

## Website Quality and Corporate Financial Performance

Paul Watkins\* and Malcolm Smith†

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### Abstract

This paper explores the relationship between the quality of a company's website and aspects of corporate financial performance, for UK manufacturing companies. Survey and archival methods are used to measure website quality and financial performance, and to specify the relationship between the two.

A significant relationship between financial gearing and website quality is observed, consistent with the findings from hardcopy corporate narratives. These findings are limited to listed UK manufacturing companies and may not be generalisable to smaller companies, other industries or different countries. The direction of causation has not been specified, but remains consistent with prior literature, in that excellent website quality may be signalling good financial performance.

The findings have implications for the constructors of websites, in that they should be aware that the content and presentation of these sites will signal users with messages regarding the financial performance of the enterprise. In this regard the paper is the first to apply a specialised commercial survey instrument in the examination of the relationship between website quality and corporate performance.

Keywords: website, internet, in-links, narrative, performance.

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### I. INTRODUCTION

There is substantial literature in which a positive association between the quality of corporate disclosures and corporate financial performance is reported (Jones 1994, Baker & Kare 1992). To date this association has largely been concerned with the content (i.e., complexity and negativity) and presentation (i.e., readability and graphics) of narratives in the annual report. Financial reporting has now been extended to corporate websites (Fisher, Oyelere & Laswad, 2004), but there have been few studies that examine the association between the quality of these disclosures and financial performance. Potentially, even the direction of causation between these two outcomes is problematical: a company might expect to benefit from a high quality website, while it is logical to suggest that a company that is performing well will put more resources into website and e-commerce development, so producing a higher quality website.

Consequently, this study intends to measure the correlation between 'website quality' and company performance, but does not seek to establish a causal relationship. It will test the hypothesis that there is a positive association between the quality of a company's website and the corresponding performance of that company.

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\* Tribal Education & Technology, Nottingham, UK

† Edith Cowan University, Perth, Western Australia

Industry membership may be an influential factor in the nature of disclosure, for instance, the IT industry might be expected to provide more resources for web design; therefore, to avoid associated complications the study is confined to the UK manufacturing sector, though sub-sector impacts are also examined.

Two sets of variables were collected from each company website: firstly alternative measures of financial performance, secondly a quality rating for the website. The study sought to examine any relationship between the two variables.

A large sample of corporate websites was needed, together with the application of a reliable instrument for the measurement of quality, in order to establish a link between the quality of a website and the companies' performance. Unbiased rating of the company websites was accomplished using a respected commercial instrument, together with multiple respondents.

## II. SAMPLE SELECTION

The authors selected sample companies from the FTSE 500 list of companies for 2005, sourced from the Financial Times website ([www.ft.com](http://www.ft.com)). This list provides a comprehensive register detailing the market value, share price and sector of each company, and is ranked in descending order of market value. These public limited companies were used because their financial data is more accessible than that of private limited companies. The 100 companies chosen from the FTSE 500 represented eleven sub-sectors of manufacturing industry: Aerospace & Defence; Automobiles & Parts; Chemicals; Construction & Building Materials; Electronics & Electrical Equipment; Engineering & Machinery; Household Goods & Textiles; Information Technology Hardware; Personal Care & Household Products; Pharmaceuticals & Biotechnology; Steel & Other Metals.

Companies from these sectors were chosen, in descending order, beginning with largest company, until one hundred workable samples were obtained. Appendix 1 details the identities of selected companies. Of the one hundred companies originally selected for the study, eight were excluded from the study, due to absence of financial information or withdrawal of the website due to a company takeover; the exclusions were replaced by the next eight largest companies from the FTSE 500 which satisfied the manufacturing industry requirement.

### Website Quality

When examining the quality of a website, usability is the key design issue; i.e., the ease with which users of the website can access and make use of the website data. If a website is not usable then all other design features become redundant, so usability must be at an appropriate level before any other design features can be considered.

The most effective way of generating results about website usability in this study is through the medium of a questionnaire completed by users of the websites. Whilst searching for a suitable questionnaire, three usability questionnaires were evaluated: SUMI (Software Usability Measurement Inventory), MUMMS (Measuring the Usability of Multi-Media Systems) and WAMMI (Website Analysis and Measurement Inventory).

SUMI is an established questionnaire, used by both developers and purchasers of software to determine the usability of the software. The questionnaire is a hardcopy, rather than electronic version, with the input of results directly into a

computer system only after the paper questionnaire has been completed. The Human Factors Research Group (1998) describes the SUMI website as providing a questionnaire which measures software quality from the end-user point of view. Similarly, MUMMS is an end user questionnaire, but it has been developed to assess the usability of Multi Media Systems rather than software. The Human Factors Research Group (HFRG), based in Cork, Ireland, developed both SUMI and MUMMS. The usability tests in the current study focus on the evaluation of websites, making the WAMMI questionnaire a much more effective and appropriate method of collecting data.

Kirakowski, Whitehand and Claridge (1998) discuss the development of WAMMI, an acronym for Website Analysis and MeasureMent Inventory; it covers a range of factors, that previously have been established as variables in the measurement of usability, notably attractiveness, control, efficiency, helpfulness and learnability. The questionnaire rates websites on their user satisfaction and gives an overall score for website user satisfaction. Kirakowski et al. (1998) test a small sample of websites using the WAMMI questionnaire and describe its success. They suggest that WAMMI is a realistically achievable way of measuring user satisfaction; one which should provide results that are comparable from one website to another. They note that the instrument is being continuously developed, but that already it provides a reliable means of benchmarking between websites.

The use of the WAMMI questionnaire is encouraged by many usability websites for the testing of usability, including: <http://www.usabilitynet.org/home.htm>, one of several websites advising IT professionals on the subject of usability. Moore (2001) endorses the use of the WAMMI instrument as a convenient and cost-effective method of assessing the value and usefulness of an Internet system, in their case the validation of a medical database website.

Lagier (2002) highlights the robustness and adaptability of the WAMMI instrument, by demonstrating its use, in conjunction with other usability tests, in the creation of an original usability questionnaire. WAMMI is also used commercially, and the developers or potential users of a new product may use WAMMI to evaluate that product. For example, Serco Ltd (2002) discuss the use of WAMMI professionally, describing how it was used to help establish whether or not the procurement of an updated system would be suitable for the company, so helping with the decision to pursue alternative products.

Extant literature suggests that the WAMMI instrument is an ideal tool for the evaluation of the quality of the one hundred company websites in the current research. Therefore, WAMMI scores as a measure of usability are used as a measure of website quality.

### III. LITERATURE REVIEW

Corporate disclosures have been studied over many years to determine what makes them successful. Haried (1972, 1973) looked at the ways in which words and symbols were employed in financial reports, utilising various techniques to evaluate their success. He believed that certain words and symbols were used in reports to convey facts, but that the words and symbols might have different meanings to other user-groups, possibly non-accountants.

Readability has been the main focus of the usefulness of corporate disclosures, where readability is interpreted as a measure of the ease and speed at which text can

be read by a group of people. By measuring factors such as long sentences, long words, and the incidence of 'hard' words a readability score can be produced.

Flesch (1948) produced what is still the most widely used formula for the measurement of readability. Smith and Taffler (1992a) demonstrate that 'readability' and 'understandability' are different concepts for accounting-based narratives, but Smith and Taffler (1992b) also show that 'readability' is significantly related to aspects of financial performance; i.e., low profitability, high gearing and poor liquidity were all significantly associated with low levels of readability, with liquidity being the major factor in the link to financial performance. These findings were supported by Subramanian et al. (1993), who looked at the readability of profitable and unprofitable companies' narratives contained within their annual reports and concluded that profitable companies had more readable narratives in their company reports than unprofitable companies.

Ross (1977) notes that in capital markets, firms that perform well will have incentives to disclose information, but also that the competitive environment would force other companies to increase their disclosures. Watts and Zimmerman (1986) develop the 'signalling hypothesis' to refer to the proposition that signalling impacts on corporate disclosures; they suggest that well-performing firms have an incentive to signal their position to potential investors by expending more resources on the disclosure of their financial information.

Healy and Palepu (1993) suggest that managers might adopt such disclosure strategies to communicate their superior knowledge of a firm's operations to external investors.

Smith and Taffler (1992b) extend the signalling hypothesis by suggesting that those firms wishing to signal their superiority to the market will do so with disclosures of greater clarity. They suggest that good financial performance will be associated with clear and readable narratives.

Frazier, Ingram and Tennyson (1984) concluded that narrative disclosures could be used to predict future performance. They studied the change in performance of 74 companies from one year to the next and also the relevant disclosures; they found that company reports could help predict future performance. Tennyson, Ingram and Dugan (1990) look at the content of narrative parts of annual reports in 46 companies, half of which had become bankrupt since the publication of the said reports. They found that these narratives gave a good indication of failure, and were a more useful predictor of performance than financial ratios.

Smith and Taffler (2000) link the content of the chairman's statements with the incidence of company failure. They generate a seven variable word-based model which correctly classifies 65 out of 66 failed and non-failed firms (a 98% success rate) with the non-financial measures accounting for one-third of the explanatory power of the model.

Means (1981) investigated stockmarket response to the readability of annual reports, finding that shareholder reaction to annual reports was not significantly affected by readability level. Means (1981) suggests that shareholders do not alter their behaviour in accordance to how difficult the annual reports are to read, because they are all perceived as difficult!

The existing studies suggest that a relationship may exist between readability of corporate narrative and company performance, with Smith and Taffler (1992b) and Subramanian (1993) identifying a decrease in readability associated with a decrease in financial performance, whether by a decline in sales, firm failure or downturn in

profits. The studies of Frazier et al. (1984) and Smith and Taffler (2000) demonstrate the ability of narrative disclosure to predict the future performance of a company.

Deliberate obfuscation, making reports difficult for the average reader to understand, might be a tool used by business managers to disguise bad performance. Business leaders might be obscuring bad performance by discouraging users to read the text, or in the case of some users, making the text impossible for them to read.

### **Company Disclosures on the Internet**

Through the advent of new technologies, the internet being at the forefront of these technologies, companies are looking for new ways to improve their corporate profile and use the new media to broadcast their message to a wider audience. Publishing reports, such as annual reports, is one of the ways the internet is being utilised by companies.

Ashbaugh, Johnstone and Warfield (1999) reported that the companies that were undertaking Internet financial reporting fell into two categories: the first being those companies that made real use of the internet by publishing timely reports on their sites, thus increasing the relevance and usefulness of the information, and the second, companies that were publishing essentially out-of-date reports. They also suggested that the amount of information available and a facility to allow users to download the data to analyse it, increased the usefulness of the reports.

Wagenhofer (2003) looked at the economic effects of internet financial performance. He suggests that by giving free access to information the Internet has changed the nature of capital markets, through its impact on the costs of information processes and with it the demand and supply of financial information. He suggests that the Internet has also created a demand for standardised financial reporting, so that shareholders or potential shareholders have access to comparable results.

Unsurprisingly, Craven & Marston (1999) found that the extent of financial reporting disclosure on the Internet increased with the size of the company. It is often the larger companies with more resources that lead the way for other, smaller companies to venture into new technologies. This suggests that the number of companies reporting on the Internet will increase, and the extent of the reporting will also increase.

Marston (2003) conducted a study into the amount of Japanese companies that had English websites containing financial information. Essentially, the study detailed the increase in financial reporting using the internet, reporting that in 1998, 78 of the top 99 companies had English language websites, with only 68 of these including some financial information. By 2001, a comparative study reported that the majority of companies that had not previously utilised an English language website, now had English language Web sites with full annual reports available, demonstrating the rapid increase in emphasis placed on Internet reporting.

Ettredge, Richardson and Scholz (2002) studied the timeliness of internet reporting and found that reports published on the company website were a long way behind share prices, in terms of timeliness, with the latter displayed almost immediately. They found the time lag increases with less profitable companies, so that while profitable companies produce reports quickly, unprofitable companies are more reluctant to do so. They also suggest that delays in report posting are associated with more technical content, which is more difficult for the non-professional to

understand; findings entirely consistent with those based on print-based narrative reports for 'good' news and 'bad' news.

Davis, Clements and Keuer (2003) and Ettredge et al. (2002) both discuss the possibility of real-time financial reporting on the Internet, concluding that its occurrence is still unlikely at present, but that quarterly reports will become more popular due to internet access.

Leong, Ewing and Pitt (2002) test the readability of websites in order to assess the varying readability of company websites within one sector (the semi-conductor industry). They find the websites consistently 'difficult' in terms of reading ease, findings similar to those for accounting narratives. However, they suggest that low readability of websites may pose more problems because of differences in access and screen resolution. Nevertheless, clear advantages in publishing financial information on the Internet lie in cost reduction (i.e., costs associated with printing and distributing hard copies to stakeholders) and, timeliness, in that the data can be distributed more quickly, and is more relevant to the user.

### **In-Links**

Vaughan and Wu (2004) aimed to show a relationship between the number of 'in-links' to a company's website and the company's financial performance; 'in-links' being the connections to a website listed on search engines. The authors chose the top 100 Chinese IT companies to eliminate sector differences and country specific cultural differences. They found the number of in-links to a company's website to be positively associated with the company's revenue, profit, and research and development expenditure. Their findings suggest that in-links are related to good performance. However, their comparative study on China's top 100 companies surprisingly found no such correlation, suggesting that there were strong industry-specific effects in the case of IT companies. Vaughan (2004) extends this study to include companies in the US and confirms the findings of Vaughan & Wu (2004), in that business performance measures were significantly correlated to the number of in-links to the company websites, but there was industry variation.

### **Company Size**

Masurel (2004) studied small medium sized enterprises (SMEs) and the impact of websites on the productivity of these businesses. He concluded that in the year of study, 1999, they had no impact on the productivity of the business, when compared to SMEs that did not have a website. However, he noted that those SMEs that were the first to have websites (the early adopters) appeared to perform better than the laggards (the late adopters). Auger (2005) extends the small businesses focus to consider the interaction between internet-based electronic commerce, website design and company performance. He suggests that the level of interactivity (two-way communication) permitted by the website is positively associated with overall performance, but that there was no direct association with the number of visitors to the site.

There remains a scarcity of studies comparing website quality with improved firm performance. However, studies that there are, such as the Vaughan in-links articles, clearly connect websites with firm performance. The in-links studies show that if users are aware of a company's website then the company will benefit or that

firms that are performing well have a bigger web presence. Other articles show that early adoption of websites improves company performance in future years. Design is shown to be a factor that makes websites valuable to companies, though the empirical evidence also highlights size and industry effects.

## Usability

The ISO standard definition of usability is: “*Usability is the extent to which a site can be used by a specified group of users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.*” The concept of usability is referred to within many studies, predominantly for testing software and websites. Usability is the main measure of the quality of a website. Nielson (2000) specifies five factors which determine the usability of a website:

- **Learnability** : the speed at which new users become familiar with a website
- **Rememberability**: the ease at which users remember how to use a website when they return to it
- **Efficiency of use**: the website has features which are easy to find and quick to load up
- **Reliability in use**: the website is always available and complete
- **User Satisfaction**: the degree to which users feel comfortable using the website

To find the reasons for redesign, Benbunan-Fich and Altschuler (2005) analysed press releases from companies that had recently redesigned their websites. They noted that most of the changes were concerned with improvements in the usability of the web presence, rather than the addition of interactive features such as online ordering. Winter, Saunders and Hart (2003) link website design to the image that customers have of an organisation. They believe that a website will influence a customer to have a positive or negative opinion of the company, and subsequently impact on purchasing behaviour. The authors liken a website to a shop-front, in that it gives a first and lasting impression of a company.

Usability is clearly an important factor in web design; if a website is not perceived by its users as usable, if it is difficult to navigate or just disliked by users, they will avoid it. Evidence suggests that the website's problems will reflect badly on the company's image as a whole. Therefore usability is a fundamental factor contributing to website quality, and is a good proxy for web quality, and is treated accordingly within the current study. Usability is the web equivalent of printed text readability, they both measure the ability of users to access from the media what they need. In the case of websites, usability implies the ability to navigate easily to relevant topics of information, and to understand what is found there; if a website is easy to navigate and users can find everything that they need but they still cannot comprehend the text then the website is not usable. This parallels the use of printed narratives used to convey messages which should be both readable and comprehensible.

## The WAMMI Instrument

Nielson (2000) recognises the opportunity that the WAMMI instrument provides for measuring ease-of-use, and maps the 20 questions in this instrument onto his own five categories of usability:

**Table 1**  
**WAMMI Question Categorisation**

Learnability	Rememberability	Efficiency of Use	Reliability in Use	User Satisfaction
This website needs more introductory explanations	Remembering where I am on this website is difficult	It is difficult to move around this website	This website is too slow	The website has much that is of interest to me
Learning to find my way around this website is a problem		I can quickly find what I want on this website	I get what I expect when I click on things on this website	The pages on this website are very attractive
Using this website for the first time is easy		This website seems logical to me		I feel in control when I'm using this website
Remembering where I am on this website is difficult		This website helps me find what I am looking for		I don't like using this website
		I can easily contact the people I want to on this website		I can easily contact the people I want to on this website
		I feel efficient when I'm using this website		It is difficult to tell if this website has what I want
		It is difficult to tell if this website has what I want		This website has some annoying features
		Using this website for the first time is easy		Using this website is a waste of time
		Using this website is a waste of time		I get what I expect when I click on things on this website
				Everything on this website is easy to understand

WAMMI has been recommended widely by literature on usability. The website of Dray and Associates (2002) describes WAMMI as a “particularly good, user-centred evaluation tool for web sites”. The WAMMI questionnaire is currently being utilised on a usability website, <http://www.usabilitynet.org/home.htm>, to test its own website.

The foregoing literature suggests the following four hypotheses, which are presented for testing in this study:

H1 : There is a positive relationship between website quality and company size.

H2 : There is a positive relationship between website quality and profitability.

H3 : There is an inverse relationship between website quality and financial gearing.

H4 : There is a positive relationship between website quality and liquidity.

#### IV. RESEARCH METHOD

A number of alternative forms of data collection to that adopted were considered and rejected as likely to produce outcomes biased in favour of their own websites, and preclude reliable comparisons; therefore, surveys/interviews of the opinions of the companies' senior employees were preferred

The WAMMI questionnaire is utilised to measure website quality in the study and enable the outcomes to be compared to financial data to establish whether there is a connection between website quality and firm performance. Two WAMMI questionnaires were completed for each of the one hundred websites, allowing a mean score to be calculated for each site. Prior to completing each questionnaire, the respondent was required to spend ten to twenty minutes navigating the website. The respondent was the able to answer the twenty questions of the WAMMI questionnaire (see Appendix 2). Each of the questions provides a five-point Likert scale with anchors from 'strongly agree' to 'strongly disagree'. The responses are summed to provide an overall score in the range 20 to 100, representing the extremes of perceived website quality.

The developers of WAMMI suggest that for optimum results, ten or more questionnaires per website should be completed. However, for the number of companies contemplated in the current sample, such a number was considered unrealistic, as it would involve one thousand separate site evaluations. Instead the authors sought two responses for each of the 100 sample companies, and tested the reliability of these scores with more intensive sampling of a sub-sample of sites, using 5 and 10 evaluations per site and 250 site evaluations in total. This permitted an evaluation of any differences in mean site rating based on two or more responses. There were no significant differences in mean website quality scores for either two, five or ten evaluations, so that the means provided by the two original evaluations are used throughout.

Inevitably the calculation of a quality rating for the websites is subjective and requires the identification, measurement, weighting and aggregation of key features. A measure of quality derived from the WAMMI score was thought to offer a suitable measurement alternative, and was used to generate reliable outcomes for content analysis in the manner suggested by Krippendorff (1980):

- Clear guidelines established for site evaluation;
- Multiple evaluations of the websites conducted by other parties;
- Any instances of wide deviation in measurement between the parties subject to further examination and negotiation, to identify reasons for variation;
- Check of a sub-sample of sites with new respondents to confirm findings;
- Check of a sub-sample of sites one month later to confirm the absence of temporal effects.

This procedure was adopted for the generation of website quality scores in this study.

#### Financial Information

The collection of the financial data is more straightforward and allows measures of size, profitability, gearing and liquidity to be calculated (or extracted directly) from company financial reports. The Reuters Website was also used ([www.reuters.com](http://www.reuters.com)) as a reliable source of comparable financial ratios for large companies.

The financial information comprises the following :

- market capitalisation at 31<sup>st</sup> December 2004 (measuring size)
- profit margin – i.e., gross profit/sales turnover -(measuring profitability)
- the Current ratio – i.e., current assets/current liabilities - (measuring liquidity)
- the Debt /equity ratio(measuring financial gearing).

## V. RESULTS

Existing evidence suggests that there are industry effects in the measurement of website quality. We seek to overcome this difficulty by confining our attention to the UK manufacturing sector, but in doing so collect data from a number of sub-categories within that sector. First, we compare website measures from across the sub-sectors to ensure that their aggregation is reasonable for the conduct of further analysis; the relevant data is presented in Table 2.

**Table 2**  
**Sub-sector dependence of WAMMI scores**

Sub-Sector*	Mean WAMMI I score	t-test statistic	df	Sig. (2-tailed)	Mean Difference
Aerospace (8)	78.81	1.241	7	.255	3.05250
Automobiles (4)	72.88	-.720	3	.524	-2.88500
Chemicals (7)	72.50	-.883	6	.411	-3.26000
Construction (29)	77.36	1.244	28	.224	1.60207
Electronic (7)	74.14	-.560	6	.596	-1.61714
Engineering (18)	73.33	-1.551	17	.139	-2.42667
Household (4)	67.88	-1.281	3	.290	-7.88500
IT hardware (8)	78.19	1.032	7	.336	2.42750
Personal Care (4)	79.88	1.022	3	.382	4.11500
Pharmaceuticals (10)	79.00	1.756	8	.117	3.24000
SECTOR TOTAL (100)	75.76				

\*two sub-sectors contained only one site – Beverages (67.50) and Steels (68.50) with WAMMI scores in parenthesis.

Table 2 shows the mean WAMMI scores to range between 67.88 and 79.88. The information technology, hardware, personal care and household products, pharmaceuticals and biotechnology, aerospace and defence and construction and building materials sectors have the highest mean WAMMI scores, all falling in the high seventies, suggesting that these sectors have websites of a superior quality. However, Table 2 also details the results of a t-test to compare mean WAMMI scores for each sub-sector with the mean value for all WAMMI scores over the whole of the manufacturing sector sample. The test shows that none of the differences between the individual sub-sector scores and the overall mean are significant at the 0.05 level, suggesting that the scores may safely be aggregated for further analysis of the sector as a whole.

Table 3 shows the Pearson correlation coefficients between WAMMI scores and the financial data for each sector and the manufacturing total. Again the two sub-sectors (Beverages, and Steels) with a single evaluation each, are omitted from the formal analysis.

**Table 3**  
**Correlations between WAMMI scores and financial data**

	Capital Value	Gross Profit	Net Profit	Current Ratio	Debt/Equity
Aerospace & Defence	-0.434	-0.138	0.718*	0.160	-0.326
Automobiles & Parts	-0.722	-0.994**	-0.980*	-0.912	0.022
Beverages	-	-	-	-	-
Chemicals	-0.348	-0.254	0.150	0.887**	-0.767*
Construction & Building Materials	0.118	-0.366	-0.096	-0.052	-0.170
Electronic & electric equipment	-0.087	-0.239	0.313	0.107	-0.635
Engineering & Machinery	0.014	0.180	0.276	-0.112	0.189
Household Goods & Textiles	-0.009	0.606	0.153	0.769	-0.985
Information technology hardware	-0.494	-0.189	-0.523	-0.228	0.573
Personal Care & Household Products	0.159	-0.837	0.578	-0.128	-0.906
Pharmaceuticals & biotechnology	-0.034	-0.203	0.703	-0.396	-0.572
Steel & other Metals	-	-	-	-	-
Total	0.025	-0.066	0.096	0.058	-0.215*

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Given the outcomes of Table 2, the overall manufacturing sector correlations are of the most interest: the Gearing ratio is significantly inversely correlated with WAMMI scores. Stronger WAMMI scores are associated with better debt positions. However, there are no significant relationships with size, profitability or liquidity measures, all of which might have been anticipated on the basis of findings from the print-based accounting narratives literature. Thus off the four hypotheses specified we are able only to accept hypothesis H3, positing an inverse relationship between website quality and financial gearing; none of our other hypotheses can be accepted. There are also a number of significant correlations present in individual sub-sectors, many of which are counter-intuitive. In view of the small sample sizes for most of these sub-sectors, they are not considered further.

## VI. CONCLUSIONS

The investigation of the connections between the quality of a website and firm performance is a relatively new avenue of research, although there is data that links narratives in annual reports and firm performance, i.e., readability (Smith & Taffler, 1992a 1992b, Jones 1988) and content (Frazier et al.,1984, Tennyson et al. 1990, and Smith & Taffler, 2000). Within websites usability is employed as a measure of the extent to which users can access data in a website; usability is regarded as the website equivalent of readability. Companies in the past have limited their information output to documents, such as annual reports, but as technology has progressed, companies

are making better use of technologies such as websites as an output for their company information. Thus, the evidence from annual report readability suggests that it should be no surprise were firm performance to be associated with website usability.

The study provides some evidence of a connection between website quality and firm performance, particularly with regard to levels of gearing. The study is limited to UK manufacturers in order to control influential variables, so the results may not be generalisable. Also, all the companies considered are 'large', in terms of being selected from the FTSE 500; it is possible that different outcomes would have applied to medium-sized or very small companies.

The study uses a single measure of website usability as a proxy variable for website quality, i.e., the WAMMI score. In retrospect, the instrument may subsequently be revised and improved, so that different instruments might provide more reliable results in the future.

Tests of significance showed that the use of two questionnaires per website (rather than the ten recommended) made no difference to the mean scores in the current research. However, future studies might seek greater replication to provide further evidence of validity.

A larger total number of companies in the sample may generate more significant results. If sub-sector analysis is to be undertaken then much larger samples from within each of the sub-sectors will be essential. Furthermore, for example, the whole of the FTSE 500 could be sampled, subject to time and resource constraints, but future samples should also include small and medium sized enterprises to permit a realistic evaluation of the impact of firm size.

Fully utilising the commercial WAMMI service would have yielded individual scores for the five aspects of a WAMMI questionnaire: attractiveness, control, efficiency, helpfulness and learnability. This may well have produced significant results by linking specific aspects of the WAMMI score to particular aspects of financial performance. It may also be found that different sub-sectors perform better or worse on each of the different aspects of WAMMI.

Nevertheless the study has shown an important connection between website quality and financial performance. Due to the scarcity of similar studies, this study is a significant starting point for further research into the link between website quality and firm performance. Of other studies that have attempted to link websites with firm performance, only Vaughan's (2004) in-link studies have significantly added to our knowledge of the impact of website quality on firm performance.

Further work needs to be undertaken on a time-series basis to explore links between website usability and profitability, both in order to justify the cost of improving websites, and to establish causality. Following Vaughan and Wu (2004), further studies could also investigate website quality in different countries, to determine whether there are any significant cultural effects on the link between website quality and firm performance.

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## Appendix 1 Companies in Study

The final 100 companies were as follows:

<b>Aerospace &amp; Defence</b>	BAE Systems Cobham Meggitt Rolls-Royce Smiths Ultra electronics Umeco VT Group	<b>Electronic &amp; electric equipment</b>	Chloride Domino Printing Sciences First Technology Invensys Laird Renishaw Spectris
<b>Automobiles &amp; Parts</b>	GKN Inchcape Pendragon Vardy	<b>Engineering &amp; Machinery</b>	AGA Foodservice Bodycote International Charter Cookson
<b>Beverages</b>	Diageo		Domnick Hunter
<b>Chemicals</b>	BOC Croda International Elementis ICI Johnson Matthey Vitrex Yule Catto & Co.		Enodis Fenner FKI Halma IMI Morgan Crucible Rotork
<b>Construction &amp; Building Materials</b>	Alfred McAlpine Balfour Beatty Barratt Developments Bellway Berkeley Bovis Homes BPB		Senior Spirax Sarco Engineering Stanelco Tomkins Vitec Weir
	BSS Carillion Costain Crest Nicholson Hanson Keller Kier M J Gleeson Marshalls McCarthy & Stone	<b>Information technology hardware</b>	ARM Holdings CSR Filtronic Imagination Technologies Marconi Corporation Psion Spirent Wolfson Microelectronics

**Appendix 1** (continued)

		<b>Personal Care &amp; Household Products</b>	
	Morgan Sindall		McBride
	Mowlem		PZ Cussons
	Persimmon		Reckitt Benckiser
	Pilkington		SSL International
	Redrow		
	Rok Property Solutions		
		<b>Pharmaceuticals &amp; biotechnology</b>	
	Taylor Woodrow		Acambis
	Travis Perkins		Alizyme
	Westbury		Alliance UniChem
	Wilson Bowden		AstraZenica
			Cambridge Antibody Technology
	Wimpey, George		GlaxoSmithKline
	Wolseley		
<b>Household Goods &amp; Textiles</b>			
	Alba		NeuTec Pharma
	Games Workshop		Shire Pharmaceuticals
	Headlam		SkyePharma
	Umbro	<b>Steel &amp; other Metals</b>	Corus

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## Appendix 2

### The WAMMI Survey Instrument

Please circle the number appropriate to your opinion:

- |  | Strongly<br>Agree |   |   |   |   | Strongly<br>Disagree |   |   |   |
|--|-------------------|---|---|---|---|----------------------|---|---|---|
| Q1. This website needs more introductory explanations.           | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q2. Learning to find my way around this website is a problem.    | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q3. Using this website for the first time is easy.               | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q4. Remembering where I am on this website is difficult.         | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q5. It is difficult to move around this website.                 | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q6. I can quickly find what I want on this website.              | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q7. This website seems logical to me.                            | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q8. This website is too slow.                                    | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q9. This website helps me find what I am looking for.            | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q10. I can easily contact the people I want to on this website.  | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q11. I feel efficient when I'm using this website.               | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q12. It is difficult to tell if this website has what I want.    | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q13. Using this website is a waste of time.                      | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |
| Q14. I get what I expect when I click on things on this website. | 1                 | - | 2 | - | 3 | -                    | 4 | - | 5 |

Q15. The website has much that is of interest to me.

1 - 2 - 3 - 4 - 5

Q16. The pages on this website are very attractive.

1 - 2 - 3 - 4 - 5

Q17. I feel in control when I'm using this website.

1 - 2 - 3 - 4 - 5

Q18. I don't like using this website.

1 - 2 - 3 - 4 - 5

Q19. This website has some annoying features.

1 - 2 - 3 - 4 - 5

Q20. Everything on this website is easy to understand.

1 - 2 - 3 - 4 - 5

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