

Interpreting the Emergence and Development of High Technology
Electronics Industry Clusters in Selected Second Tier Global Regions

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Abstract

The thesis focuses on the high technology electronics industry and why and how electronics manufacturing firms emerged, developed and evolved endogenously into dense industry clusters in a limited number of selected, small and relatively isolated second tier cities. These developments occurred in small regions rather than in large established industrial centres. The high technology electronics industry typically produces small volumes of highly complex, high value-added, customisable, intellectual property-based products and systems for commercial, industrial and professional applications in sectors including food, health, security, transport, government, communications, manufacturing, defence, education and research.

The high technology electronics industry developed in parallel to the large, typically multinational firms, which mass-produce high volumes of standardised consumer electronics products for personal communication, information and entertainment. The parallel development of these two sectors provides significant contrast since the high technology electronics industry, although significantly larger in revenue and employment than the consumer electronics sector, is less understood by governments and communities.

The research examines the widely studied high technology electronics industry in Silicon Valley, California; Cambridge, UK and Austin, Texas, that by incorporating technologies developed in their universities the industry emerged and evolved over decades into dense, interconnected regional clusters of typically smaller firms and related organisations. Knowledge obtained from these exemplar clusters assists the understanding of the origin and development of high technology electronics clusters in the second tier regions of Adelaide and Christchurch. The thesis analyses and quantifies these antipodean electronics industry clusters and adds to the growing literature describing the endogenous emergence and self-organised development of technology-based firms into clusters in small and relatively remote second-tier cities and without the involvement of universities. Endogenous cluster development is contrasted with electronics industry clusters created by government programs in selected regions.

The contribution to knowledge is consistent with and builds on the work of Porter (1990b) and Mayer (2011). The thesis recognises that a stimulus other than universities occurred in Adelaide through the establishment in 1947 of Australia's defence research and development laboratories and in Christchurch through the 1954 start-up of a two-way radio manufacturing firm. Through spin-outs and start-ups the electronics clusters in these two second tier cities have reached the highest density in their respective nations, comparing favourably with the leading global electronics industry clusters.

The thesis recognises that in small cities proximity to industry peers facilitates trust and collaboration, and that ethical and reliable behaviour of cluster members is essential in these close-knit communities. The thesis provides case studies of firm and cluster origin and development with cross-regional data comparisons and regional location quotients. Australian statistics on location quotients are not published for the electronics industry and Australian governments generally appear to be unaware of the economic value of the high technology electronics manufacturing industry.

With knowledge of electronics industry origin and cluster development government and industry can develop policies and programs for its sustainable development and its major role in the transition of the regional economy of Adelaide from its past dependence on industrial-age manufacturing to its future through knowledge-age industry.

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List of Abbreviations

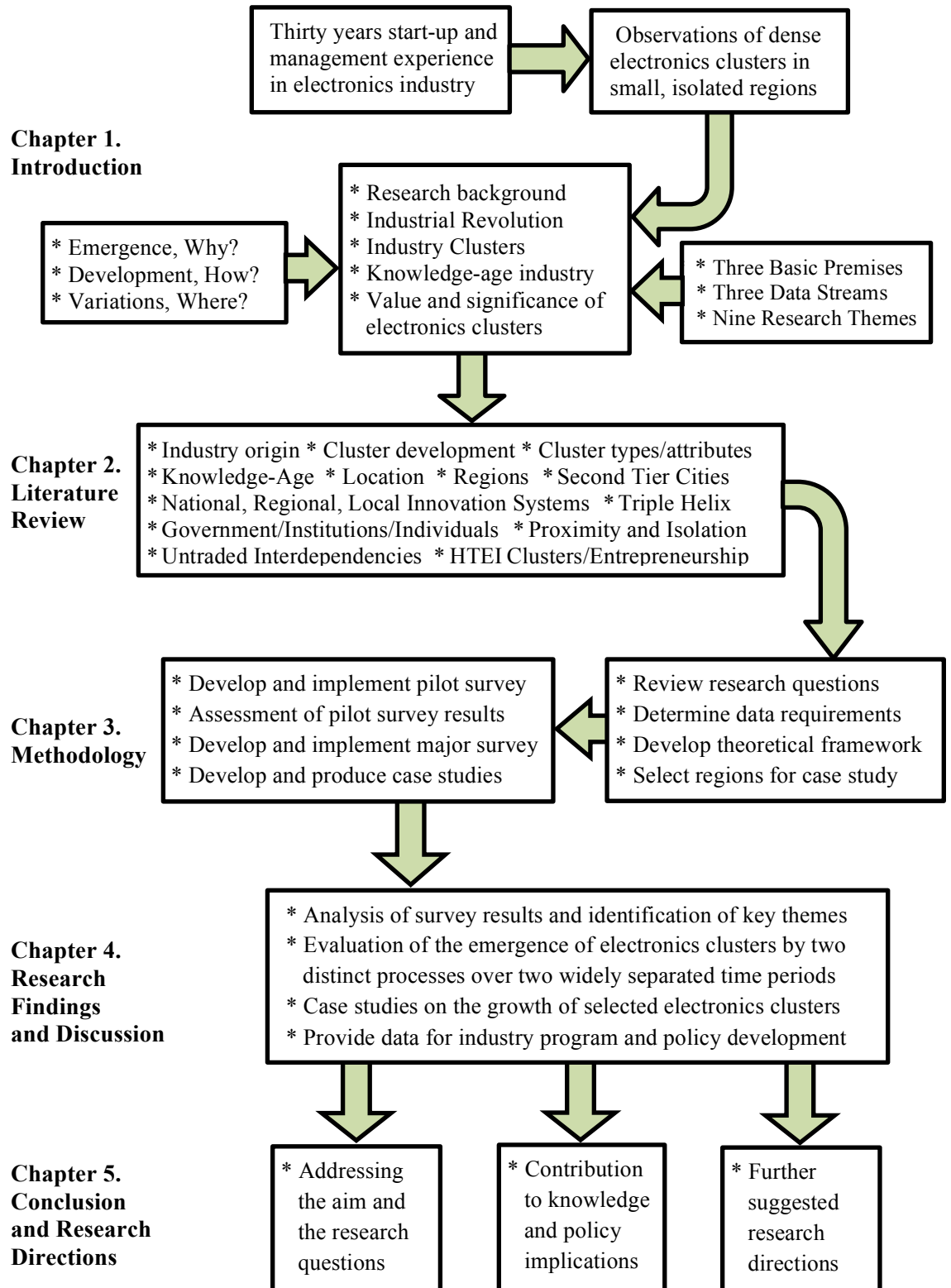
ABS	Australian Bureau of Statistics
AEEMA	Australian Electrical and Electronics Manufacturers Association
ANZSIC	Australian and New Zealand Standard Industry Classification
ATI	Austin Technology Incubator
AWA	Amalgamated Wireless (Australasia) Ltd
CAGR	Compound Annual Growth Rate
CEO	Chief Executive Officer
CIC	Cambridge Instrument Company Ltd
CSI	Cambridge Scientific Instruments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTT	Canada’s Technology Triangle
DEC	Digital Equipment Corporation
DETE	Department of Enterprise, Trade & Employment, Ireland
DME	Distance Measuring Equipment
DSTO	Defence Science and Technology Organisation
EASA	Electronics Association of South Australia
EIAA	Electronics Industry Action Agenda
EIA	Electronics Industry Association

EU	European Union
FDI	Foreign Direct Investment
FTC	Federal Telegraph Company
Forfás	Board for Enterprise, Trade, Science, Technology and Innovation
GACC	Greater Austin Chamber of Commerce
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GFC	Global Financial Crisis
GOVERD	Government expenditure on research and development
GSP	Gross State Product
HETI	High Technology Electronics Industry
HTO	High Technology Organisation
IC	Integrated Circuit
IC ²	Institute for Innovation, Creativity and Capital, University of Texas at Austin
ICT	Information and Communications Technology
IDA	Irish Development Authority
ILS	Instrument Landing Systems
IT	Information Technology
IP	Intellectual Property
IPO	Initial Public Offering
JVSV	Joint Venture Silicon Valley,
LFR	Less Favoured Region
LIS	Local Innovation System
LQ	Location Quotient
LRWE	Long Range Weapons Establishment
MCC	Microelectronics and Computer Technology Corporation - Austin, Texas
METI	Ministry of Economy, Trade and Industry, Japan
MIT	Massachusetts Institute of Technology
MITI	Ministry of International Trade and Industry, Japan
MNC	Multi-national Company
MSA	Metropolitan Statistical Area (USA)
MSTC	Master of Science in Technology Commercialization (Adelaide and Austin)
NAICS	North American Industry Classification System
NIS	National Innovation System

NOMIS	National Online Manpower Information System
NTB	New Technology Based [Firms]
RIS	Regional Innovation System
SIC	Standard Industrial Classification (UK)
R&D	Research and Development
SME	Small and Medium Enterprises
SRI	Stanford Research Institute (Palo Alto)
STC	Second Tier City
TNC	Transnational corporation
TIA	Technology Industry Association
UK	United Kingdom
UN	United Nations
USA	United States of America
UT	University of Texas
VC	Venture Capital
WIGO	What is Going On
WRE	Weapons Research Establishment

Research Plan Diagram

Interpreting the Emergence and Development of High Technology Electronics Industry Clusters in Selected Second Tier Global Regions



Declaration by Candidate

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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