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Helen Cripps

*Edith Cowan University, h.cripps@ecu.edu.au*

Jari Salo

*University of Oulu, jari.salo@oulu.fi*

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## **The lost “E” in Clustering: an Australian Case Study**

**Helen Cripps**

Edith Cowan University, Australia  
h.cripps@ecu.edu.au

**Jari Salo**

University of Oulu, Finland  
jari.salo@oulu.fi

### **Abstract**

*The research investigated the use of information communication technology within collaborative relationships in a multi industry cluster in Australia. The study found that collaborative business relationships were present in the cluster, however the role of ICT in these relationships was not significant due to a number of industry characteristics displayed across the cluster, such as secrecy, a high need for security and low ICT adoption.*

**Keywords:** Clusters, Collaboration, Information Communication Technology, Australia.

### **1 Introduction**

Within industrialised countries one of the main producers of wealth and prosperity has been “well coordinated and sustainable systems, capable of converting technological innovation assets into substantial levels of local industrial productivity and global competitiveness” (Scheel 2002, p.356). One of the ways of achieving this has been through the establishment of regional clusters. At the time of the research there was a belief within government circles in Western Australia that collaboration, using information communication technology (ICT), would assist regional economic growth. Initial research in a multi industry regional cluster showed a low level of ICT sophistication, so the research focused on the relationships between the firms in the cluster and to the use of collaborative e-commerce. The study was undertaken in a cluster located south of the capital city Perth. The cluster had a number of unique elements including the dominance of high priced and low volume industrial manufacturing, a number of large multinational firms and the pre-eminence of large defence contractors. The drive behind the government funded research was to find ways to facilitate greater collaboration using ICT between the firms in the regional cluster. It was perceived that there was a significant gap between the large firms and the lower tiers of middle sized and small firms. The local governments (municipalities) involved in the research hoped that increased online collaboration would assist the medium sized and smaller firms to grow, thus improving the economic robustness of the region.

## 2 Regional Economic Development

Globalisation and the rise of technology have reduced the role location plays in competitive advantage as knowledge, resources, capital, and technology can now be sourced from global markets and it is no longer necessary for firms to locate near the markets they serve. Internet services such as web portals and auction sites have become the enablers of globalised e-business and e-commerce. Businesses are now becoming embedded within “networks of collaborative relationships that influence the flow of resources among the stakeholders” (Ratnasingam, 2004, p 382).

Technology and the accompanying globalisation diminished the impact of governments on their local economies (Porter, 2000). However government intervention in regional economies continues with a dual approach focusing on the development of existing natural resources and the provision of incentives to those who relocate into the region being developed (Etzkowitz, 2007). The development or revitalisation of regional economies that have suffered an economic downturn has been the focus of programs and policies across Europe, the USA and Australia (Maude, 2004). Even with the rise of technology economic development from a government policy perspective is often reliant on the provision of infrastructure such as industry parks and business incubators (Drabenstott, 2005).

A review of the literature identified five regional economic development strategies based around: Entrepreneurship; Networks; Innovation Systems; Triple Helix and Clusters. The literature also indicated a set of common characteristics associated with regional economic development, these being knowledge creation and sharing, Intellectual Property/technology transfer, technological innovation, growth and export, collaboration, education/training, use of ICT, infrastructure provisions and a focus on Small to Medium Enterprises (SMEs) (Cripps, 2007). Of the regional economic development strategies clustering displayed all the economic development characteristics previously listed including collaboration and the use of ICT which were the main focus of the study.

### 2.1 Clusters

Porter (2000) defined clusters as “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate” (Porter 2000, p.15). Boekholt and Thuriaux (1999, p.381) defined clusters as “networks of production of strongly interdependent firms (including specialised suppliers), knowledge producing agents (universities, research institutes, engineering companies), bridging institutions (brokers, consultants) and customers, linked to each other in a value-adding production chain”. Clusters differ from networks in that membership of a network is often defined whereas a cluster is an informal grouping of firms (Boekholt & Thuriaux, 1999). The advantages of clustering include the increased supply of specialised inputs; access to new and expert knowledge; access to institutions, public goods and government incentive programs (Porter, 2000).

Though many governments have backed away from direct intervention in cluster development, Lundequist and Power (2002) suggest that government still has a role as a source of resources for regional development. The provision of meeting places within the cluster can foster trust, collaboration and knowledge exchange. The common strategies for regional cluster development policy include the creation of regional identity through location incentives, recruitment of existing business to the region, the support of business networks and the provision of business development services, the support and expansion of research and development through building university research competencies, creating non-university laboratories and research centres, R&D incentives, subsidies and awards. Also important is

the provision of physical infrastructure for business development such as business incubators facilities including laboratory space, buildings and business parks. Other areas include the provision of training and basic education, regulatory assistance and regulatory enforcement, procurement and supply chain development (Feser, 2002; Sölvell et al., 2003; OECD, 2005). For a cluster to be successful there needs to be continual improvement of the government policies and strategies that support the cluster’s informal networks, knowledge exchange and targeted education programs (Lundequist & Power, 2002; Boekholt & Thuriaux, 1999).

Clustering as a means of regional economic development has been popular, particularly in Europe, although the Porter model has not received universal acceptance as the answer in every situation (Palazuelos, 2005).

## **2.2 The Australian Context of Regional Economic Development**

In contrast to the USA and the majority of European countries Australia can be characterised as a small country in economic terms which is heavily reliant on natural resources rather than high tech and knowledge intensive industries (Maude, 2004). Key for government in supporting regional economic development were the use of a top down strategic approach to further Australian industry and the engagement of all economic stakeholders in this process (DoTaRS, 2002). Beneath the overarching government strategy regions must themselves develop a bottom up approach based on their regional assets and strengths. In the Australian context the impediments to regional economic development identified by DoTaRS (2002, p.197) include: “difficulty in accessing skills, in particular, difficulties with the recruitment and retention of skilled labour; a lack of awareness of new business opportunities; under-developed business skills; a lack of supportive infrastructure; perceived shortfalls in an area’s ‘lifestyle’ and ‘livability’ attributes; a lack of access to capital; and a low take up rate of government business assistance.”

According to a 2004 study conducted by Global Entrepreneurship Monitor, Australia was in the top five countries on their Entrepreneurial Activity Index of the OECD countries (Fitzsimons, et al., 2004). In contrast to the level of entrepreneurship Australia as an innovative nation is outside the top 10 of OECD countries. Australia has a number of strengths including “a broad scientific base, world class in some areas; success in converting knowledge into patents; and high growth in several areas including biotechnology, pharmaceuticals and office and computing equipment”. It also has some notable weaknesses including “insufficient attention to the development of human capital (for example, entrepreneurship); low average company size which may impede ability to compete in new industries and innovate; in international terms, business expenditure on research and development is poor; and many research institutions have poor linkages with potential users of research” (Australian Business Foundation 2005, p.19). For Australia to become an innovative nation government policy must address the gap between R&D and commercialisation in both the public and private sectors, boosting the capacity at a firm level to create, diffuse and apply knowledge to form a strong innovation system within the country (Australian Business Foundation, 2005).

SME’s were the focus of the Federal Government Business Networks Program established in 1995 (Killen et al., 2003). Only 2% of SMEs participated in the program compared to between 10-15% in an equivalent program in Denmark (Fulop, 2000). Fulop (2000) found that none of the participants in the networks studied in the research were committed to business growth in the network. The research found that the use of formal contracts rather than relationship building lead to reduced levels of trust between firms in the networks

(Fulop, 2000). However there were examples of significant levels of integration of networks where the business had high levels of complementarity. Killen, et al. (2003) note that the Business Network Program ran only three years compared to similar programs in other countries which ran for considerably longer and were more successful (The Department of Industry, Tourism and Resources, 2004).

### **2.3 Clusters in Australia**

Of the regional economic development strategies, clusters seem to have been the most extensively applied in an Australian setting. The creation of industry clusters has been growing in popularity in Australia since the 1990s with particular focus on regions that have suffered economic hardship much of which rose out of the economic restructuring of the 1980s (Roberts & Enright, 2004). The 1980s were characterised by “the restructuring of the manufacturing sector; growth in the development of business services, especially financial services; corporatization of many State owned enterprises such as Qantas and the Commonwealth Bank; reform of the public sector under National Competition Policy; improvements in productivity gains; removal of protective tariffs and financial deregulation and Australia mimicking the structure of the US economy” (Roberts & Enright 2004, p102). These changes saw the decline in the old manufacturing industries with many moving off shore or being acquired by multinationals.

The environment of the 1990s saw two forms of cluster develop in Australia. Firstly, single industry clusters, which usually rise out of old industries that have been restructured. Secondly, groupings of industries regional based and connected through networks. These clusters are often facilitated by public policy support directed at industry innovation and collaboration between firms to build the cluster (Roberts & Enright, 2004). These clusters tend to be weaker as they lack the strength of a national industry. For clusters to succeed they require “substantial capacity building to support regional strategic infrastructure...to turn a local or regional network of firms and industries into a cluster” this often requires significant long term commitment from government sources (Roberts & Enright 2004, p.117).

Of the clustering programs initiated over the 1990s many failed due to a lack of resources, experience, expertise in regional development and failure to create linkages with international markets. Though originally driven at a Federal level the majority of the support and funding for cluster programs came from State governments (Roberts & Enright, 2004; Department of Industry, Tourism and Resources, 2004). Often these programs were based around technology parks or innovation centres. In the Australian context, the key factors to be considered when developing a cluster are: organic growth in response to changing circumstances; maximisation of the creative conditions and facilitation of spin off and growth opportunities (The Department of Industry, Tourism and Resources, 2004).

According to Blandy (2004) the development of clusters over time stemmed from a region’s economic foundations including existing companies and local demands for products and services. Clusters emerge from the local community to become economic champions for the region’s progress. There is an ongoing cycle between the cluster’s development and its original foundations and this interplay assists in the stimulation of the industry cluster. Blandy (2004) suggested that the interest in the development of local economies through Government policy seems to have a universal appeal.

Generally, the clusters in Australia are not well developed compared with those of the US and Europe due to the small size of the domestic economy, lack of critical mass within industries, lack of suitable local partners, multinationals conducting R&D offshore, the strength of the

export focused resources industry over other industries and the lack of regional specialisation which reduces the opportunity of cluster building (Maude, 2004). Parker (2006) also noted that there was little evidence of regional industry specialisation, co-located firms or clusters in Australia. Many of the government facilitated clusters reviewed by the Department of Industry, Tourism and Resources (2004) had failed.

Three critical issues hamper the development of clusters in Australia “insufficient critical mass, lack of focus and distinctiveness and political and administrative difficulties” (Roberts & Enright 2004, p.116). According to Roberts and Enright (2004) there has been a lack of cohesive policy and action between all three levels of government in Australia and a lack of buy in from industry had meant that Australia has yet to fully reap the benefits of clusters that have been experienced by other OECD countries. A lack of knowledge, expertise and commitment among those agencies that are to facilitate the process has hampered effective cluster development. Further research is required into the effective building of clusters within the Australian context as they will assist Australian industry to compete in the global market place (Roberts & Enright, 2004). Clustering has only had minor acceptance in urban Australia where it is argued by Roberts and Enright (2004) it would be most effective.

It has been recognised that “Cluster development on its own is not a panacea for economic development, but rather, depending on the sustainability and effectiveness of the cluster model, a powerful tool for growth” (The Department of Industry, Tourism and Resources, 2004). There has been a move away from direct intervention by Government towards the facilitation of collaboration between firms within the cluster and between public and private organisations (Innovation Lab Australia, 2002). Regional development agencies, large industry associations, corporations and industry alliances can assist in the development of clusters by attracting high-level functions and services that are critical to the needs of firms in the cluster (Roberts & Enright, 2004).

The physical proximity within clusters supports communication, the development of social networks, collaboration and competition which are enhanced by knowledge exchange and market flows (Innovation Lab Australia, 2002). Clusters provide a means for SMEs to overcome the disadvantages of their size and their lack of access to knowledge, thus enhancing their ability to innovate both in local and international markets (Innovation Lab Australia, 2002). Multinational firms are attracted to clusters where there is innovation, technology and market intelligence. Clusters are likely to be successful if there is a commitment to the process of building trust, respect and collaboration to reach a common goal (Roberts & Enright, 2004).

According to The Department of Industry, Tourism and Resources (2004, p.5) “Australia should now generate its own clustering traditions, taking account of its own unique geographical, cultural and historical factors...establishing a benchmark for a sustainable cluster in its own right, rather than be shackled to past ‘truisms’ that may (or may not) apply to the Australian environment”.

### **3 Research Methodology**

Preceding this research data was gathered from the literature, overseas experts, a pilot study and a pilot case study. This information was used to design a research instrument which was administered to firms in the marine, defence and resources cluster located in the Henderson/Rockingham region located south of Perth, Western Australia. Interviews were conducted with a representative senior executive from companies located in the cluster as well as external organisations such as education institutions, government departments and industry peak bodies. In total 35 interviews were conducted in 35 companies. All the interviews were taped with the interviewee’s permission and then transcribed and analyzed

accordingly. Nvivo 7 software was employed for qualitative data analysis in order to thematize the material (Miles and Huberman, 1984). The results and their discussion are outlined below.

### **3.1 Expert Interviews**

Prior to the main study a number of unstructured interviews were undertaken as part of an international study tour. Locations and experts selected for interview were identified from the literature. The interviews provided a cross section of information on the defence and marine industries and case studies on industry and regional cluster development. From the interviews and the pilot case study the following expert insights for practitioners were compiled in relation to cluster development. Though collaboration as part of cluster development was addressed, there was no direct reference to the collaborative use of ICT or systems for knowledge sharing. The collaborative use of ICT was also absent within the research findings which are outlined below.

### **3.2 Data Collection**

The research was designed to incorporate both industry organisations in the Henderson/Rockingham region and non-industry organisations that potentially impacted the region. The industry organisations interviewed can be divided by size into large, medium and small organisations. The large organisations were often termed “Primes” due to the primary role they played in attracting work to the region such as multi million dollar Navy contracts. Generally these organisations employed over 101 staff or were part of national or multi national organisations with their head offices in the eastern states of Australia or overseas. Medium sized firms are those that employ between 21 and 100, with small organisations employing 1 to 20 staff.

The organisations interviewed in the non-industry category comprised two educational institutions with campuses in the region, one University and a Technical College, which supplies certification in trades such as aluminium fabrication. Other external organisations interviewed included an industry association, a government funded small business incubator, a representative of a regional local government organisation, representatives of two State Government authorities, and a State Government funded facility in the region. The industry focus each organisation interviewed is summarized in Table 2.

Table 2: Types of Companies Interviewed

<b>Industry Interviews</b>	
<b>Large Firms</b>	
	Oil and Gas
	Defence & Oil/Gas
	Defence Shipbuilding
	Defence Submarines
	Commercial Shipbuilding and Defence
	Defence Systems
	Navy Alliance Shipbuilding
	Navy Alliance Ship repair
<b>Medium Firms</b>	
	Engineering for Defence
	Underwater Systems Oil and Gas/ Defence
	Engineering and Construction Oil and Gas
	Commercial Shipbuilding
	Steel Fabrication
	Super Yacht Interiors & Yacht building
	Commercial Shipping Fittings and Fixtures
<b>Small Firms</b>	
	Commercial Boat Builders
	Commercial Boat Builders
	Marine Engineering
	Commercial Boat Builders
	Marine Design Naval Architects
	Marine Engineering
	Marine Coatings and Engineering
	Yacht and Pleasure Craft Building
	Yacht and Pleasure Craft Building
<b>Non Industry Interviews</b>	
	Local Government Regional Coordinator
	State Government Department

	State Government Agency
	State Government Agency
	Education
	Education
	Peak Industry Body
	Economic Development Agency

## 4 Results and Discussion

One of the reasons this study was undertaken was to gather examples of the use of ICT to assist firms to work collaboratively and grow their markets. Unfortunately this was not possible due to the low level of ICT use within the cluster both by the individual firms and within a collaborative context. The level of shared technology identified in the study are contained in Table 4.

Table 4 Use of Shared Technology in Collaborative Relationships

<b>Role of Shared Technology</b>	<b>Citations</b>
Not used in collaboration	14
Email collaboration	12
Collaboration through external party	9
Inhibitors	9
Role of shared technology – general	6
Internal networking	5
Face to face collaboration	2
Use Customer Relationship Management software	2

The low level of ICT usage found was unexpected in light of the previous literature which suggested that the adoption of ICT would benefit collaborative relationships (Ratnasingam, 2004; Chatterjee & Ravichandran, 2004). Although ICT is designed to facilitate the sharing of information and assist collaboration, the characteristics of high security, secretiveness and the high level of competition in the region made the development of trust and the willingness to share information difficult. These factors have impeded the adoption of collaborative ICT in the Henderson/Rockingham cluster (Ryssel, et al., 2004; Perry, Cavaye & Coote, 2002; Ratnasingam, 2004). The respondents did identify benefits using ICT within the cluster that were consistent with the literature, however the drawbacks were significant as detailed in Table 3.

Table 3 Benefits and Drawbacks of ICT Adoption

<b>Benefits</b>	
<b>Results</b>	<b>Literature</b>
<ul style="list-style-type: none"> <li>❖ Convenience in the transfer of information and collation of data on the progress of projects.</li> <li>❖ Overcoming distances particularly working in export markets.</li> <li>❖ Increased efficiency and reduced costs.</li> <li>❖ Provision of long term data on workflows which allows better scheduling.</li> <li>❖ Improved communication and the reduction of confusion.</li> <li>❖ Allowing the dissemination of information across organisations to obtain a uniform understanding on a collaborative project.</li> <li>❖ Greater access to classified material which assists with scheduling of projects.</li> </ul>	<ul style="list-style-type: none"> <li>• 24 hour trading and information exchange and management.</li> <li>• Expanded marketplaces.</li> <li>• Access to new customers and trading partners.</li> <li>• Productivity improvements.</li> <li>• Potential cost reductions.</li> <li>• Customisation of products and services.</li> <li>• Cost savings in communications and marketing.</li> <li>• Greater business exposure.</li> </ul> <p>(du Plessis &amp; Boon, 2004; McIvor &amp; Humphreys, 2004; Raisinghani et al, 2005; Chau, 2004)</p>
<b>Drawbacks</b>	
<b>Results</b>	<b>Literature</b>
<ul style="list-style-type: none"> <li>❖ The leaking of intellectual property.</li> <li>❖ The general lack of technology literacy among firms in the industry.</li> <li>❖ The need for cultural change within the collaborating organisations.</li> <li>❖ Technical problems such as network failure.</li> <li>❖ The double handling of information and the lack of co-ordination between collaborating firms and their IT systems.</li> <li>❖ Lack of compatibility between systems in the large firms and their collaborators.</li> </ul>	<ul style="list-style-type: none"> <li>• Concerns over privacy and security.</li> <li>• Lack of technological skill and experience.</li> <li>• Applicability to the organization’s business model.</li> <li>• Lack of awareness.</li> <li>• Skill shortages.</li> <li>• The high cost of entry.</li> <li>• Lack of financial resources.</li> <li>• Insufficient return on investment.</li> <li>• Lack of support from management.</li> <li>• Telecommunications infrastructure, customer demand for online services.</li> <li>• The size of the organization.</li> </ul> <p>(Lawton et al., 2003; Zhu et al 2003; Wu, et al., 2003; OECD, 2004;, (OECD, 2001; Lee et al., 2003).</p>

Although there were a number of collaborative relationships represented within this study, the majority of business relationships were of a subcontractor nature with a significant power asymmetry. According to an interviewee there were advantages to working collaboratively,

however, it needed “to be a long term relationship to make IT investment worthwhile”. The interviewee found that when a collaborative system was instituted conflict arose between the partners as to which or “whose” system would be used for which particular function of the alliance. The implementation of a new system required significant cultural change on the part of the collaborating firms as they came from very divergent cultures. It was pointed out by one of the small firms that even though technology improved communication with their collaborative partner it still did not provide any earlier warning of changes in the firm’s work schedule. Organisations spoke about their preference for face to face relationships with one interviewee commenting that while technology facilitated relationships it lacked a personal tone and the interviewee commented that “face to face allows me to use my ‘trust radar’”.

It has been suggested that smaller firms are more likely to adopt ICT if pressured by a larger more powerful collaborator (Morris et al., 2003). The lack of evidence in the study supporting this concept may be due to the overall low level of ICT use, particularly by smaller firms. The literature suggested that the presence of a prior relationship, which builds trust, might facilitate the use of collaborative ICT (Vlosky et al., 1997; Ratnasingam, 2004). If this is the case the relationships contained within this study were often fraught with significant difficulties which may have inhibited the adoption of collaborative ICT. If firms require a level of ICT adoption as suggested by the diagram on the left side of Figure 1, then only four of the firms interviewed would be in a position to move on to collaborative commerce.

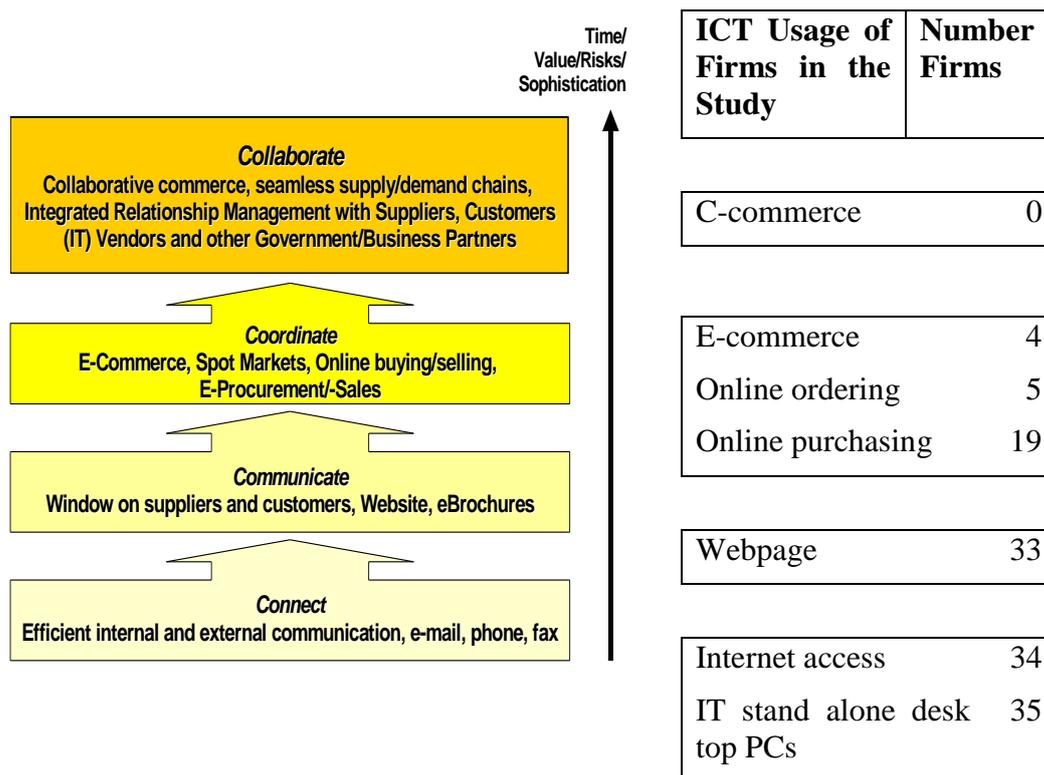


Figure 1 Electronic Business’s Evolution Towards Collaborative Commerce (ARC Grant Application, 2004)

Within the study there were two possible examples of what could be termed the collaborative use of ICT, the first being the alliance developed to manufacture and upgrade the ANZAC class frigates where there was a limited use of common ICT. The second example was a firm with a spreadsheet based, workflow management system. The interviewee from this firm had

previous experience in ICT as he came from a systems management background as opposed to a Navy or trades background and this prior experience may have encouraged him to create and implement the system (Chau, 2004; Martin & Matlay, 2001).

#### **4.1 Insights for Government and Practitioners**

One of the outcomes of the research project was to provide insights into collaborative relationships and the use of ICT to inform the development of government policy in the region. The research findings suggest that to facilitate the economic growth of the cluster at Henderson/Rockingham the following factors for successful cluster development need to be addressed:

- Building on pre-existing relationships within the cluster.
- The engagement of key decision makers.
- The identification of a cluster champion or champions.
- Identifying and working with those willing to embrace change.
- Mapping the cluster to identify common and rare capabilities.
- The exploitation of regional strength and history.
- The willingness to provide a united identity within the market place.
- The development and implementation of consistent policies across all levels of government.

When attempting to develop policy to facilitate collaborative relationships at the industry and firm level there are a number of characteristics identified in the study that require consideration including:

- The low usage of ICT within this cluster due to its characteristics of high security, competition and low volume/high cost projects.
- The hierarchal nature of the relationships within the cluster with the dominance of less than ten national or international firms.
- The unwillingness of the small firms in the region to grow beyond a certain size.
- Lack of collaboration between firms, especially the smaller ones, to access export markets.
- The lack of cross collaboration between industries in the region and the lack of information exchange and local innovation.
- The low level use of collaborative ICT as an impediment to opportunities for growth and is reducing the competitiveness of the industries in a global market place.

These factors mean that any form of strategy considered by government agencies to facilitate economic growth, collaboration and the use of ICT would require significant resources and a cultural shift within the cluster.

#### **4.2 Conclusion**

The study was exploratory in nature and as such the finding can not be generalized. The absence of collaborative e-commerce in the cluster studied maybe cultural, as participants in

the study often commented on the dominance of competition rather than collaboration in the local business environment. The presence of heavy manufacturing that dominated the cluster may also be a contributing factor to the low level of collaborative ICT (Salo & Cripps, 2007). The research does highlight the differences between clusters in Europe and Australia and the fact that one size does not fit all. From the Australian perspective the findings are concerning as low levels of collaboration and ICT use do not aid the local or international competitiveness of the industries represented in the cluster. Despite Australia's physical isolation it must compete in a globalized electronic economy.

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