E-BUSINESS DIFFUSION IN AUSTRALIA’S HORTICULTURE SUPPLY CHAIN

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EXECUTIVE SUMMARY

Despite the widely acclaimed potential of e-business to transform business and supply chains, its diffusion in different sectors of an economy greatly vary. The agribusiness industry is one of the early users of electronic trading. Long before the Internet, there were successful electronic trading mechanisms for the exchange of agricultural products such as eggs and cotton. The homogeneity of agricultural products, the volume of fragmentation along the supply chain and the need for efficient transfer of goods accompanying documents for quality assurance, inspection and trading makes Internet based e-business an attractive proposition for most agribusinesses. This study examines the implementation of e-business technologies and electronically performed business functions and the drivers, influencing factors and benefits of e-business, in the horticulture supply chain. Data were collected through a survey of Australian horticulture growers, service providers and industry associations.

In terms of implemented technologies and e-business functions, the findings reveal that while farm management systems (such as computerized accounting) and mobile technologies are widely diffused, the adoption of e-supply chain technologies is rather very limited. Correspondingly, existing e-business functions are by and large informational and there is a general lack of sense, monitor, track and supply chain coordination and collaboration e-business capabilities.

In terms of e-readiness, overall, the Australian horticulture supply chain lacks e-readiness. The results indicate that while horticulture firms demonstrate a relatively better organisational preparation for the conduct of e-business, the value network within which they operate and the wider institutional environment doesn’t appear to encourage and support their endeavours. In particular, the government and industry associations have not been seen as playing supportive role in encouraging the use of e-business among the members of horticulture supply chain.

In terms of benefits, most firms have only experienced informational gains. However, those that have developed e-business capabilities have identified benefits including improved market access, reduced costs of transaction and coordination, and enhanced transparency and visibility of the horticulture supply chain.

The majority of respondents expect the government and horticulture industry associations to provide incentives, set e-business norms and practices and play active roles in promoting e-business.

The results have established a benchmark that provides an understanding of developments in e-business in agribusiness and can be used for future positioning and comparisons.

ACKNOWLEDGEMENTS

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The researchers also wish to extend their gratitude to those that helped evaluate the survey and provide their valuable time to assisting the researchers.

The researchers also extend their gratitude to GS1 Australia for providing access to their database to identify participants for the survey.

Finally, the researchers wish to thank the respondents for taking the time to complete and return the survey that provided the data to develop this report.
INTRODUCTION
The purpose of this report is to provide a snapshot view of the use of electronic business (or e-business) and its associated supply chain technologies and functions in the Australian horticulture sector. This report covers key issues related to survey participants, e-readiness, e-business drivers, current state of e-business technologies and functions and future plans, as well as e-business benefits identified by those using the technologies.

PROFILE OF SURVEY PARTICIPANTS
Most of the respondents (84%) who completed the questionnaire were General Managers or their equivalent (such as Managing Directors, Chief Executive Officers, or Owners). The rest had different titles such as Export Director, Administration Manager, Business Development Manager and President. The businesses have been operating on average for 28 years - the oldest being 128 and youngest three years.

Fifty two percent of the firms grow fruit, vegetables, plants and cut flowers, while 32% are involved in production, harvesting, post harvest and logistics and marketing services. While 36% of them are engaged in two lines of businesses such as growing and services, another 17%, 7% and 2% operated three, four and five lines of businesses respectively. This shows limited vertical integration in the horticulture supply chain.
Participants of the survey were from different business size categories (as measured by employee numbers) and export orientation.

- Based on full time equivalent employee numbers, the average business size is small.
- Thirty-three percent are involved in export trading.
- Of those that are exporting, 20% export more than 50% of their production.
- Twenty two percent earn annual revenues of up to five million Australian dollars per year.

CURRENT STATE OF E-BUSINESS IN HORTICULTURE

The current state of e-business was assessed in terms of the diffusion of e-business technologies and the business functions performed electronically.

<table>
<thead>
<tr>
<th>Adoption of E-business Technologies</th>
<th>Adopted</th>
<th>Intend to adopt</th>
<th>Will never adopt</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computerized farm accounting</td>
<td>76%</td>
<td>11%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Broadband Internet connection</td>
<td>71%</td>
<td>11%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Mobile and wireless technologies</td>
<td>65%</td>
<td>18%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Website</td>
<td>43%</td>
<td>32%</td>
<td>18%</td>
<td>7%</td>
</tr>
<tr>
<td>On-farm electronic monitoring</td>
<td>36%</td>
<td>16%</td>
<td>36%</td>
<td>12%</td>
</tr>
<tr>
<td>Bar-code</td>
<td>29%</td>
<td>29%</td>
<td>30%</td>
<td>11%</td>
</tr>
<tr>
<td>GPS (Global Positioning System)</td>
<td>24%</td>
<td>25%</td>
<td>40%</td>
<td>11%</td>
</tr>
<tr>
<td>EDI (Electronic Document Interchange)</td>
<td>21%</td>
<td>22%</td>
<td>46%</td>
<td>12%</td>
</tr>
<tr>
<td>Internet enabled tracking systems</td>
<td>15%</td>
<td>29%</td>
<td>42%</td>
<td>13%</td>
</tr>
<tr>
<td>Internet enabled cold chain systems</td>
<td>3%</td>
<td>25%</td>
<td>54%</td>
<td>17%</td>
</tr>
</tbody>
</table>

The most widely diffused technologies are farm accounting and Internet, whereas supply chain management-related technologies are the least adopted.

Of all the members of the horticulture supply chain in the sample, plant nurseries appear to show the most aggressive stance with 100% adoption of five (Computerized accounting, Broadband, Website, Tracking Systems, and Mobile) out of the ten technologies. To the contrary, vegetable growers tend to lag in most of the technologies adopted.

The level of implementation of the technologies between micro and small (MSE) and medium and large enterprises (MLE) shows some variation, with larger businesses leading the smaller ones especially in the On Farm Monitoring, Broadband Internet and Bar-code technologies adoption.

Exporting firms tend to adopt computerized accounting (100%), mobile and wireless (81%); broadband (81%), websites (62%) and on farm electronic monitoring (62%) technologies.

There is no significant difference between older and recently established firms’ adoption of technology.

Some firms believe that even basic accounting and Internet technologies are not applicable to them. These firms tend to be largely micro businesses.

Respondents are not planning major implementation of advanced supply chain technologies. For example, of the 66 growers in the sample, more than 50% will never adopt e-supply chain technologies such as bar-codes, EDI, cold chain and tracking systems.
Among growers, while broadband internet, mobile and wireless and internet enabled cold chain systems are popular, bar-codes, on-farm e-monitoring, GPS and EDI systems are the least diffused.

Among production, harvesting, post harvest, logistics and marketing services providers, computerized accounting, mobile and wireless and broadband internet are the most widely diffused technologies.

Diffusion of e-business technologies amongst traders follows the same pattern as service providers.

Note that some of the e-business technologies might not be applicable to traders.

All the horticulture associations in the sample have adopted broadband and most have computerized accounting and websites.

Note that some of the technologies might not be applicable to horticulture associations.
E-BUSINESS FUNCTIONS
The use of the e-business and other Internet based technologies for performing 13 e-business functions were assessed. The results indicate that, e-business practice in the Australian horticulture supply chain is at its infancy.

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Perform now</th>
<th>Plan to perform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply chain Information exchange</td>
<td>Exchanging information on growing, climatic conditions and harvest maturity electronically in real-time</td>
<td>18%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Use website to provide access to database relevant to horticulture</td>
<td>26%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Use website to provide information relevant to horticulture</td>
<td>33%</td>
<td>4%</td>
</tr>
<tr>
<td>Sense, monitor and track</td>
<td>Electronically monitor growth conditions of products on-farm and report the information back in real time</td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Electronically monitor environmental conditions of containers in transit and report the information back in real time</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Use or provide on-line order/shipment tracking and tracing</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Supply chain execution</td>
<td>Stock availability, prices or delivery times are shared with trading partners electronically in real-time</td>
<td>22%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Exchange trading information (orders, delivery notices, invoices, statements, remittance advice) online and in real-time</td>
<td>29%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Joining e-markets for on-line purchase or sale</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Supply chain collaboration and co-ordination</td>
<td>Shipment and logistics management are facilitated with suppliers and distributors via the Internet</td>
<td>16%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>On-line collaboration to schedule spraying and harvest programs</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Remote displaying/viewing of products during production</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Website supports online communities</td>
<td>7%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Current e-business functions in horticulture tend to be informational (mostly via Websites) with limited sense, monitor and track, transactional and supply chain collaboration capabilities.

Very few organisations e-enabled their supply chain execution activities with only 22% and 29% exchanging pre-transaction and post transaction trading information online respectively.

Use of e-markets for selling and/or buying is very limited.

Although some of these functions are not applicable for some of the firms in the sample (such as horticulture associations). Overall the sector has yet to invest in building e-supply chain management capabilities.
WHAT DRIVES E-BUSINESS IN HORTICULTURE?
The drivers of e-business can be grouped into three broad categories of efficiency (such as the need for more and better information sharing and time saving), legitimacy, (fear of being left behind because of not adopting e-business technologies and positive images associated with e-business adoption), and market forces (pressure from customers and trading partners to adopt e-business technology).

- Of the three e-business driver categories, efficiency drivers appear to be dominant followed by legitimacy.
- Market forces appear to play a limited role in driving e-business in horticulture.
- The limited adoption of e-business technologies and functions can therefore be due to the fact that respondents are yet to be convinced about the potential of e-business to generate efficiency and return on investment.

HOW E-READY ARE HORTICULTURE FIRMS?
The perceived e-readiness of horticulture firms were assessed in terms of organisational e-readiness, perceived value network e-readiness and perceived institutional e-readiness. Organisational e-readiness was assessed in terms of awareness, resources and commitment. Perceived value network e-readiness was assessed in terms of supplier, competitor and customer pressure. Institutional e-readiness was measured in terms of support from government, horticulture associations and IT firms. The scale used ranges from 1 = strongly disagree to 5 = strongly agree.

- Sample organisations showed relatively better organisational e-readiness in terms of awareness and resources. Value network and institutional e-readiness is perceived as least favourable.
- Government and industry associations have not been seen as playing a supportive role in encouraging the use of e-business amongst members of the horticulture supply chain.
Impact of business size on e-readiness

The effect of business size, using the Australian Bureau of Statistics classification, on e-readiness is evaluated.

- Medium size organisations appear to show a relatively better level of e-readiness on all the measures except for awareness and resources than the rest of the group.
- Micro organisations on the other hand show a relatively lower level of e-readiness.
- The two important e-readiness dimensions that are affected by business size differences are awareness and resources.

Impact of sector on e-readiness

The effect of the value chain position of firms on e-readiness indicates horticulture associations with better profiles of e-readiness. Interesting to note in the result is how horticulture associations rate their commitment and support for e-business. This, however, is not shared by other participants; hence the lowest score for associations support.
**Impact of export orientation on e-readiness**

There does not appear to be a clear difference between exporting and non-exporting organisations’ e-readiness. However, exporters appear to perceive the readiness of their value network, that is, customers, suppliers and competitors slightly better than that of non-exporters.

![E-readiness profile by export orientation](image)

**E-BUSINESS BENEFITS**

The benefits firms experienced from their e-business investment and applications were assessed based on ten questions. Only about half of the respondents answered these questions. The findings are consistent with the level of e-business technologies adoption and electronically performed e-business functions.
Most of the respondents indicated that their e-business practices have allowed them to have easy and timely access to information relevant to their business. This corresponds with the most widely performed e-business function, that is, provision and access of information via a website.

E-business has also allowed a significant proportion of the respondents to enhance their business network with customers, partners and suppliers.

Some respondents have experienced cost reductions related to general management activities such as planning, accounting and compliance processing.

Transaction cost savings such as shipping, scheduling, order processing, transporting and warehousing are very rare.

Respondents who experienced better e-business benefits:
  • are mostly growers of medium size;
  • tend to implement farm accounting, broadband, website, GPS and mobile and wireless technologies;
  • have developed e-business capabilities related to exchanging growing, trading and shipment information online and in real time with partners; and
  • demonstrated relatively better organisational e-readiness in terms of e-business awareness and commitment and its utility for staying competitive in the industry.

SUMMARY AND OBSERVATIONS

This study captures the implementation of e-business technologies and electronically performed business functions and provides a benchmark for future positioning and comparison. However, because of the low response rate, the findings presented above can only be considered as exploratory and cannot, as such, be generalised.

The findings, in terms of implemented technologies and e-business functions, reveal a consistent picture of the assimilation of e-business in Australian horticulture. At the time of the survey, farm management, mobile and Internet technologies are the most widely implemented technologies. In similar fashion, most of the respondents reported using these Internet-based channels to enhance and support their information exchange, but the extent of use is limited and has yet to permeate the supply chain.

Implementation plans for both e-business technologies and functions do not show great promise and appear to revolve around extending existing websites, broadband Internet and mobile technologies to enhance the exchange of information. Planned implementations of e-supply chain technologies and supply chain execution and collaboration and co-ordination capabilities tend to be very limited.

Given the large proportion of growers and micro and small organisations in the sample, it might not be surprising that e-business is not heavily experimented with and adopted. Such firms often lack both the motivation and resources to invest in innovations that can increase the visibility of the supply chain.

In terms of e-readiness, overall, the Australian horticulture supply chain lacks e-readiness. This seems to suggest that the agribusiness sector exhibits limited e-maturity and might require special attention to be integrated into Australia’s digital economy.

Most respondents expect the government and horticulture industry associations to provide incentives, set e-business norms and practices and play active roles in promoting e-business in horticulture.

The assessment of e-business benefits indicates that, although corresponding to existing levels of e-business use, most firms have only experienced informational gains, for those that have invested in higher levels e-business capabilities, e-business can indeed improve market access, reduce the cost of transaction and coordination, and enhance the transparency and visibility of the horticulture supply chain.
RESEARCH METHODS NOTES

- Data for this study was collected through a survey of firms in the horticulture supply chain between September and October 2007. To select survey participants, a sample frame was developed from a combination of a database leased from a commercial database provider, Web searches and from members of the Australian administrator of global supply chain standards.
- The questionnaire used to collect the data was developed and pilot tested through interviews with three horticulture industry experts.
- 1335 questionnaires were mailed out. 40 bounced back as undeliverable because of either business closure, or address change or name change.
- After four weeks, over 450 follow up phone calls were made to randomly selected, out of the sample frame, potential respondents. Further, we sent e-mail reminders to over 500 firms.
- Of the delivered questionnaires, 101 replied giving an 8% response rate. Nine had too many missing data points and were excluded from the analysis. This resulted in 92 usable responses.

About the Authors


Dr Konrad Peszynski is a Senior Lecturer in the School of Business Information Technology. His research is divided into two specific domains: online learning and digital business, incorporating eBusiness and supply chain technologies. He has published over twenty articles in journals, book chapters and internationally recognised information systems conferences. Dr Peszynski is also an on the editorial board for the journal Information & Management. Dr Peszynski’s research interests lie primarily in the realm of supply chain management and its associated technologies and methodologies. Specifically, Konrad is interested in how eBusiness technologies can enhance the supply chain making it more efficient and effective.

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