A further 8 academics and retailers, who hadn't participated in the first phase of pre-testing, critically evaluated the questionnaire. 3. Representatives of 10 retail organisations completed the questionnaire and provided critical feedback with respect to its validity, wording and clarity. <p>After each of the three phases the draft questionnaire was modified to take account of the participants concerns and observations. The pre-testing resulted in many significant changes to the questionnaire's design, which greatly increased its quality.</p>
Pilot testing	Having successfully pre-tested and refined the research instrument, a pilot test was conducted to assess the likely response rates and to confirm the questionnaires reliability (Straub, 1989). From the total of 132 retailers randomly selected, a total of 29 replies (response rate: 22%) were received.
Full Survey	The survey, once thoroughly validated, was mailed to the UK's leading retailers (1099 organisations). Ultimately 164 valid responses were received representing retail organisations from 17 product activity sectors. The respondents were all managers, or senior managers, typically from the marketing function. A fuller discussion of the targeting of the survey can be found in section 3.2.

Table 2: Potential Inhibitors and facilitators of Internet adoption (Variable set 1).

Variable Description	Additional Sources
Level of funding available retail development on the Internet	Teo <i>et al</i> , (1997)
Senior management's level of commitment	Teo <i>et al</i> , (1997)
Web design skills of company personnel.	
Company's technological infrastructure	Teo <i>et al</i> , (1997)
Company's logistical infrastructure	
Level of human resources available	Teo <i>et al</i> , (1997)
The management vision of the usefulness of the Internet	Teo <i>et al</i> , (1997)
Suitability product range for Internet retailing	O'Keefe et al (1998)
Company's target customers' levels of access to the Internet	Hoffman & Novak, (1998)
Company's target customers' levels of computer literacy	
Company's target customers' levels of Internet awareness	
Gender of company's target customers	
Age of company's target customers	
The current size of on-line market place	
The maturity of Internet market	
Other retailers' on-line retail activities	Vadappalli & Ramamurthy (1997)
Technical reliability of the Internet	
Web developer's promotional offers	
The company's Internet development strategy	
Outsourcing of functions not available within the company	

Table 3: Potential Advantages and Disadvantages of Internet adoption (Variable set 2).

Issue / Content	Additional Sources
High cost of running on-line and off-line operation.	
High cost of the logistical support of on-line sales operation.	Morgansky (1997)
Consumer's perceived shopping preferences	KPMG & OXIRM (1996)
High cost of restructuring operations for on-line operation.	
Concerns about on-line security	O'Keefe et al, (1998)
Media reporting of the negative aspects of the Internet	
Low set up costs of on-line operation	O'Keefe et al, (1998);
Low running costs for the operation of the Internet	Pavit, (1997)
Increased trading hours e.g. 24 hours a day 365 days a year	Aldridge & Darnwood (1998)
Increased access to global consumer markets	O'Keefe, (1998);
Increased access to niche consumer markets	Aldridge & Darnwood (1998)
A new means of collecting Market Research Data	Davis (1997)
Reduction in need for future investment	KPMG & OXIRM (1996)
The rapid speed of communication with customers	Vadappalli & Ramamurthy (1997)
A new and innovative method of interaction with consumer	O'Keefe et al, (1998);
Expanded customer services	
Internet's inability to convey sensual information	

Table 4: Adoption of Active Web-site

No Internet activity planned	URL Only	URL and actively planning	URL and actively developing	Active Web site
35 (21%)	32(19.6%)	18 (11%)	17 (10.4%)	62 (37.8%)

Table 5: Adoption of On-line Ordering Facility

No Activity planned	Planned to include in Web site	Actively being developed	Already present in Web site	Missing Cases
43 (26.2%)	55 (33.5%)	20 (12.2%)	30 (18.3%)	16 (9.85)

Table 6: Mean Ratings and Significance Levels for Internet Adoption

Factor name	Non adopters	URL Only	URL and planning	URL and developing	Active Web site	F ratio	Sig.
1 Internet strategy	2.31	2.46	3.19	2.97	3.24	10.70	0.00*
2 Infrastructure & development capability	2.38	2.53	2.81	2.88	3.00	6.27	0.00*
3 Internet target segment	2.29	2.59	3.19	2.96	3.21	8.25	0.00*
4 Internet market-place	2.52	2.61	3.10	3.11	2.97	4.22	0.01*
5 Internet communications	3.20	3.28	3.86	3.70	3.63	3.11	0.02#
6 Internet cost opportunity	2.76	2.81	3.09	3.14	3.23	2.04	0.09
7 Market development opportunity	3.11	2.97	3.37	3.50	3.65	3.29	0.01*
8 Cost of Internet trading	3.22	3.06	2.96	2.92	2.36	4.75	0.00*
9 Concerns	2.78	2.45	2.88	2.66	2.65	0.74	0.56
10 Consumer sensitivity	3.80	3.36	3.68	2.91	3.05	4.73	0.00*

Notes: * significant at the 1% level; # significant at the 5% level

Table 7: Mean Rating and Significance Levels for the Ordering of Goods On- line

Factor	None	Planning	Developing	Active	F ratio	Sig.
1 Internet strategy	2.53	2.88	3.29	3.24	5.56	0.00*
2 Infrastructure & development capability	2.50	2.80	3.00	3.01	4.77	0.00*
3 Internet target segment	2.24	3.03	3.09	3.35	13.12	0.00*
4 Internet market-place	2.42	2.94	3.19	3.20	10.90	0.00*
5 Internet communications	3.09	3.58	4.02	3.62	6.88	0.00*
6 Internet cost opportunity	2.73	3.10	3.23	3.25	2.48	0.06
7 Market development opportunity	2.82	3.46	3.78	3.58	5.90	0.00*
8 Cost of Internet Trading	3.07	2.72	2.75	2.28	3.34	0.02#
9 Concerns	2.57	2.90	2.70	2.40	2.08	0.11
10 Consumer sensitivity	3.54	3.46	2.90	2.83	4.90	0.00*

Notes: * significant at the 1% level; # significant at the 5% level

Table 8: Interpretative measures for the 'Adoption of an Active Web-site'.

Factors	Standardised	Discriminant	Univariate		
	Weights	Loading	F Ratio		
	Value	Value	Ranking	Ranking	
1 Internet strategy	0.733	0.833	1	40.797	1
3 Internet target segment	0.562	0.693	2	29.655	2
2 Infrastructure & development capability	NI	0.352	3	22.951	3
7 Market development opportunity	NI	0.343	4	11.675	5
4 Internet market-place	NI	0.312	5	15.947	4
5 Internet communications	NI	0.286	6	11.272	7
10 Consumer sensitivity	NI	-0.189	7	7.822	8
6 Internet cost opportunity	NI	0.168	8	7.800	9
8 Cost of Internet trading	NI	-0.166	9	11.506	6
10 Concerns	NI	-0.120	10	0.27	10

Notes: This discriminant function is highly significant (.000) and has a predictive accuracy of 75%. Eight of the factors are not included (NI) in the stepwise solution.

Table 9: Interpretative measures for the 'Adoption of On-line Sales'.

Factors	Standardised	Discriminant		Univariate	
	Weights	Loading	Ranking	F Ratio	Ranking
	Value	Value		Value	
3 Internet target segment	0.655	0.874	1	35.644	1
4 Internet market-place	0.530	0.792	2	28.188	2
7 Market development opportunity	NI	0.405	3	16.123	3
5 Internet communications	NI	0.355	4	15.352	4
2 Infrastructure & development capability	NI	0.312	5	11.563	5
1 Internet r strategy	NI	0.277	6	10.969	6
6 Internet cost opportunity	NI	0.225	7	6.912	7
10 Consumer sensitivity	NI	-0.122	8	3.804	9
9 Concerns	NI	0.053	9	0.680	10
8 Cost of Internet trading	NI	-0.034	10	5.737	8

Notes: This discriminant function is highly significant (.000) and has a predictive accuracy of 79%. Eight of the factors are not included (NI) in the stepwise solution.

Appendix A: Results of the Factor Analysis

Variable Set 1- Factors and Loadings for Underlying Variables.

Component	Factor 1	Factor 2	Factor 3	Factor 4
Level of funding available retail development on the Internet		0.757		
Senior management's level of commitment		0.864		
Web design skills of company personnel.				0.522
Company's technological infrastructure				0.744
Company's logistical infrastructure				0.729
Level of human resources available		0.545		
The management vision of the usefulness of the Internet		0.844		
Suitability product range for Internet retailing	0.646			
Company's target customers' levels of access to the Internet	0.910			
Company's target customers' levels of computer literacy	0.880			
Company's target customers' levels of Internet awareness	0.888			
Gender of company's target customers	0.708			
Age of company's target customers	0.701			
The current size of on-line market place			0.651	
The maturity of Internet market			0.742	
Other retailers' on-line retail activities			0.766	
Technical reliability of the Internet			0.710	
Web developer's promotional offers				0.484
The company's Internet development strategy		0.721		
Outsourcing of functions not available within the company				0.383
Eigen Values	6.388	2.692	2.028	1.469

Note: Whilst the final variable, '*outsourcing of functions*', has a factor loading which is below the minimum of 0.4 recommended by Hair et al (1997). However, given that it only just misses the cut-off, and it forms a coherent group with the other four variables, it was retained in factor 4.

Variable Set 2 - Factors and Loadings for Underlying Variables.

Variables	F5	F6	F7	F8	F9	F10
High cost of running on-line and off-line operation.		0.835				
High cost of the logistical support of on-line sales operation.		0.866				
Consumer's perceived shopping preferences						0.772
High cost of restructuring operations for on-line operation.		0.774				
Concerns about on-line security					0.723	
Media reporting of the negative aspects of the Internet					0.815	
Low set up costs of on-line operation			0.836			
Low running costs for the operation of the Internet			0.886			
Increased trading hours e.g. 24 hours a day 365 days a year				0.546		
Increased access to global consumer markets				0.746		
Increased access to niche consumer markets				0.743		
A new means of collecting Market Research Data	0.549					
Reduction in need for future investment			0.625			
The rapid speed of communication with customers	0.816					
A new and innovative method of interaction with consumer	0.862					
Expanded customer services	0.827					
Internet's inability to convey sensual information						0.543

Eigen Values	4.311	3.005	1.612	1.291	1.113	1.027
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