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Ahmad Ghandour
University of Otago, aghandour@infoscience.otago.ac.nz

George Benwell
University of Otago, george.benwell@otago.ac.nz

Kenneth Deans
University of Otago, ken.deans@otago.ac.nz

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Completed Research Paper

Ahmad Ghandour
Dept. of Information Science
University of Otago, New Zealand
aghandour@infoscience.otago.ac.nz

George Benwell
School of business
University of Otago, New Zealand
george.benwell@otago.ac.nz

Kenneth Deans
Dept. of Marketing
University of Otago, New Zealand
Email: ken.deans@otago.ac.nz

Abstract

Online businesses are often engaged in web metrics to gauge the performance of their eCommerce website. This study examines the relationships between web metrics and the financial performance. The key purpose of the present paper is to learn whether metrics measures have an impact on profitability in eCommerce website. An online survey was used to gather data from companies that have eCommerce website. The results from this study indicate that companies with perceived successful financial performance have also enjoyed perceived success in the customer behaviour on their website. Furthermore, the study explores the role of five contingency variables,the markets it operates in, the effort of the company to make the website visible, the involvement of the owners, the percentage of the online business and the age of the website, on this relationship. The results indicate that these variables moderate the relationship between metrics measures and the performance of the website so that a positive association occurs under older website, higher percentage of online, and higher level of owner's involvement with the website. The findings prompt the owners to carefully monitor their website traffic for a possible downturn and remedy the situation prior to its occurrence.

keywords: eCommerce, eCommerce website, Website performance, eMetrics

Introduction

One of the central issues to website management is to measure its performance. The effectiveness or performance of a website is commonly measured to gauge the extent to which the desired purpose has been fulfilled. The purpose of the website is reflected by the firm's online model. While there are various business models of eCommerce, one is commonly used involve selling goods and services through a company's website (Chakraborty et al. 2002). Such a business model operates to serve as a communication channel for bidirectional information transfer, a platform for transacting, an interface for providing customer service (Quelch and Klein 1996) and facilitate marketing initiatives (Schubert and Selz 2001). The goal of such a business model is to market products/services and maximise profit/shareholder value by allowing transactions online with another party.

Venkatraman and Ramanujam (1986) provided a framework classifying the measurement of business performance as either financial or operational. Financial performance is at the core of the organizational effectiveness domain. Such performance measures are considered necessary, but not sufficient to define overall effectiveness (Chakravarthy 1986).

Beyond this core lie operational performance measures, that define a broader conceptualization of organizational performance by focusing on factors that ultimately lead to financial performance (Murphy et al. 1996). Performance measurement could be improved by examining both operational and financial measures (Venkatraman and Ramanujam 1986). The extensive literature review by Murphy et al (1996) concluded the importance of using not only multiple dimensions of performance but also multiple measures for each dimensions used. They also pointed out the importance of establishing a common ground in order to compare performance among businesses. Control variables for size, industry, age were found to be relevant to new ventures and small businesses.

In line with the arguments suggested by Venkatraman and Ramanujam (1986) and Murphy et al (1996), this paper attempts to empirically establish the relationships between website usage (operational measure) and its financial performance along control variables (age, online percentage and the involvement with the website development). We have adopted the concept of eMetrics for the website usage. The targeted population is SMEs in New Zealand that are engaged in eCommerce.

The remainder of this paper is structured in four sections. The following two sections discuss the two concepts of usage and financial performance of a website followed by the research design and methods used in this paper. We then discuss results and the implications. Last, we conclude the paper with a conclusion.

Usage versus Financials in Website Performance

Information systems (IS) researchers have demonstrated that usage is a key variable in explaining the performance impact of information technology. Seddon (1997) pointed out that system use is a good proxy for IS success when the use is not mandatory. In eCommerce, website users are customers; their use is more often voluntary. The nature of a system's use and the amount of the usage are both important indicators of success and this will not only impact the organization but also will assist the organization in improving the quality of their website (DeLone and McLean 2003). Hence traffic measures is determined with reference to the number of new or repeated visitors, the number of conversion rates and the pattern of their navigation (DeLone and McLean 2004). According to Epstein (2004), website usage in terms of their behaviour on the website lead to increased in sales, improvement in sales, and dollar saved in expenses (cost saving), which will ultimately lead to profitability of the website conducting eCommerce. Huizingh (2002) argues that the number of visitors is a more convincing measure of website performance than web sales, as customers might be informed online and complete the purchase offline. Quaddus and Achjari (2005) used page view, stickiness, conversion rate and the extent of the contribution of eCommerce to meet the organisational goals for their definition of website success. A traditional method of measuring website usage is by conducting a market research (customer interview) and asking users of their experience with the website to identify ways for improvement. Such an approach is often too costly, requires a long time interval and is time consuming (Weischedel and Huizingh 2006). Alternatively, data can be automatically collected about people visiting the site which allow managers to aggregate data over many visitors, allowing them to evaluate how effective their website is (Schonberg et al. 2000). Online technology, however, enables us to collect large amounts of detailed data on visitor traffic and activities on websites. Such data offer a plethora of metrics to which companies must carefully choose measures for different purposes (Phippen et al. 2004). Otherwise, the sheer amount of data available can be overwhelming, as can the multitude of ways to compare it.

However, for the purpose of this research, use is captured by the different metrics available to managers who utilise clickstream data which reflects how customers are using the website. Despite the limitations of clickstream data (Weischedel and Huizingh 2006), detailed and concrete data on customers' behaviour can be collected to indicate trends rather than provide definitive data/statistics on website usage. Indeed, a reasonable measure could be determined by assessing whether the full functionality of a website is being used for its intended purposes (Welling and White 2006).

While use represents the success at the site level (operational), consequences represent success at both individual and organisation level (DeLone and McLean 2003). DeLone and McLean (2003) replaced both individual and organisational impacts in their original model with the net benefit construct for the sake of parsimony. Net benefit is determined by context and objectives for eCommerce investment (DeLone and McLean 2004). While there are other forms of benefits, in eCommerce websites that transact online the financial returns are of special interest. Giaglis et al (1999) observe that the most common methods of evaluating information technology investments is by way of established accounting techniques, such as Return on Investment (ROI).

In this paper, we provide empirical insights into the relationships between the metrics on the performance of a website and the financial measures of a business due to the website. More specifically we aim to answer the following two questions: (1) Do website metrics relate to the its financial performance? (2) Is this relationship influence by: the markets it operates in, the effort of the company to make the website visible, the involvement of the owners, and the percentage of the online business?

Conceptual Framework

In view of the argument that website usage is related to the financial performance, we study if such relation exists. Next, we explore the moderating effect of several factors on such relation. We assess whether the website usage leads to better financial performance differs in business-to-business or business-to-customer markets. Also, the involvement of the website owner may affect such relation. Additionally, website visibility (the business activities to promote their website) could moderate the relationship, and finally the percentage of the online business compared to its offline activities is also assessed to determine if it has an effect on the relationship between usage and financial performance of a website. Hence our Conceptual model is as shown in Figure 1.

Figure 1. Conceptual Framework
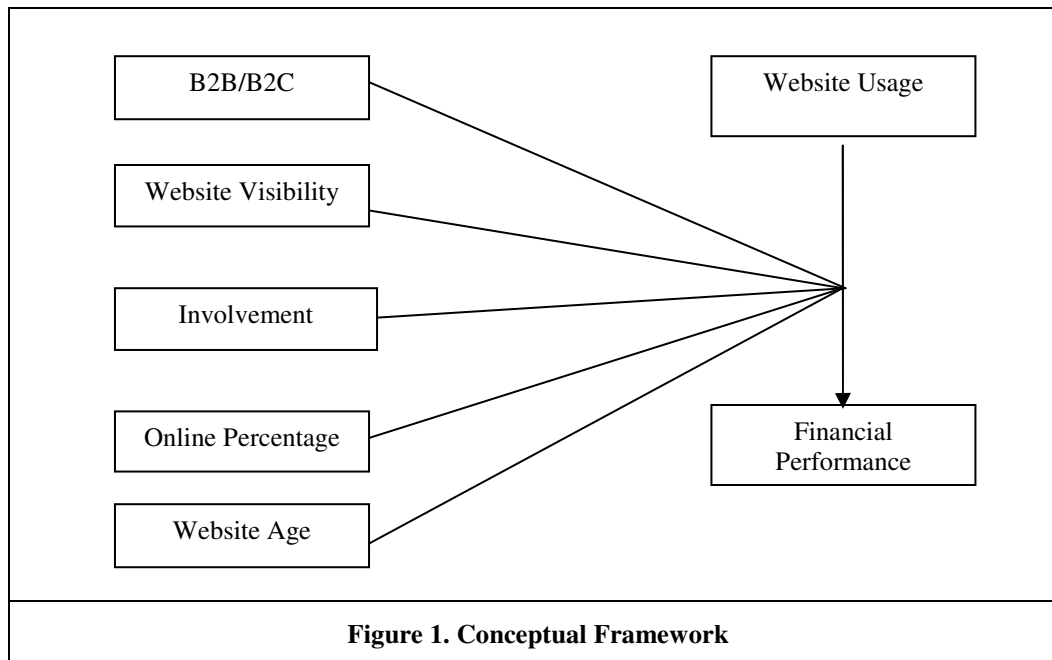
Research Design and Method

The intended population for this study was online businesses within New Zealand. A list of 1093 websites across industries formed the sample for this study. This research employs an online survey sent out by email to businesses engaged in eCommerce where the respondents can answer at their convenience and at their own pace. A total of 1093 email were sent out, and 344 responded giving a 31.47 % response rate. The survey asked the respondents whether they are actively involved in monitoring their website or not. If they don't the survey is terminated then and if they do a set of 11 metrics is then revealed to the respondent to complete the survey. Of the 230 participants that indicated they monitored their website 225 responses were usable.

The Variables

Three types of variables were used, dependent, independent and control variables. The financial performance as the dependent variables which was measured by six items developed by Auger (2005). A representative item is "return on investment". A range of variables include the market the business operates in, the involvement of the owner with the development of the website, the visibility of the website, the age of the website and the percentage of the online business sales were all used as control variables. The independent variables were represented by those metrics available to managers. Eleven metrics were used to capture such variables.

Traffic volume. The traffic on a website can be measured by **number of visitors**, **repeat visitors** and **conversion rate**. Traffic remains a valid measure for performance as without traffic no revenues could be generated; however, even with heavy traffic there could be no sales lead. Achieving high traffic volumes is still a prerequisite for higher level goals in most websites, regardless of their purpose (Alpar 2001).

Website relevance: Relevance is how much of the website is relevant to the visitor. This is measured by pageviews. website performs well if all pages have been viewed by all visitors to your website

Website stickiness: Stickiness is the effectiveness of the content in holding the visitor's attention i.e. visitors are finding what they expect to find as soon as they arrive on the website. This is measured by the time duration visitors spent on the website. website performs well if visitors spend time on the website more than the average time needed for a customer to make a purchase.

Navigation behaviour tracking: The ability to track the path that visitors take through your website. website performs well if the majority of visitors follow an orderly and logical path through your website.

Customer profile: This is measured by the demography of the visitors. website performs well if the visitors to website match the profile of customers.

User environment: The website is performing well if the website is compatible with the users environment e.g. browsers, operating systems and keywords.

Referring website: Number of visitors acquired through other website/search engine.

Reach: Number of visitors acquired through marketing campaign, loyalty scheme(s), discounts sales, etc.

Bounce rate: Number of visitors that, upon arriving at our website, immediately leave.

The study used perceptual measures to capture data on both the operational and the financial constructs. Respondents were asked to rate the importance of these metrics on a seven-point likert-type scale, where 7 represents very important, and where 1 represents not important; and again to rate the performance of that particular metrics on a range of 1 when website performance is worse than expected , and a 7 when website performance is better than expected. The resulting composite measure (importance x perceived success) is referred to as effective performance measure (Gupta and Govindarajan, 1984).

The measure concerning the control factors are as follows. The market the business operates in coded as 1 = business-to-business, or 0= business-to-customer. The owners were also asked to rate their involvement with the website as low, medium and high. The visibility of the website represents the activities of the business in promoting their website, and is measured as the average of four items, such as "our website is promoted offline". The respondents were also asked to answer the age of the website and the percentage of the online business sales.

Results

Validity

Validity defined as the extent to which a measure reflects only the desired constructs without contamination from other systematically varying construct (Cook and Campbell 1979) and has three components: construct, convergent and discriminant validity.

Construct Validity

the 17-items measuring the website performance was submitted to a principal component analysis with Varimax rotation. All the items have value of measures of Sampling Adequacy (MSA) more than 0.5. Besides, Kaier-Meyer-Olkin Measure of Sampling Adequacy is 0.92.

Based on the rotated component matrix, out of 17 items, two items (repeat visitors, and Visitors conversion) were dropped out as they have cross loadings. Also, item bounce rate dropped due to its low communalities (.35). Two factors (Dimensions) met the selection criteria of eignvalues greater than 1.0, explaining a total of 59.55 % of the variance. All the items selected had factor loadings greater than 0.5.

Factor 1 contained 8 items related to website usage. Factor 2 consisted of 6 items represent the financial performance of a website. Table 1 present factor loadings obtained after deleting items with cross loadings and low communalities.

Convergent Validity

This refers to all items measuring a construct actually loading on a single construct (Campbell and Fiske 1959). Convergent validity established when items fall into one factor as theorised. The two dimensions (factors) displays unidimensionslity with factor 1 (website usage), the KMO was 0.87 explaining 49.07% of the variation. Factor 2 financial returns, KMO were 0.888 explaining 71.86%. (See Table 2 and Table 3). [a]

Table 1 Factor Analysis for both operational and financial measures		
Rotated Component Matrix [a]		
	Component	
	1	2
NUMBER_OF_VISITORS		.588
WEBSITE_RELEVANCE		.613
WEBSITE_STICKINESS		.638
NAVIGATION_TRACKING		.661
CUSTOMER_PROFILE		.778
S6_USER_ENVIRONMENT		.689
REFERRING_WEBSITE		.673
REACH		.646
RETURN_ON_INVESTMENT	.847	
ONLINE_SALES	.880	
SALES_GROWTH	.880	
PROFIT_FROM_WEBSITE	.885	
COST_REDUCTION	.632	
MARKET_SHARE_INCREASE	.688	

[a] Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 3 iterations.

Table 2: Factor Analysis results for the financial measures							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Communalities	Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		
Return On Investment	4.312	71.862	71.862	4.312	71.862	71.862	.746	.864
Online Sales	.606	10.103	81.965				.830	.911
Sales Growth	.450	7.497	89.463				.794	.891
Profit from Website	.316	5.261	94.723				.847	.920
Cost Reduction	.187	3.109	97.833				.488	.698
Market Share Increase	.130	2.167	100.000				.608	.779

Extraction Method: Principal Component Analysis.

Table3: Factor Analysis results for the operational measures							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Communalities	Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		
Number of Visitors	3.926	49.069	49.069	3.926	49.069	49.069	.458	.677
Website relevance	.858	10.726	59.795				.478	.691
Website Stickiness	.678	8.471	68.266				.510	.714
Navigation tracking	.613	7.657	75.924				.495	.703
Customer Profile	.602	7.520	83.444				.520	.721
User Environment	.568	7.106	90.549				.476	.690
Referring Website	.400	4.994	95.544				.508	.713
Reach	.356	4.456	100.000				.481	.693

Extraction Method: Principal Component Analysis.

Discriminant Validity

 It refers to the extent to which measures of two different constructs are relatively distinctive, that their correlation values were neither an absolute value of 0 or 1 (Campbell and Fiske 1959). Correlation analysis was done on the two factors generated and the result is presented in table 4. As can be seen, the two factors are not perfectly correlated where their correlation coefficients range between 0 and 1. (See Table 4)

Table 4 Correlations between website use and website financial returns			
		USE	Financial Returns
USE	Pearson Correlation	1.000	.558[**]
	Sig. (2-tailed)		.000
	N	225.000	225
Financial Returns	Pearson Correlation	.558[**]	1.000
	Sig. (2-tailed)	.000	
	N	225	225.000

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

Reliability Analysis

The reliability of the scale used to both measures (operational and financial) was appraised by using Cronbach's coefficient alpha. A widely used rule of thumb has been suggested that construct with coefficient alphas which is equal to or greater than 0.70 indicate the homogeneity of its given set of items. The results are given in Table 5

Table5: Reliability test results		
Constructs	Cronbach's Alpha	N of Items
Operational measures	.876	11
Financial measures	.920	6

Correlation

A two tailed Pearson correlations was conducted to show the relation between all measures. Results are shown in Table 6

Table 6 correlations between all measures

	RETURN_ON_INVESTMENT	ONLINE_SALES	SALES_GROWTH	PROFIT_FROM_WEBSITE	COST_REDUCTION	MARKET_SHARE_INCREASE
NUMBER_OF_VISITORS	.347**	.401**	.418**	.394**	.373**	.427**
WEBSITE_RELEVANCE	.369**	.406**	.362**	.378**	.390**	.445**
WEBSITE_STICKINESS	.314**	.393**	.374**	.398**	.410**	.354**
NAVIGATION_TRACKING	.322**	.396**	.363**	.385**	.279**	.389**
CUSTOMER_PROFILE	.204**	.238**	.208**	.266**	.234**	.288**
USER_ENVIRONMENT	.323**	.332**	.248**	.322**	.281**	.305**
REFERRING_WEBSITE	.369**	.379**	.335**	.399**	.330**	.460**
REACH_EFF	.296**	.358**	.346**	.364**	.292**	.451**

**. Correlation is significant at the 0.01 level (2-tailed). N=225

Regression

The regression analysis shown in Table 7 and 8 indicates significant results between website use and its financial returns at $p<0.05$. The contribution of use to financial returns is moderate with a beta value = 0.588, and explain about 35% of the variation in the financial returns. Thus a positive relationship between use and financial returns.

Table 7 Regression ananlysis				
Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.588[a]	.346	.343	6.25004
a. Predictors: (Constant), USE				
b. Dependent Variable: FINANCIAL RETURNS				

Table 8 ANOVA Analysis					
ANOVA[b]					
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4599.567	1	4599.567	117.747	.000[a]
	Residual	8711.046	223	39.063		
	Total	13310.613	224			
Predictors: (Constant), USE					
Dependent Variable: FINANCIAL RETURNS					

Discussion and Implications

The primary goal of this study is to examine the relationship between website usage and its financial performance. The results have been analyzed statistically to identify correlations among measures of both constructs. It demonstrates a low to moderate correlation between usage and financial performance of the website.

Barua et al (1995) asserted that the relation between IT investment and IT payoff in IT projects is wide and suggested another measures to be in place. In a subsequent study Barua et al (2001) found a relationship between operational and financial performance of e-business. This study verified that through metrics that are available to the firm the financial returns such as return on Investment can be established. For practitioners these measures should be monitored on a daily or weekly basis. It triggers for weaknesses or strength.

For academics, these measures could be used as a dependent variable for the website performance success objectively or subjectively but with careful interpretation.

The central idea lies in that managers need to understand what drives operational performance and then committing the necessary resources to the development of the drivers (Barua et al. 2001).

Conclusion

The results from this study indicate that companies with perceived successful financial performance have also enjoyed perceived success in their website usage. These indications prompt the seller to carefully monitor their website traffic for a possible downturn and remedy the situation prior to its occurrence.

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