

# **Cost Focussed Firms and Internet Usage\***

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### **Abstract**

This paper looks at Internet usage by Australian firms that have a cost focussed competitive strategy. The data source for this analysis is the *Melbourne Institute Business Survey*, conducted by the Melbourne Institute of Applied Economic and Social Research. The survey was conducted in late 2001, and targeted large Australian firms. Instrumental variables estimation found that cost-focussed organizations utilised the Internet more intensively for both internal organizational activities and external market activities than organizations that did not have a high focus on costs. However, this impact appeared greater for internal organizational activities, suggesting that these firms possibly believed that there were greater cost savings and efficiency gains—at least in terms of Internet usage—to be had in using the Internet as part of the internal operations of the organization.

## 1. Introduction

This paper looks at Internet usage by Australian firms that have a cost focussed competitive strategy. One of the features of the Internet is it provides a cheap method of transmitting information—and lots of it—quickly and conveniently (Litan and Rivlin 2001). The research undertaken to date suggest that the cost savings through use of the Internet are non-negligible (Kenney and Curry 1999; Litan and Rivlin 2001). Given this, it would be helpful to know whether, and how, cost conscious Australian firms are utilising Internet technology.

The data source for this analysis is the *Melbourne Institute Business Survey*, conducted by the Melbourne Institute of Applied Economic and Social Research. The survey was conducted in late 2001, and targeted large Australian firms. According to the Australian Bureau of Statistics *Business Use of Information Technology*, large businesses (those with 100 or more employees) have a much higher take-up of the Internet compared to their smaller counterparts. The advantage of this survey is that it allows the examination of whether a particular competitive strategy and/or organizational characteristics influence the intensity with which the Internet is utilized in these large Australian firms.

The following section provides a brief discussion of the relationship between the Internet, productivity and costs. Section 3 gives more detailed information on the Melbourne Institute Business Survey, including summary statistics of the types of Internet usage across the sample. Section 4 provides results of the analysis of Internet usage by cost-focussed firms. Section 5 concludes.

## 2. The Internet, Productivity and Transaction Costs

### 2.1. Information and Communications Technology and Productivity

The strong growth in US labour productivity over the past decade has coincided with the rapid take-up of new developments in information technology, particularly the use of the Internet. Partly in response to this phenomenon, the US has been at the forefront of attempts to measure and analyse how extensive use of E-commerce is, with the census bureau now publishing retail E-commerce sales and providing several papers for discussion and comment on measuring the electronic economy.<sup>1</sup> They also have a supplement incorporated into their

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<sup>1</sup> See for example, <http://www.census.gov/econ/www/ebusiness614.htm>.

survey of manufacturing businesses designed to measure integration of E-commerce and E-business into manufacturing plant day-to-day operations and business processes.

The majority of research in the 1990s tended to concentrate on investment in information and communication technology in general—such as hardware, software and communication equipment—rather than the Internet in particular. Early studies were at a loss to explain why productivity had not improved despite considerable investment in information technology products. In hindsight, it was suggested that the reason information technology investment did not show up in the productivity statistics is because such investment was still small relative to the overall capital stock (Oliner and Sichel 2000). From around 1995 onwards however, all this changed. Not only was there a substantial increase in US labour productivity growth (albeit from a trough in the productivity cycle) there was also a more rapid increase in the stock of information technology capital, an increase in information and communications technology capital deepening, a decline in prices for information and communications technology, and greater technical advances in information and communications technology (Oliner and Sichel 2000; Parham 2002). In addition, it was around this time that there was a considerable increase in the interconnection of this information technology through greater use of the Internet (Blinder 2000).

Australia also experienced a surge in productivity growth over this time, with labour productivity growth averaging 3 per cent per year between 1993/94 and 1999/00, and multifactor productivity growth averaging 1.8 per cent per year over the same time period. According to these estimates, both labour and multifactor productivity growth accelerated by around 1.1 percentage points over this time (Parham 2002). Similarly to the US, information and communication technology capital deepening began to influence productivity estimates from around 1995 onwards. Analysis by Parham, et al. (2001) and Parham (2002) suggests the use of information and communication technology contributed about 0.3 percentage points to the productivity acceleration, with micro-economic reform accounting for 0.8 percentage points. Importantly however, Parham (2002) concludes that it was micro-economic reform that encouraged the use of new technology as Australian businesses strived to remain competitive in a more deregulated economic environment. Unfortunately, the analysis by Parham (2002) does not attempt to separate out the effects on productivity of the use of the Internet in particular, but based on the estimates presented above, it would seem that the impact of the Internet had a very modest influence on productivity growth at the aggregate level in Australia. However, aggregate statistics may mask the benefits arising out

of use of the Internet, in part because of measurement issues to do with growth accounting framework that is employed [Brynjolfsson, 2000 #148]. Accordingly, the current approach using firm-level survey data may reveal information that cannot be gleaned from the macroeconomic evidence.

## 2.2. *How the Internet Influences Productivity*

Litan and Rivlin (2001) outline three methods through which the Internet may influence productivity. The first of these is the ability of the Internet to reduce transaction costs (Subramaniam and Shaw 2002). Transaction costs are defined as the costs involved in the transfer of goods and services from one operating unit to another, either within or between firms (Chandler 1990; Williamson 1996). The nature of the Internet suggests *a priori* that it is most likely to be utilized by those firms who have frequent, low-risk transactions, where the production of the good or service does not involve a great deal of asset specificity. Obviously, when there is a more efficient exchange of goods and services between these units, the cost of these transactions decline (Chandler 1990). One of the defining characteristics of the Internet is that it can deliver a considerable amount of information quickly and cheaply, especially when compared to paper-based information exchange, or other electronic systems such as electronic data interchange. Routine functions, such as invoicing and recruiting, are therefore the most obvious candidates in minimizing transaction costs through Internet technology (Litan and Rivlin 2001). Organizations in finance, health and government services are typically characterised as being information-intensive, suggesting that such organizations may be able to realise substantial cost savings just by adopting Internet technology for the handling of this information. (Clemons and Hitt 2001; Danzon and Furekawa 2001; Fountain 2001; Litan and Rivlin 2001).

Transaction cost savings are also related to those of scale and scope, in that as the output of goods and services grow, so to does the number of recurring transactions (either within or between firms) allowing more intensive use of such technology (Chandler 1990). This implies that larger firms may be more likely to take advantage of Internet technology than their smaller counterparts, as the potential gains are larger. Indeed, it has been suggested that small firms generally adopt the Internet for communication requirements rather than strategic reasons, which has the added implication that small to medium enterprises may be less likely to successfully adopt Internet technologies—in terms of giving them an advantage over their

competitors—compared to larger organizations (Litan and Rivlin 2001; Porter 2001; Sadowski, Maitland et al. 2002; Schlauch and Lapos 2001).

The second method through which the Internet may influence productivity is by increasing management efficiency through improvement in the management of the supply chain. This may involve using the Internet for accounting, ordering, tracking, invoicing and recruiting, as well as enabling employees across the firm to work together on projects such as product development and marketing (Fine and Raff 2001; Litan and Rivlin 2001). The nature of supply-chain management suggests that manufacturers will be more likely to use the Internet for supply-chain management issues, such as information sharing, interaction with suppliers, sharing of production schedules, product development, and procurement.

In regards to procurement, there are several dimensions through which the Internet is likely to influence costs. The first of these is search or co-ordination costs, that is, the costs involved with determining the availability and price of goods and services, finding a potential buyer or seller, and bringing parties together to transact (Milgrom and Roberts 1992). The Internet may reduce the costs involved in an existing process (that is, moving from fax to Internet), and may help in a more precise matching of buyers and sellers (Garicano and Kaplan 2001). According to the Australian Bureau of Statistics *Business Use of Information Technology*, 44 per cent of businesses now use the Internet to search for the availability or cost of goods and services. The precise direction of the cost effect is more difficult to ascertain. If search costs are reduced because of the reduced time it takes to ‘point and click’ when searching for prices and product or service availability, then the effect is likely to be positive. However, if the availability of this technology leads to a greater number of searches with little benefit at the margin, then it may have a negative impact on overall costs. The second relates to motivation or incentive costs. The precise direction of the effect is also difficult to determine in this instance. If the buyer wishes to physically examine the good, they will be worse off under an Internet system. Commitment costs may also increase when using the Internet if the buyer tries to avoid the costs of dealing with an intermediary by viewing the product on the Internet, but contacting the primary seller directly should they wish to purchase (Garicano and Kaplan 2001). Alternatively, commitment costs may be reduced if the search process is standardized. Ultimately, it is an empirical question as to which effect takes precedence.

The third method through which the Internet may influence productivity is by increasing competition, putting pressure on suppliers to adopt cost-saving techniques. Litan and Rivlin (2001) note that the Internet has the potential to bring a much wider range of buyers and

sellers together, broadening the reach of markets, and providing transparent pricing of well-defined goods and services. They point out however that such competition will only improve efficiency and productivity if it increases the chance that firms with a better product are able to successfully market and sell this product, thereby forcing competitors to adopt more efficient techniques to remain competitive. On the other hand, if greater competition simply leads to lower profit margins, there will be no improvement in productivity, and the benefits will go to consumers in the form of lower prices, an outcome that is also noted by (Porter 2001) when discussing the Internet and competitive strategy.

This paper is not interested in exploring the relationship between Internet usage and productivity *per se*, but whether organizations with an interest in reducing costs and increasing efficiency are more likely to utilize the Internet as part of this strategy. As such, it is more concerned with the transaction costs issue, although there is some overlap with management efficiency and supply-chain management. Unfortunately, the survey to be utilised for the analysis has no information on the extent to which the Internet has increased competitive pressures, and will thus not be examined here.

The Australian Bureau of Statistics *Business Use of Information Technology* indicates that of the 20 per cent of businesses that used the Internet for purchasing in 2000/01, half indicated that it reduced business or transaction costs, and 87 per cent indicated that it saved time. The same benefits were not as apparent for the 9 per cent of businesses that use the Internet for selling, as only around a quarter of respondents indicated that it reduced business costs, with a similar number reporting that it increased business costs. While it has so far been difficult to quantify the cost savings from utilising the Internet (Pilat and Lee 2001), estimates from the US indicate that they could be in the order of between 1 to 5 per cent of GDP (Kenney and Curry 1999; Litan and Rivlin 2001), or an annual contribution to baseline productivity growth of 0.2 to 0.4 per cent (Oliner and Sichel 2000; Litan and Rivlin 2001; Parham 2002). There are very few estimates on the impact of the Internet on costs for businesses in Australia, although it has been suggested that there could be a 25-50 per cent saving in procurement costs, which represents a 10-15 per cent saving in product costs (Boston Consulting Group 2001).

Although the take-up of the Internet has been relatively widespread among Australian businesses and households, there may still be scope for a larger role of the Internet in business operations and productivity improvements. The above discussion highlights several areas where Internet usage has the potential to reduce costs and/or improve efficiency.

However, it is possible that businesses may still need to be convinced about the potential benefits of the Internet over and above existing information technology systems such as electronic data interchange (Subramaniam and Shaw 2002). This requires formal evaluation of the impact of Web-based systems on processes and therefore the value to the enterprise. Typically, systems such as electronic data interchange have been utilized by large businesses, primarily due to the substantial costs involved in setting up the system. One of the benefits of the Internet is that it has a relatively standard format, which makes set-up costs reasonably cheap and does not require other enterprises to embark on the costly process of setting up a system specific to a particular supplier or customer. Should the sunk costs associated with existing information technology systems be large enough, it may hinder the adoption of the Internet technology. The purpose of this paper is to explore whether a cost-focused competitive strategy significantly influences Internet usage.

### **3. The Melbourne Institute Business Survey**

Despite the apparent potential of Internet technology, there is a paucity of publicly available data that would allow a more thorough investigation of who uses the Internet and why.<sup>2</sup> In order to fill part of this gap, questions regarding Internet use were incorporated into the Melbourne Institute Business Survey, which surveyed the top 1000 enterprises (as measured by total revenue) on issues ranging from industrial relations to management style.<sup>3</sup> Based on initial calls, 813 surveys were mailed out, with 281 useable surveys returned to the Melbourne Institute, representing a response rate of 28 per cent, which is consistent with surveys of this type. The distribution of responses across industries does not differ markedly from the initial selected population implying that the responses should not be biased towards a particular group. The main exceptions are a slight over-representation of electricity, gas and water suppliers, transport and storage and education, with a corresponding under-representation of organizations from wholesale trade and finance and insurance.

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<sup>2</sup> The primary public data sources are the 1997 and 1998 waves of the ABS Business Longitudinal Survey (which is now somewhat out-of-date) and ABS Cat. No. 8129.0, *Business Use of Information Technology* (1994, 1998, 2000, 2001).

<sup>3</sup> The survey was part of a collaborative research program entitled *The Impact of Enterprise and Workplace Focused Industrial Relations on Employee Attitudes and Enterprise Performance*. The project was supported by the Australian Research Council, the Business Council of Australia and the Committee for the Economic Development of Australia.



Respondents were asked to rank the extent to which they used a variety of Internet-enabled business practices, where 1 represented ‘not at all’ and 7 represented ‘a very great extent’. Only three respondents indicated that they did not use the Internet for any of the listed options. Most respondents used the Internet extensively for the sharing and dissemination of organization information, as seen from Table 1. This is in line with the view held by Tchokogue and Boisvert (2002) that websites are predominantly used for promotional purposes (what they refer to as a ‘virtual business card’), rather than to change the way a product or service is delivered. Aggregate Australian statistics also corroborate these findings, with the Australian Bureau of Statistics *Business Use of Information Technology* reporting that 91 per cent of Australian businesses used the Web to provide information about the business in 2000-01.

Use of the Internet for knowledge directories, and procedure or process manuals also ranked highly. Responses were broadly spread for the rest of the Internet-enabled businesses practices, with the sharing and dissemination of competitor information considered the least likely application of the Internet.

**Table 1: Internet enabled business practices**

	Not at all						A very great extent
	1	2	3	4	5	6	7
<b>Internal Organizational Activities</b>							
Sharing and dissemination of organization information	2	2	7	13	22	35	20
Self-service personnel, benefits administration or training	17	20	15	12	22	12	2
Knowledge directories, and procedure or process manuals	4	6	9	11	33	24	14
Internet-enabled linkage of purchase, inventory, and forecasting systems with suppliers	13	17	13	17	23	12	5
<b>External Market Activities</b>							
Collaborative product design/service coordination across locations	15	17	16	19	18	12	3
Co-ordination of delivery arrangements	17	16	11	18	22	12	4
Real-time transaction of orders (availability/delivery time)	15	15	14	14	23	14	5
Sharing and dissemination of competitor information	15	15	17	24	16	7	5
On-line sales channels including Web sites and Internet marketplaces	18	19	13	12	15	16	6
Customer self-service via Web sites and intelligent service request processing	18	18	11	16	17	13	6

Note: The questions on Internet enabled business practices were derived from Porter (2001).

However, it is probable the estimates from the full sample mask differences in usage across various organizations. The next section therefore considers whether an increased focus on cost and efficiency is a significant determinant of Internet usage, as the Melbourne Institute Business Survey allows an examination of the form of Internet usage undertaken by those

businesses that are interested in improving efficiency. In particular, it will concentrate on answers to the question, “To what extent do the following statements best describe your organization’s competitive strategy?” The three answers pertinent to cost-focussed firms are “increases operating efficiencies”, “develops new process innovations that reduce costs” and “focuses on increasing productivity”. As with the Internet questions above, respondents were asked to rank the extent to which the statement applied to them on a 1 to 7 scale, where 1 represented ‘not at all’ and 7 represented ‘a very great extent’. These three items were then averaged to form a scale measuring the extent to which organizations focus on reducing costs and/or improving efficiency.

#### **4. Cost Focussed Firms and Internet Usage**

##### *4.1. Exploratory Analysis*

A simple preliminary ordered probit estimation was undertaken to determine which types of Internet usage increased as firms reported being more interested in reducing costs and improving efficiency, the results of which are presented in Table 2. An ordered probit technique is utilised because the responses for Internet usage are (ordered) categorical, that is, the choices range from 1 to 7 (Kennedy 1992).<sup>4</sup> Businesses that are interested in reducing costs are significantly more likely to use the Internet for the sharing and dissemination of organization and competitor information; collaborative product design/service coordination across locations; knowledge directories, procedure and or process manuals; real-time transaction of orders; and on-line sales. There is also weak evidence that such organizations make greater use of the Internet for customer self-service.

While this approach does provide some useful information regarding competitive strategy and Internet usage, there are several problems with using individual ordered probit estimations. The first of these is that types of Internet usage are likely to be related to one another, and it would therefore be more informative if the types could be grouped. The second is that there are likely to be other factors associated with Internet usage, such as the type of industry the organization operates in, the management style of the organization, and how innovative the organization is (Loundes 2002). It would therefore be more appropriate to adopt a multivariate analysis to examine the relationship between a cost focussed competitive strategy and Internet usage.

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<sup>4</sup> This model is estimated without a constant, and therefore the first boundary parameter is restricted to zero.

**Table 2: Types of Internet Usage and Cost-Focussed Firms (Ordered Probit Estimation)**

	Coefficient	Robust Standard Error
<b>Internal Organizational Activities</b>		
Sharing and dissemination of organization information	0.213	0.078***
Self-service personnel, benefits administration or training	0.102	0.080
Knowledge directories, and procedure or process manuals	0.283	0.077***
Internet-enabled linkage of purchase, inventory, and forecasting systems with suppliers	0.105	0.076
<b>External Market Activities</b>		
Collaborative product design/service coordination across locations	0.332	0.089***
Co-ordination of delivery arrangements	0.140	0.088
Real-time transaction of orders (availability/delivery time)	0.192	0.085**
Sharing and dissemination of competitor information	0.224	0.080***
On-line sales channels including Web sites and Internet marketplaces	0.244	0.090***
Customer self-service via Web sites and intelligent service request processing	0.164	0.084*

Notes: \*, \*\*, and \*\*\* represents significant at the 10%, 5% and 1% levels respectively.

The research to date shows that there are significant differences in the types of Internet usage depending on the industry the organization operates in (Cheng, Cheung et al. 2002). As mentioned earlier, manufacturers tend to use the Internet for supply-chain management issues, such as information sharing, interaction with suppliers, sharing of production schedules, product development, and procurement (Fine and Raff 2001; Litan and Rivlin 2001). In contrast, finance, health and government services are more likely to use the Internet for the purposes of lowering transaction costs, and would therefore find areas such as customer self-service and on-line sales more suited to their needs (Clemons and Hitt 2001; Danzon and Furekawa 2001; Fountain 2001). Previous analysis of this data indicates that there are indeed differences in Internet usage across industries: manufacturers are more likely to use the Internet for the co-ordination of delivery arrangements; wholesalers are more likely to use the Internet for the sharing and dissemination of competitor information, and collaborative product design/ service coordination across locations; and finance, insurance, property and business services more likely to use the Internet for customer self-service (Loundes 2002).

Another distinguishing feature regarding the intensity of Internet usage is its role as a complement to new innovations, including the introduction of new products and services—product innovation—and organizational change, or process innovation (Bresnahan, et al. 2002; Brynjolfsson and Hitt 2000). Whether or not Internet technology is actually used however will also depend on whether such an approach fits into an overall strategy, and the willingness of management to invest in new “risky” technology. As pointed out by

Bresnahan, et al. (2002), “firms do not simply plug in computers or telecommunications equipment and achieve service quality or efficiency gains”. Typically, it is only when such investments form part of an overarching strategic plan that potential gains are actually realized, and firms gain a competitive advantage over their rivals (Porter 2001). Evidence from case studies suggest that the success of information technology adoption, of which the Internet is a part, relies on being part of an overall strategy of organizational change that is mutually reinforcing (Milgrom and Roberts 1990; Brynjolfsson and Hitt 2000). Earlier work using the current data set provided some evidence that organizations that are more innovative utilize the various Internet practices more intensively (Loundes 2002).

Related to the above discussion is the impact that management style has on the innovativeness of organizations, that is, the extent to which new technologies are adopted, and how willing management are to make the necessary organizational changes to ensure the success of their strategic plan. While there has been little empirical research relating management style to technological change, *a priori* it is expected that firms that favour high-risk projects and take an aggressive attitude towards initiating change are going to use the Internet more intensively as a management tool than those firms that adopt a “wait and see” posture. Similarly, firms whose strategic decision style relies on formal and extensive quantitative analysis are more likely to be able to correctly identify how Internet usage fits into their overall competitive strategy.

Table 3 presents the variable definitions and descriptive statistics for the variables used in the estimations. Factor analysis revealed that the ten Internet questions in Table 1 formed two distinct subscales; those associated with internal organizational activities (such as internal knowledge and information management) and those associated with external market activities (such as logistics and sales).

**Table 3: Variable Definitions and Descriptive Statistics, N=247**

	Description	Mean	Standard deviation
<b>Internet usage</b>			
Internal organizational activities	A 4-item, 7-point scale measuring the extent of Internet usage for support activities ( $\alpha=0.75$ )	4.310	1.254
External market activities	A 6-item, 7-point scale measuring the extent of Internet usage for primary activities ( $\alpha=0.85$ )	3.655	1.367
<b>Competitive strategy</b>			
Cost focussed competitive strategy	A 3-item, 7-point scale measuring the extent to which organizations focus on efficiency ( $\alpha=0.78$ )	5.207	0.856
<b>Market conditions</b>			
Market volatility	A 5-item, 7-point scale measuring the extent of external market volatility ( $\alpha=0.70$ )	3.728	1.154
Barriers to entry	A 7-point scale measuring perceptions of market barriers to entry	3.146	1.611
Concentration	A 7-point scale measuring perceptions of industry concentration	4.919	1.648
<b>Internal operations</b>			
Employee development	A 5-item, 7-point scale measuring the effort put into employee development, e.g. training ( $\alpha=0.74$ )	4.715	0.874
Employee involvement	A 4-item, 7-point scale measuring employee involvement, e.g. employee feedback ( $\alpha=0.80$ )	4.922	0.978
Grievance and appraisal	A 3-item, 7-point scale measuring the use of grievance and appraisals systems ( $\alpha=0.66$ )	5.426	1.097
Rewards	A 4-item, 7-point scale measuring the rewards system, e.g. pay for performance ( $\alpha=0.84$ )	4.381	1.328
<b>Management style</b>			
Bold management style	A 6-item, 7-point scale reflecting managers' attitudes towards initiating change ( $\alpha=0.82$ )	4.231	1.009
Intuitive management style	A 5-item, 7-point scale measuring managerial reliance upon intuitive information ( $\alpha=0.78$ )	3.844	0.989
<b>Innovativeness</b>			
Process innovation	A 2-item, 7-point scale measuring the extent of organizational & managerial change ( $\alpha=0.78$ )	4.794	1.203
Product innovation	A 2-item, 7-point scale measuring the extent to which new products/services were introduced or changed significantly ( $\alpha=0.83$ )	4.794	1.249
<b>Industry</b>			
Manufacturing		0.275	0.448
Utilities		0.093	0.291
Wholesale trade		0.105	0.308
Retail trade		0.065	0.247
Accommodation, cultural & personal services	Measures whether or not the firm is in a particular industry (1 = yes, 0 = no)	0.061	0.239
Transport & communication		0.065	0.247
Finance & property		0.194	0.396
Education & health		0.085	0.279

The cost focussed competitive strategy variable measures the extent to which the organisation is interested in improving efficiency, reducing costs, and increasing productivity. The three market conditions variables are self-reported measures of the market conditions facing the organization. Market volatility refers to a series of questions relating to the external market environment, including the frequency with which the organisation has to change marketing practices to keep up with competitors, product obsolescence, the ease with which organisations can keep track of competitor actions and consumer demand, and whether the production or service technology is subject to much change. The barriers to entry variable measures the ease with which respondents believe new competitors can enter the market, and the concentration variable measures the extent to which respondents believe their market is dominated by a few firms with large market shares who can influence the competitive situation.

The employee development variable measures the extent to which respondents provide training for both new and existing employees (including multi-skilling) and career opportunities for employees. Employee involvement measures the extent to which employees are involved in decision-making at the organization through regular communication, acting on employee feedback and suggestions, and giving teams responsibility for work methods and assignment. Grievance and appraisal measures the extent to which there is a formal appraisal and grievance system at the organisation, including methods to address poorly performing employees. The rewards variable measures whether the organization has a “rewards for performance” system, be it individual performance, team performance or organization performance.

Management style is measured by the extent to which the organization takes a bold approach to competitive opportunities, and the extent to which they use intuition and experience to make decisions. The bold management style variable measures whether management favour innovative, high-risk (for high-return) projects, and whether they take an aggressive market position in order to gain an advantage over their competitors, such as through being first-to-market with new products and services or processes. The intuitive management style variable measures how much management relies on intuition and experience to make strategic decisions, rather than formal quantitative and systematic analysis of information. Process innovation measures both managerial and organizational change in the firm over the past three years. Product innovation measures the extent to which the organization has introduced new or improved products or services over the past three years.

The hypothesised model is therefore:

$$\text{Internet usage} = f(\text{competitive strategy, internal operations, management style, innovativeness, industry})$$

#### 4.2. Instrumental Variables Estimation

It is highly likely that some of the variables that influence Internet usage also influence the type of competitive strategy adopted. To examine this possibility, the cost-focussed competitive strategy variable was regressed against the market conditions variables, a range of variables representing the internal operations of the organization (including management style), the degree of innovativeness of the organization, and industry dummies (see Table 3 for the list of variables). The results from this estimation indicate that the cost-focussed/efficiency strategy is significantly related to market volatility, the degree of process innovation, and employee development. It was therefore decided to use these three variables as instruments for cost-focussed competitive strategy in the Internet usage estimations.

One issue surrounding the use of the instrumental variables technique is it utilises an OLS procedure, which requires a continuous—as opposed to a ranked—variable. Although the individual items in the Internet usage variables are 7-point scales, the two variables that are used are averages of these individual items (see Table 2 for a list of the individual items in each subscale). Therefore, they have a continuous element to them, allowing the use of the instrumental variables technique. Another issue is that it is difficult to determine what a marginal change in these average scales actually means. It is, however, possible to make comparisons with the other variables in the estimation. Consequently, discussion of the results concentrates on the sign and significance of the coefficients, as well as the relative size of the impact compared to other variables in the regression equation.

The results of the instrumental variables estimation on Internet use for internal organizational purposes are presented in Table 4. Two sets of results are presented; a full version of the model specification where all variables discussed above are included, and a restricted specification where variables with t-ratios less than one are excluded (with the exception of the industry control variables).

Looking at the restricted specification, the adoption of a cost focussed competitive strategy has a positive and significant association with use of the Internet for activities that are internal to the organization. The association appears quite strong, having about four times the

impact of having a formal grievance and appraisal system, or introducing new products or services over the past three years. The results therefore lend support to the claims made elsewhere that the intensity of Internet usage is likely to be closely tied to a formal competitive strategy (Porter 2001). It also indicates that organizations that are interested in reducing costs and/or improving efficiency believe that using the Internet to manage some of their internal operations is an effective method by which to achieve this aim.

**Table 4: Cost-focussed Firms and Internet Usage for Internal Organizational Activities (Instrumental Variables Estimation)**

	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Constant	-1.24	1.315	-1.55	1.162
Cost focussed competitive strategy	0.70	0.313**	0.78	0.278***
Bold management style	-0.01	0.095		
Intuitive management style	-0.01	0.087		
Employee involvement	-0.01	0.099		
Grievance and appraisal	0.18	0.099*	0.20	0.095**
Rewards	0.08	0.094		
Product innovation	0.20	0.091**	0.19	0.091**
Manufacturing	-0.67	0.391*	-0.66	0.392*
Utilities	0.29	0.425	0.33	0.423
Wholesale trade	-0.26	0.426	-0.24	0.417
Retail trade	-1.03	0.502**	-1.01	0.512**
Accommodation, cultural & personal services	0.08	0.533	0.11	0.537
Transport & communication	-0.32	0.440	-0.36	0.432
Finance & property	-0.04	0.414	-0.01	0.410
Education & health	0.69	0.494	0.62	0.476
Observations	247		247	
F(11, 235)	5.07		6.08	
R <sup>2</sup>	0.18		0.14	
Root MSE	1.17		1.19	

Notes: \*, \*\*, and \*\*\* represents significant at the 10%, 5% and 1% levels respectively.

The presence of a formal appraisal and grievance system, as well as having a transparent system to address poorly performing employees, is positively associated with using the Internet for internal organizational activities. This may well reflect the fact that, with a formal system in place, one of the most effective methods of sharing this information with employees is via the Internet (assuming they have access to the Internet). Additionally, the Internet allows for the loading of documents such as procedure and process manuals that contain grievance and appraisal procedures and processes, which employees can then download when the need arises. Two of the items in the internal organizational activities



scale do indeed capture these options: the sharing and dissemination of organization information, and the use of knowledge directories and procedure or process manuals.

The positive relationship between product innovation and Internet use for internal organizational activities may represent the observation that firms that introduce a range of new or improved products or services onto the market are probably the same firms that are likely to take the risk of using new technology. That is, both these variables are capturing different measures of organizational innovativeness, which is in line with research elsewhere positing that information technology adoption forms part of a cluster of innovations that the firm is undertaking (Brynjolfsson and Hitt 2000).

Organizations that operate in the retail sector make significantly less use of the Internet for internal activities. This is perhaps indicative of the growing recognition that Internet usage is going to be more important in the production process of goods, rather than in sales of goods to the final consumer (Bailey 2001). According to Gertner and Stillman (2001), it is primarily vertically integrated specialty retailers, such as The Gap, that have been able to take advantage of on-line sales. Results from the Australian Bureau of Statistics *Household Use of Information Technology* show that use of the Internet by adults to purchase goods or services for private use only increased from 3 per cent in 1998 to 7 per cent in 2000. As such, retailers may feel that if they are not going to realise many gains from using the Internet as a sales channel, they may also be loathe to dedicate resources to setting up a system that helps manage the internal workings of the organization. There is also weak evidence that manufacturers make less use of the Internet for this purpose. This is in line with previous research, which suggests that manufactures tend to use the Internet for supply-chain management purposes, rather than internal organizational activities (Fine and Raff 2001; Litan and Rivlin 2001; Loundes 2002).

The results of the instrumental variables estimation on Internet use for the external market are presented in Table 5. Again, both the full version of the model specification and a restricted version are presented. The restricted specification indicates that organizations with a cost focussed competitive strategy are also interested in using the Internet more intensively for external market purposes, such as on-line selling and collaborative product design across locations. These results suggest the cost focussed competitive strategy encourages intensive use of the Internet across most applications, although the results are somewhat weaker for external market activities compared to internal organization activities.

The positive relationship between product innovation and Internet usage for external market activities may represent use of the Internet as a tool for bringing these new or improved products or services to the market. It is difficult to determine the extent to which the need to bring new products to market is a driving factor behind external market activity use of the Internet, or whether it again reflects innovativeness in general, as discussed in the previous set of results. Unfortunately there is no historical information that allows an examination of the timing of the introduction of new products versus the timing of the introduction of Internet technology. Nevertheless, for those organizations that are characterised as being product innovators, there is some evidence that they are utilizing the Internet as a tool for getting these products and services into the public domain. This evidence is in line with Bresnahan, et al. (2002) and Brynjolfsson and Hitt (2000) who suggest the use of information technology tends to be bundled up with a range of innovations across the firm, including product innovation and organizational change.

**Table 5: Cost-focussed Firms and Internet Usage for the External Market  
(Instrumental Variables Estimation)**

	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Constant	-1.78	1.406	-1.68	1.297
Cost focussed competitive strategy	0.38	0.336	0.47	0.327**
Bold management style	0.04	0.100		
Intuitive management style	0.05	0.084		
Employee involvement	0.06	0.112		
Grievance and appraisal	0.12	0.098	0.12	0.095
Rewards	0.20	0.083***	0.21	0.079***
Product innovation	0.24	0.078***	0.25	0.078***
Manufacturing	0.09	0.353	0.09	0.361
Utilities	-0.03	0.422	-0.04	0.427
Wholesale trade	0.58	0.435	0.59	0.441
Retail trade	-0.28	0.463	-0.30	0.467
Accommodation, cultural & personal services	0.29	0.543	0.30	0.554
Transport & communication	0.07	0.426	0.07	0.437
Finance & property	-0.23	0.374	-0.23	0.383
Education & health	0.49	0.487	0.55	0.494
Observations	247		247	
F(11, 235)	5.76		6.54	
R <sup>2</sup>	0.25		0.17	
Root MSE	1.23		1.27	

Notes: \*, \*\*, and \*\*\* represents significant at the 10%, 5% and 1% levels respectively.

Having a rewards system for employees based on how well the employee, team or organization performs is positively related to using the Internet for external market activities. Part of the explanation for this result may lie in understanding the purpose of such a reward system. Presumably, organizations that have pay for performance schemes have measurable performance targets related to the output of the firm. If it is believed that the adoption of the Internet for external market activities—such as collaborative product design and the sharing and dissemination of competitor information—can help achieve those performance targets, there is a greater chance Internet technology will be used more intensively compared to those organizations that do not have such targets.

Unfortunately, the information available does not allow for the determination of how successful the Internet has been for reducing costs and/or improving efficiency at the organizations surveyed. Aggregate data from the Australian Bureau of Statistics reveals that of those businesses earning income via the Internet, 26 per cent reported a decrease in costs, 25 per cent reported an increase in costs, and 43 per cent reported no change. However, it should be emphasized that these results are for firms that sell on the web, whereas the above discussion suggests that cost savings are more likely to arise when the Internet is used for other purposes (perhaps in conjunction with selling) such as collaborative product design, or the sharing and dissemination of organization information.

## **5. Conclusion**

The purpose of this paper was to examine whether firms that were concerned with reducing costs and/or improving efficiency were more likely to utilise Internet technology. It was hypothesised that organizations with such a competitive strategy would be interested in using the Internet because of its potential to reduce transaction costs and improve supply chain management by reducing search and coordination costs. Initial estimates suggested that there was evidence that firms with a cost-focussed competitive strategy were more likely to use particular aspects of the Internet, specifically: the sharing and dissemination of organization and competitor information; collaborative product design/service coordination across locations; knowledge directories, procedure and or process manuals; real-time transaction of orders; on-line sales and customer self-service.

Subsequent analysis using an instrumental variables technique found that cost-focussed organizations utilised the Internet more intensively for both internal organizational activities and external market activities than organizations that did not have a high focus on costs.

However, this impact appeared greater for internal organizational activities, suggesting that these firms possibly believed that there were greater cost savings and efficiency gains—at least in terms of Internet usage—to be had in using the Internet as part of the internal operations of the organization.

Several other factors also had an influence on Internet usage. The degree of product innovation (that is, the extent to which the organization had introduced new or improved products or services over the past three years) was significantly associated with both types of Internet usage. This significant positive association supports the view that the adoption of information technology, of which the Internet is part, is tied in with other innovations within the firm. The existence of a formal grievance and appraisal system had a positive and significant relationship with use of the Internet for internal organizational activities. This may have been because, with a formal system in place, an effective method of sharing this information with employees is via the Internet. Performance related pay systems were positively and significantly related to use of the Internet for external market activities. This relationship was likely the result of what such rewards were actually measuring. That is, with rewards based on performance, the more intensive use of the Internet for external market purposes may be viewed as a method of achieving set performance targets.

Overall, it appears that use of the Internet plays an active role in the competitive strategy and innovation process of large Australian firms. Although it is difficult to generalise these results to the wider Australian business population due to the focus on large firms, previous research suggests that it primarily larger firms that are taking the most advantage of Internet technology. Further research should now address the question of measuring the extent of the payoffs from such investment.

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