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Clustering: A uniquely Australian experience

Abstract

Cluster examples are shown to exist across the developed and developing worlds with many governments seeing clusters as a way in which to promote growth. This in turn has resulted in a number of cluster case studies and subsequent cluster theories and models which have informed cluster practioners and policy makers. Many of these cluster examples come from Europe and the United States of America which have markedly different contexts to the Australia. This paper considers if the uniqueness of the Australian cluster context is substantially different to that of the cluster examples reported in the cluster literature and if as a result the application of theory and examples in Australia is limited.

Introduction

Cluster research has continued to develop over the past two decades, particularly since the work of Michael Porter (1990, 1998a, 1998b). Indeed a review of cluster literature by Cruz and Teixeira (2010) showed a doubling of published cluster articles since 1998. Interestingly, over the past five years there appears to have been a reduction in the reporting of Australian based cluster examples, content and analysis. The Australian cluster experience has significant differences from that in Europe and America and other regions of the world, influenced by factors ranging from population size through to geographical expanses and distance between economic centres. This has left Australian clusters and researchers to rely on theoretical development by overseas authors who may not understand, or are unable to provide relevance from their examples to, the Australian cluster experience.

Using empirical data collected from researching the Aerospace Tooling Cluster in Australia, this paper contests that the Australian cluster experience is uniquely different from those reported from overseas. This case study highlights a unique tiered cluster structure which has operated across three states of Australia and brings into question the requirement of clusters to maintain geographical proximity - a key component of many cluster definitions, including that of Porter. This paper also calls for more research into the uniqueness of Australian based clusters as a way of assessing the transferability of the overseas cluster experience.

Clustering in Australia

Clustering has been a policy consideration of governments in Australia since the early 1980's. However it was not until the 1990s that it was directly suggested as a way of increasing the nation's competitiveness. The Australian Federal Government was one of many governments in the 1990s to consider clustering with the assumption being that cooperative behaviour between Small and Medium Enterprises (SME) would help them compete more effectively in international markets. Governments can assist the development and success of clusters by providing benchmarking and trends information, investing in technologies and capabilities, providing linkages to networks beneficial to clusters and generally supporting clusters through policy considerations (Marceau 1999).

A 1994 Federal government report by McKinsey and Company was amongst the first to specifically mention clusters as an industry policy. Part of this policy involved the development of 'enterprise networks' which saw companies pooling resources in an effort to develop collective strategies aimed at increasing international awareness of each group. A desired result from these networks was to obtain work which was beyond the capability of the individual firms. However, a change in government at a Federal level in 1996 saw the abandonment of a number of the cluster programs. The remaining Business Network Programme was designed to search for collective infrastructure and bring together firms who would not normally work together. This was also undertaken under an umbrella of increasing innovation. Overall, the programme met with mixed success with the overarching problem being that clusters tended to be dominated by one or a few large firms (Rosenfeld 1996, Cluster Competitiveness Group 2002, Enright and Roberts 2001, McPherson, 2002, Marceau, 1999).

Many of the initial efforts at clustering failed, owing to the lack of experience, resources and training of regional development organisation staff in facilitating industry based cluster development programs. A possible reason for this is that the process of clustering often involves two different groups, those who develop clusters and those who implement cluster policy. The distinction between the two groups can also cause failure through a lack of coherent approach to the process. Some authors contend that there needs to be interest in the role of clusters at all levels of government throughout Australia, currently a majority of the interest (both financial and in kind) being shown from the South Australian and Queensland governments (Enright and Roberts, 2001, Genoff and Sheather 2003).

With both State and Federal government involvement in clusters, it is important to note that clustering needs to be a long term project. Such long term focus requires commitment from industry and governments working together on long term strategies to allow clusters to be sustained. The issue which is raised from this is what responsibility falls on government and industry for cluster success and what contribution is financial and what is in kind? Within sectors of the Australian government there is further debate as to whether government should be involved in cluster facilitation at all. Another difficulty with government policy and clusters is that different governments and government agencies have attempted to use cluster policy to promote a wide range of initiatives. Some of the aims of cluster policy have included attempting to achieve growth (localised and nationally) in regional development, development of SMEs, growing knowledge industries, and creating a national innovation system. Such a diverse range of desired cluster policy outcomes has added pressure and complexity to a developing cluster context within Australia (Enright and Roberts 2001, McPherson 2002). An explanation of part of this level of complexity is offered by Porras, Clegg and Crawford (2004) in which they investigate trust within clusters using Australian clusters as the basis of the study. It was found that trust is indeed a dynamic and an important factor within clusters.

Australia has some early and growing experience with clusters which has been primarily driven by a dual regional and product/service focus, such as the Hunter Valley wine cluster which has centred on both the region and the region's largest income generating sector, wine-making. Other clusters have been driven more by the region itself such as the Cairns clusters operating out of the Cairns Regional Economic Development Centre (CREDC). The Cairns

clusters covered a range of sectors including marine, agricultural and education and were the focus of a study by Athiyaman and Parkan (2008). Given that worldwide experience with clusters is relatively new and the fact that Australian clusters face their own unique challenges, cluster development is an ongoing process. What will be important for Australian clusters is the incorporation of cluster development into policy making, cluster operation and cluster development. It will also be important that clusters provide benefits beyond that of the individual firms within a cluster. Benefits must extend to the region, industry and community within which the cluster exists. Furthermore, the benefits should be broad and include benefits such as regional development, new trade opportunities, investment and employment opportunities (Enright and Roberts, 2001; CREDC 2004).

In addition to the Australian clusters noted above, others include Playford in South Australia (Genoff and Sheather 2003) and the Gold Coast Innovation Corridor in Queensland (Couchman, McLoughlin and Charles 2008). There does not appear to currently be a consensus as to how many clusters exist in Australia. This is not surprising given the previously mentioned difficulties which surround cluster definition and measurement. Johnston (2004) identified sixty two clusters within Australia through his own research, while research by Brown (2007) identified more than one hundred clusters within Australia. The survey conducted as part of the Cluster Initiative Greenbook (Solvell et al 2003) identified thirteen cluster initiative respondents from Australia. Finally, the Competitiveness Institute identified only four cluster initiatives in Australia (http://www.competitiveness.org accessed 01 May 2008). While there may not be agreement as to the number of clusters in Australia, there is at least a consensus that they do exist and further research is required in this area. This need for further research is strengthened by when the unique geographical nature of Australia and its economic centres is considered.

Despite the clear evidence that clusters do exist in Australia and the fact that they have been part of government policy the amount of literature with an Australian influence has significantly decreased over the past five years. From the literature reviewed there were no examples within an Australian context since 2008. It is unclear whether this is a lapse in the literature or whether the occurrence of clusters has decreased during this period of time.

Aerospace Tooling Cluster in Australia

This research is based on an Australian case study of a cluster within the Australian aerospace tooling industry and provided the opportunity to add another Australian case study to the cluster literature. This section outlines chronologically the events surrounding the development of the Aerospace Tooling Cluster upon which this thesis is based. This case has been developed from a range of secondary sources of data and confirmed through data provided in the interview stage of data collection. It should be noted that the names of the organisations involved have been altered with the exception of Boeing.

In 2002 Boeing USA began work on developing a new passenger aeroplane called the 7E7 (also known as the Dreamliner) which would deliver 1000 aircraft between 2008 and 2022. As part of this development Boeing undertook a new, global approach to the manufacturing of the aircraft. The global approach sought to improve quality, while reducing costs by up to

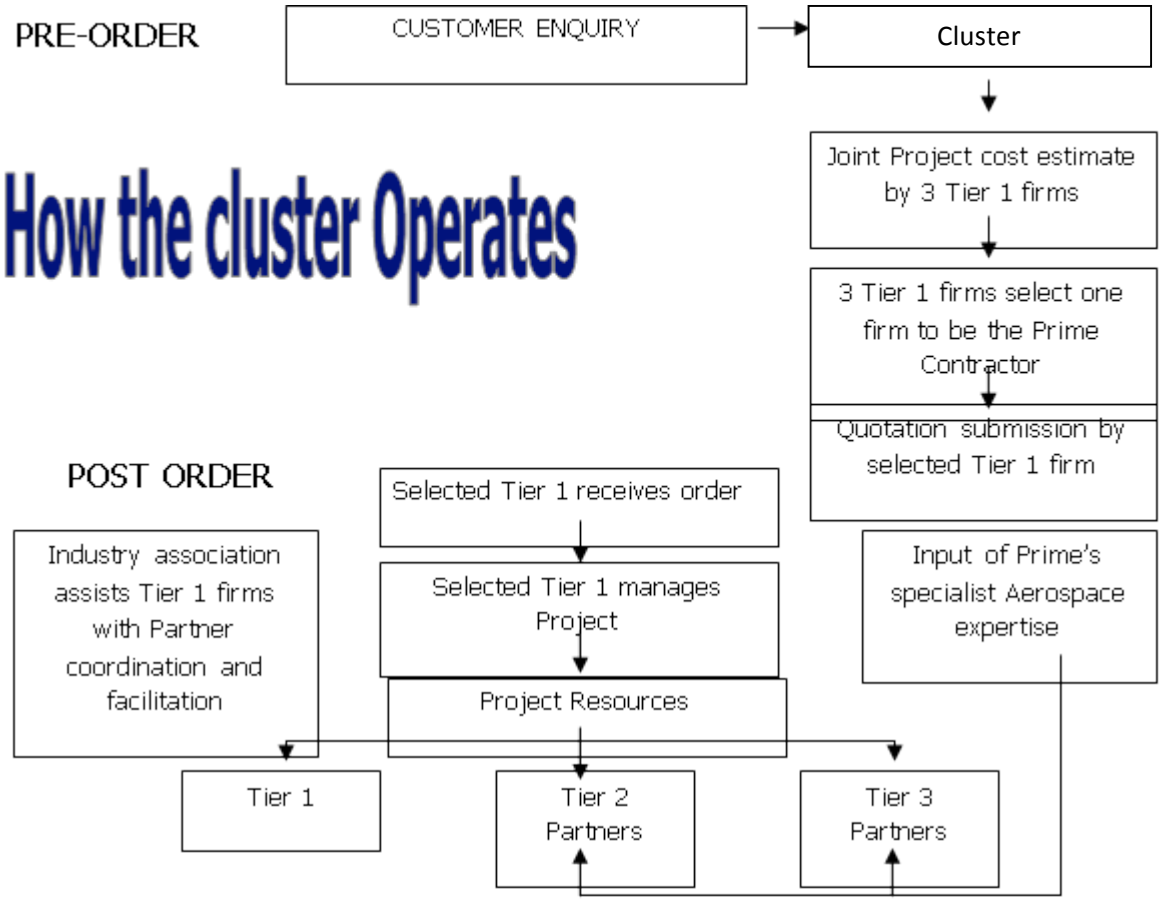
50% and reducing tool development time from 30 months down to 18 months. Boeing acknowledged that achieving these improvements would require a new approach to supply chain management, including tooling companies. Improvements in delivery time to market and reduced costs would be facilitated by sourcing preferred tooling suppliers at a global level, rather than employing the services of a large number of local firms individually. These firms would need to be innovative, technologically advanced and culturally mature. Boeing also called for work on different components of the aircraft which would be completed simultaneously and would require a concurrent approach to the tooling and overall manufacturing (Ford 2003, Boeing 2003, RELINK 2004).

For the aerospace tooling industry within Australia these changes to the global aerospace market resulted in a general downturn which saw employment stabilise after a period of growth and an overall reduction of export earnings. This period also saw the closure of a number of specialist tool rooms. In identifying these issues the Federal government attempting to financially stimulate this sector of the economy. This period of change within the tooling sector provided upheaval for some firms but also presented the opportunity for those firms willing to take advantage of new opportunities to take on an increase project management role (Austool 2004).

As part of this new global approach to manufacturing and with the assistance of existing suppliers, Boeing identified a number of areas around the world which supported emerging tooling industries, including Australia. Boeing used their Australian supplier Aerospace Australia, to source tooling capacity and capability for various components of the 7E7. This information was collected via an audit of Australian tooling firms which was done in consultation with the Tooling Industry Association. It should be noted that the audit was confined to members of the Tooling Industry Association. Based on this audit firms were classed as either Tier 1 which included firms experienced and currently involved in the aerospace industry (three firms identified), Tier 2 those who had previous experience in the aerospace industry or capabilities comparable with those required for aerospace work, and Tier 3 firms which could prove technology and capacity as required. Through the audit it was found that there were approximately 1,000,000 man-hours of capacity available for the 7E7 project amongst Industry Association members. Aerospace Australia advised that it would be dealing with the Tier 1 firms only as a strategy to reduce the number of suppliers they engaged. That being the case, smaller firms (Tiers 2 and 3) would have access to the available work by aligning themselves with the Tier 1 firms in order to co-operatively work together and pool resources. The three Tier 1 firms consisted of two firms from Melbourne and one from Sydney, with the companies in the remaining Tiers being located across New South Wales, Victoria and South Australia (Boeing 2003, Ford 2003, TIFA 2004, RELINK 2004).

In order to better understand the operation of the cluster the section below and Figure One outline the processes which took place within the cluster for ordering and completion of work. The distinction of pre and post order components is important to the cluster as there is a transfer of group responsibility to an individual firm.

Figure One: outlines the processing of work for the cluster and is described in this section.



How the cluster Operates

PRE-ORDER

- Customer enquiry is forwarded to cluster
- Tier 1 firms companies jointly estimate project
- Prime contractor selected
- Full quotation is provided by selected Tier 1 firm
- Customer order is placed on selected Tier 1 firm

POST ORDER

- Full Project responsibility with selected Tier 1 firm
- Cluster resources accessed as required by selected Tier 1 firm
- All primes operate to common procedures and processes

Source: TIFA (2004) Efficiency and Innovation through Partnership.

In the pre-order stage customer enquiries were directed through the Tooling Industry Association (using the cluster name) as the single point of contact sought by Boeing. Once enquiries were made to the cluster the three Tier 1 firms, with the assistance of the Industry Association, jointly priced the work and decide which of the firms should present the quote and be responsible for that particular part of the job. It was then up to the Tier 1 firms to

formalise a quotation and act on behalf of the cluster. Once an order was accepted by Boeing (or others) the Tier 1 firm responsible project managed the work and distributed work to the other Tier 1 firms, Tier 2 and 3 firms within the cluster. The Industry Association's role in these processes was one of facilitation to ensure the group operate effectively and also in the interests of the other cluster members. The Industry Association's role would be more considerable at the start of each project and diminish once the work were to begin and project management then became the responsibility of the nominate Tier 1 firm. This in part occurred as the Industry Association did not have the knowledge or expertise to provide quotations for potential work (TIFA 2004).

Research Framework

Recent work by cluster authors has shown an increase in the amount of empirical research, with much of this research supported by qualitative methods. Indeed the most common qualitative method employed recently by authors is case study method of one or a small number of clusters. It is through qualitative case studies that these authors have begun to identify and appreciate the complexity of inter-relationships within clusters. This research will embrace this form of qualitative analysis and undertake a case study analysis of the Aerospace Tooling Cluster. The use of case study methodology is well established within the cluster literature (Lin and Sun 2010, Speirs 2007, Sonderegger and Taube 2010) and was used for the investigation of the Aerospace Tooling Cluster. In developing a case study approach to this research the author has been guided by the principles of case research outlined by Yin (2003)

The Aerospace Tooling Cluster emerged out of the following sequence of events: Aerospace Australia had approached the Industry Association with the potential of it receiving a large amount of tooling work as part of the development of the 7E7 aircraft. After undertaking an audit of members, the Industry Association called for expressions of interest from within its membership base which in 2004 had 85 financial members Australia wide (TIFA capabilities guide 2004). From these firms, 48 formed the Aerospace Tooling Cluster and were allocated as either Tier one, two or three firms as a result of an audit of their capabilities and capacity. As the number of firms and the relevant Tiers had been determined prior to the research, the author has used these predetermined groupings as a means of constructing relevant interview questions. In all there were 26 tooling firms that were interviewed from an original list of 48 firms; this represents a response rate of 54%. The 26 interviewed firms consisted of three Tier 1 firms, five Tier 2 firms and eighteen Tier 3 firms.

It was deemed that there were key stakeholders associated with the Aerospace Tooling Cluster that were not tooling firms and that they should also be interviewed, with those stakeholders being the Industry Association and Aerospace Australia. The Industry Association was seen as a key stakeholder as they were instrumental in the establishment of the Aerospace Tooling Cluster and took on a facilitation role. As such, two representatives from the Industry Association were interviewed. Aerospace Australia was responsible for bringing the possibility of work to the Industry Association and the tooling firms and therefore this cluster would not have formed without their input and influence. A representative from Aerospace Australia was also interviewed as part of this research. As a result a total of twenty nine (29) interviews were conducted as part of this research. Semi structured interviews utilising a series of open ended questions were used to probe the

respondents regarding the multitude of cluster based issues (Shank 2006). A thematic analysis undertaken by the author using NVIVO coding of interview data was conducted on all the interview transcripts. A range of secondary sources of information has also been collated to form a sound background to the cluster. Information has been provided from the Industry Association in the form of minutes to meetings for the clusters and steering committees; they have also provided promotion material for cluster. Company information has also been obtained from industry based websites which outline capabilities, company websites and advertising materials (Collis and Hussey, 2003, Zikmund, 1994).

Discussion and findings

The analysis of the Aerospace Tooling Cluster case study provides the cluster literature with a new and updated Australian case study. This is important as the recent cluster literature has been devoid of Australian specific cluster examples in recent years. However, the addition of an Australian specific cluster is not the only outcome of this research. The Aerospace Tooling Cluster consists of firms which exist across three States of Australia and brings into question the requirement of geographical proximity to the cluster definition. This in turn raises questions as to whether the experience of clustering within Australia is somewhat unique to that experienced by other regions. Or is it simply a fact that each cluster will exhibit characteristics which are particularly unique to that particular cluster? From these discussions it is evident that there is a requirement for more research of Australian based clusters to further develop the cluster theory. In the following sections each of these areas will be discussed in further detail.

A requirement of geographical proximity

Marceau (1999) discussed the unique geographical dispersion of Australian markets and the role that virtual clusters may play. The cost in travel and time of cluster members moving between economic centres and the benefits associated with face to face contact are being reconsidered in the wake of technological advances. However, clusters need to hold some level of shared values and virtual clustering will be more suited to instances where easily understood ideas exist. Replacing face to face contact within a cluster is not a straight forward and needs careful management (Johnston 2004). The inability of many clusters to move beyond traditional face to face interactions has acted as a significant drawback to cluster development. The uniqueness of the Australian geography adds further complication as alluded to by Marceau (1999). Australia's economic centres are geographically disperse which means clusters are either restricted to working with other local firms or they overcome the difficulties associated with developing clusters without firms being geographically close.

Schiele (2008) acknowledges that since 2000 hundreds of potential clusters have been identified and studied in an attempt to uncover more about clusters. Yet there is still a lack of a clear understanding of cluster boundaries which creates much confusion. This brings into question whether or not cluster boundaries are geographically (spatial) or industrially based

(Martin and Sunley 2003). Furthermore, how strong does the interconnectedness need to be and how is interconnectedness measured? The vagueness of the use of geographical proximity as a requirement for clustering has seen authors provide their own variation of a cluster definition which has added to the confusion around clusters. A result of this lack of a defined and agreed cluster boundary has seen clusters with 'extreme flexibility' and cluster policies being described as 'slippery' Bagwell (2008). This has created difficulties in the development of the cluster literature as authors have become preoccupied with the development of a suitable definition and less focused on the application and practicalities experienced by cluster practitioners.

The Aerospace Tooling Cluster brings into question this requirement of geographical proximity through the fact that the firms which make up the cluster are located across three states of Australia. Physically some of the firms are more than 1,000 kilometres away from each other yet still they were able to work together and successfully quote on work, win work and deliver a finished product. In part, the Tier one firms acknowledged that much of the face to face communication was replaced by information technologies including phone, e-mail and teleconferencing. However it was also noted that the three Tier 1 firms did arrange to meet face to face throughout the project, a point noted more strongly by the New South Wales based Tier 1 firm. The reduction in flight costs and ability to return within a day was also seen as a key component to overcoming the geographical distance between the three Tier 1 firms.

As technology develops, firms are increasingly operating in a virtual environment, making virtual clustering a logical extension. Clustering in a virtual environment does not require geographical proximity between the firms involved as work is completed in a virtual world (Rosenfeld, 2005). Indeed, as noted above, the application of geographical proximity as described by Porter (1998) himself is somewhat fluid and has been used to describe so called clusters across large and small geographical expanses. Across a range of cluster definitions there is a theme of reference to geographical proximity or co-location, but no reference to the way in which this is to be applied or measured (Martin and Sunley, 2003).

The requirement of geographical proximity for clusters was invigorated by the work of Porter (1998b) and the inclusion of geographical proximity as part of his cluster definition. Since then this has remained one of the more divisive elements of cluster definitions throughout cluster literature. Increasingly, the cluster literature offers support to the fact that firms can achieve significant benefits from geographical proximity (McCann and Folta 2011). Some products and services require face to face contact and cannot work without close proximity. Manufacturing of a product being moved from cluster member to cluster member can be both costly and time consuming; this is often why firms will cluster in the same geographical area. With geographic proximity there may be lower transaction costs associated with a reduced need for transportation of people, products, resources and reduced costs in communicating. The removal of time and distance barriers prevents the occurrence of communications becoming distorted, and face-to-face oral communication is more easily fostered within geographically close clusters (Enright and Roberts, 2001).

Regardless, the analysis of the Aerospace Tooling Cluster uncovered a unique cluster structure which differed from those found in the existing cluster literature. Using this structure the cluster stakeholders were able to work together, despite being located across three states of Australia. As an example of a working cluster within Australia this case brings into question the requirement of geographical proximity for clusters which is prefaced in many cluster definitions, most notably that of Michael Porter. These findings indicate that clusters need to be considered more broadly than just involving firms which are geographically close.

Cluster uniqueness

The discussion above also raises questions as to whether or not the uniqueness of Australian industries makes theories and cluster examples from overseas redundant within an Australian market. Authors such as Akoorie (2011) discuss elements of skills, knowledge, labour mobility and specialisation as being key components of cluster discussion. While these elements can be considered important to cluster their interpretation within an Australian context may be somewhat different. For example, labour mobility within Australia could see skills transferred across thousands of kilometres and as within the case of the Aerospace Tooling Cluster this mobility could occur within the same cluster.

Couchman, McLoughlin and Charles (2008) looked at innovation clusters in Australia and the United Kingdom and made direct comparison between the two regions studied, particularly the government policy supporting the clusters. From their investigation they were able to develop a model which broadly described a relationship between firms, governments and universities in relation to clusters across both regions. However the authors acknowledged the limitation of the discussion in that it was restricted to providing broad, idealised versions of cluster relationships as opposed to a set of criteria which fitted both scenarios. In other words, the broad concept of governments, firms and universities working within clusters was applicable; however the specifics of the examples were much more diverse.

Perhaps then the discussion of cluster needs to be centred on identifying the different clusters from round the world and looking for broad lessons or applications which may apply to other clusters. It is acknowledged that some of the characteristics of the cluster described within the existing literature were also identified within the Aerospace Tooling Cluster, thus making this literature a valuable point of reference for cluster practitioners and policy makers. However there is also a need to continue to take into consideration unique factors surrounding a particular cluster and this includes the uniqueness of Australian markets. Elements such as the diverse geographical nature of this cluster were simply beyond the scope of the existing literature.

Future Research

Overall, the existing cluster literature provides cluster practioners and researchers with useful information; however there is an important covenant which needs to be included when using this information. The models, discussions and theories have often been developed and are discussed in the context of a specific cluster, within a specific industry, within a particular country. This level of context means that the ability to be able to directly apply lessons from these cluster examples to another specific, yet different, context is likely to be somewhat difficult.

In order to be able to make more use of the cluster literature it is recommended that future authors make more comparisons between cluster examples and observe cluster models across multiple locations. This will allow for recurring themes to be identified and these themes could then become a set of important set of considerations for clusters, rather than a prescribed mode of operation or remedy for clusters. As part of this future investigation, consideration should also be given to the impact which different regional or industrial contexts have in presenting cluster examples. For example, do the specific conditions surrounding the Aerospace Tooling Cluster context allow for the results of this case to be more broadly applied, and if not what impact has the unique Australian context had on this outcome.

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