

## Chapter 5

# Process Innovation with Ambient Intelligence (AmI) Technologies in Manufacturing SMEs: Absorptive Capacity Limitations

**Kathryn J. Hayes**

*University of Western Sydney, Australia*

**Ross Chapman**

*Deakin University Melbourne, Australia*

### ABSTRACT

*This chapter considers the potential for absorptive capacity limitations to prevent SME manufacturers benefiting from the implementation of Ambient Intelligence (AmI) technologies. The chapter also examines the role of intermediary organisations in alleviating these absorptive capacity constraints. In order to understand the context of the research, a review of the role of SMEs in the Australian manufacturing industry, plus the impacts of government innovation policy and absorptive capacity constraints in SMEs in Australia is provided. Advances in the development of ICT industry standards, and the proliferation of software and support for the Windows/Intel platform have brought technology to SMEs without the need for bespoke development. The results from the joint European and Australian AmI-4-SME projects suggest that SMEs can successfully use “external research sub-units” in the form of industry networks, research organisations and technology providers to offset internal absorptive capacity limitations.*

### INTRODUCTION

Through case study research, this chapter discusses some of the challenges Small and Medium Enterprises (SMEs) in the manufacturing sector face

in identifying and adopting Ambient Intelligence (AmI) technologies to improve their operations. Ambient Intelligence technologies are also known as Pervasive computing or Ubiquitous computing, and we include the descriptions of these terms when we refer to AmI technologies. Our study includes case studies of three Australian

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SMEs and a comparison with similar application requirements in a German SME manufacturer. The outcomes of the study are likely to be applicable to small firms in many nations.

The 1980s and 90s saw the operations of many large manufacturers revolutionized by the introduction of process and technological innovations (Gunasekaran & Yusuf, 2002). While there have been uneven adoption rates in smaller businesses and across different nations (Chong & Pervan, 2007; Oyelaran-Oyeyinka & Lal, 2006) it is clear that technological innovations such as Electronic Data Interchange, Business Process Re-engineering, Enterprise Resource Planning and robotic automation, amongst others, have played key roles in increasing manufacturing productivity. At the beginning of the twenty first century this transformation continues. Ambient Intelligence (AmI) technologies are being positioned as the next performance and productivity enhancing purchase for manufacturers, and a potential means for manufacturers in developed nations to counter perceived threats from lower labour cost countries (Kuehnle, 2007).

Thus, the key objectives of this chapter are to consider potential applications of AmI technologies in Australian SME manufacturers, and discuss the opportunities and shared challenges faced by such firms in adopting these technologies. In doing this we will compare different levels of absorptive capacity and technological readiness in Australian firms, seeking possible reasons for similarities and differences in their comparative technology adoption processes. The chapter also examines the role of intermediary organisations in alleviating these absorptive capacity constraints.

Our overarching research question is: "Can external intermediaries overcome absorptive capacity limitations in SMEs seeking process innovation through the application of AmI technologies?" In order to understand the issues surrounding this problem, a brief overview of ICT (Information and Communication Technologies) adoption in

manufacturing and an explanation of Ambient Intelligence (AmI) technologies are provided in the following section. Following that we examine the role of SMEs in the Australian manufacturing industry plus the impacts of government innovation policy and absorptive capacity constraints in SMEs in Australia.

## **BACKGROUND**

### **ICT Adoption for Business Performance Improvement**

Brown and Bessant (2003) described the global manufacturing environment developing in this new century as an increasingly competitive landscape, characterised by on-going demands for improved flexibility, delivery speed and innovation. A frequently occurring element in manufacturers' responses to these pressures is the implementation of increasingly sophisticated ICTs. The benefits of incorporating ICTs on business responsiveness have been identified as: more effective and more efficient information flows; assisting in value-adding improvements for current processes; greater access to efficiency enhancing innovations throughout the value chain (Australian Productivity Commission, 2004); and the ability to access world markets through e-commerce (Kinder, 2002).

ICT adoption has been considered worth the risk, given the competitive pressures placed on business to keep pace with technology. For example, in Australia, the uptake of ICTs has increased dramatically towards the later part of the 90's and into the 21<sup>st</sup> Century. Reports show that in 1993-94, 50 per cent of firms used computers with 30 per cent having internet access; by 2000-01 these figures had increased to 85 per cent and 70 per cent respectively (Australian Productivity Commission, 2004). Recent figures (Australian Bureau of Statistics, 2009) reveal that almost all Austra-

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