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Identifying attributes of sustainable transitions for traditional regional manufacturing industry sectors – A conceptual framework

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ABSTRACT

Traditional manufacturing industry is facing significant transformation. Fundamental to this transformation, are the challenges of a changing social, economic, political and environmental future in response to climate change, global competition and limits to finite resources. These challenges have motivated a transition towards a new sustainable trajectory. Within a range of disciplinary fields, scholars have studied and developed conceptual frameworks to explain the processes, outcomes and effectiveness of particular transitions, yet, there remains limited evidence drawing together these conceptual approaches to identify the elements and attributes essential to holistic, practical and long lasting transitions within established manufacturing regions. To address this gap, this paper introduces an interdisciplinary framework, 'Attributes of Sustainable Transitions', by reviewing and integrating four existing conceptual approaches (Advanced Manufacturing, Sustainability Transitions, Spatiality of Regions and Transition Regions) to identify attributes of sustainable transitions within the manufacturing industry sector. In the process, this article also focuses on regions as important spaces for transitions, an emphasis currently missing from traditional economic approaches. Examples from international and Australian case studies are used to support the conceptual analysis, paving the way for future empirical research based on Australian firms.

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1. Introduction

The world is experiencing challenges within two critical and interrelated dimensions of sustainability – economic and environmental. These challenges include the impacts of climate change, environmental forces and future energy generation coupled with the global competitive pressures on manufacturing in developed economies. Traditional economic development strategies are struggling to navigate the maze of these concerns. In addition, applying sustainability is not yet common practice in business, particularly within the manufacturing sector. Typically, sustainability is seen as a cost, something that would be good to do for the environment or to tick the 'green' box of a customer contract rather than a fundamental component of 'doing business'. Nevertheless, significant opportunities await those firms willing and able to change. Consequently, within the context of traditional manufacturing, a transformation is slowly taking place, reshaping the way industries are configured and paving a route towards a new sustainable economy.

A plethora of scholarly literature focuses on the business transition towards a 'green' or sustainable economy. These contributions mainly focus on technological and market driven approaches. For instance, Mol and Sonnenfeld (2000) introduced the concept of Ecological Modernisation based on the premise that ecological degradation could be fixed by institutional, technological and policy solutions. The development of the Green Car Innovation Fund (Goods et al., 2015) in Australia's automotive sector is an example of 'weak' Ecological Modernisation, a top down approach attempting to provide an ecological fix (Gibbs, 1998). Second, Kemp (2010) pioneered the concept of Eco-Innovation as the development of products or processes that reduce negative impacts of resources used. Innovations in clean coal technology aimed at cutting carbon emissions are an example (Miranda et al., 2011; Nill and Kemp, 2009). Both approaches have been critiqued for their technological focus and neglect of the social and spatial setting, with scholars arguing for a more integrated approach that includes analysing the social dimension and impacts of technology (George et al., 2012).

Alternatively, market driven approaches such as Corporate Social Responsibility (CSR) have focused on internalising costs associated with production such as pollution, to reduce the environmental footprint of organisations (Siegel, 2009). For

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example, [Martinez et al. \(2012\)](#) showcase how Adnams Brewery in the UK adopted eco-friendly values to 'green' the business and its products. However, it is difficult to measure the tangible benefits of CSR which is often isolated from core business and generally used as a marketing tool ([Siegel, 2009](#)). Similarly, emissions trading uses a property rights approach to incentivise individuals to protect the environment. Theoretically, increasing individuals' understanding of their responsibilities for common property, in this case, the quality of the environment, will motivate them to modify the impact of environmental harm on the atmosphere. Arguably, within a specific regulatory framework, the market then determines the most efficient method of controlling pollution. Yet, with so many variations on emissions trading systems ([Parliament of Australia, \(2010\)](#)), debate surrounds their durable effectiveness in reducing emissions ([Garnaut, 2011](#)).

Over the last decade, a socio-technical systems approach towards sustainable transition research has also emerged within the field of evolutionary economics ([Nelson and Winter, 2009](#)), complex systems theory ([Kauffman, 1995](#)) and socio-technical systems theory ([Geels, 2002](#); [Loorbach and Rotmans, 2010](#); [Rip and Kemp, 1998](#); [Trist, 1981](#)). This article studies this shift from unsustainable modes of operating towards sustainable alternatives within a socio-technical system approach. Of particular relevance here, is the link with one of evolutionary economic geography's master concepts, path dependence, which emerged from research in manufacturing and industrial districts in the 1980s and 1990s ([Cooke, 2009](#)). The concept of path dependence tends to lead firms to create strategies to optimise existing capital investment and technology. For many decades, economic and industrial development policy has focused on this somewhat narrow specialisation philosophy ([Cooke, 2009](#)). This paper argues for a more diversified policy approach that enables a fundamental shift towards long-term sustainable change. This requires a holistic analysis within the traditional manufacturing sector of relevant socio-technical characteristics. This might include user practices and life-styles, business models, value chains, organisational structures, regulations, spatial dimensions of knowledge spill-overs in related sectors and regional proximity attributes, institutional and political structures. The issue of how to drive and coordinate a transition in this sector towards sustainability is now receiving increasing attention in policy and scholarly forums ([Cooke, 2009](#); [Gibbs and O'Neill, 2014](#)).

The aim of this paper is to integrate four existing bodies of literature to introduce an interdisciplinary conceptual framework, 'Attributes of Sustainable Transitions' that contributes to this call for sustainable policy development. Development of the framework is part of a larger study on the elements associated with sustainable transitions within a traditional regional manufacturing setting. Rather than considering the elements of one theoretical approach in isolation, this framework reviews and incorporates four. These include: Advanced Manufacturing ([Green and Roos, 2012](#); [Roos et al., 2014](#); [Wilcox, 2014](#)), Sustainable Transitions ([Kemp, 1998](#); [Geels, 2002](#); [Geels and Schot, 2007](#); [Markard et al., 2012](#); [Lachman, 2013](#)), the Spatial Significance of Regions ([Massey, 1979](#); [Hudson, 1999](#); [Cochrane, 2012](#); [Gibson et al., 2012](#)) and Transition Regions ([Amison and Bailey, 2014](#); [Cooke, 2009](#); [Enright and Roberts, 2001](#); [Gibbs and O'Neill, 2014](#); [Horwitch and Mulloth, 2010](#)).

To develop the proposed integrative framework, this paper is divided into 5 sections. In section 2, the need to transition towards a sustainable economy is explored. Section 3 considers the importance of manufacturing, based on the Australian context. The differences between former and potential future manufacturing approaches are explored ([Green and Roos, 2012](#)). Section 4 introduces the four elements of the conceptual framework –

Advanced Manufacturing (AM), Sustainable Transitions (ST), the often regional nature of sustainable transitions in manufacturing and the significance of the spatial lens in transitioning traditional manufacturing regions. This latter elements supports the need to understand the path dependent, related variety and proximity qualities for regenerating the traditional manufacturing industry sector.

2. What is a transition?

Scholars have articulated the meaning of a 'transition' in a variety of ways. Within the field of sustainability and economics, [Pisano et al., \(2014\)](#) consider 'transition' refers to the smaller pieces of the transformation phase, whereas political science scholars such as [Davies \(2013\)](#), argue a transition involves the bigger picture, incorporating social, political, economic and cultural change. Transition scholars typically define the term holistically as involving a range of dimensions: technological, material, organisational, institutional, political, economic and socio-cultural ([Geels and Schot, 2007](#)). In contrast, human geographers such as, [Hicks \(2014 p.7\)](#) consider a transition to be evolutionary, 'the process of adaptation, whereby an organism becomes better able to live in its habitat'. Rather than abandon these meanings in search of another term, together, they contribute to a fundamental shift towards a new sustainable trajectory.

2.1. The need for transition

The need for transition to a sustainable economy is not without challenges. As [Diesendorf \(2014\)](#) suggests the concepts, green, low carbon, ecological and sustainable are contestable. Arguably, this perceived dispute has not been because global society has failed to strive for a more ecologically balanced economy. A benchmark survey in Australia, for example, revealed that whilst two-thirds of Australians accept climate change is real, 89 per cent of those surveyed believe that humans bear some responsibility for climate change and 71 per cent agree that tackling climate change creates jobs and investment in clean energy for a sustainable future ([The Climate Institute, 2013](#)). Rather, the contest reflects the current rhetoric of political and dominant industry stakeholders, threatened by how the transition discourse challenges the status quo and neo-liberal policy agendas. [Diesendorf \(2014\)](#) argues that the current orthodoxy embedded in everyday workings of government and daily lives, alienates the environment and denies a progressive and socially just transformation ([Kelsey, 2014](#)). The result has been to stymie any fundamental shift towards a sustainable economy.

3. Does manufacturing matter? – an Australian perspective

Manufacturing made a vital contribution to Australian economic development, producing ample goods to supply domestic needs ([Milne, 2010](#)). However, in recent decades it has been in a well-documented decline. Current Australian political and scholarly debates tend to focus on whether Australia should manufacture at all ([Gibson et al., 2012](#)). Following the loss of the large car and steel production facilities in recent times, for instance, Ford and Toyota have now committed to cease vehicle production in their Victorian plants by 2017 ([Dowling, 2014](#)). BHP Newcastle closed its steelworks in 1999 and BlueScope Steel, Port Kembla has been reducing domestic steel production since 2010, decommissioning one blast furnace in the process. These closures not only impact the existing industry and its current workforce, but also, the supply chain businesses and regional communities surrounding them.

Interdisciplinary scholars within geography, including, [Gibson \(2012\)](#), [Hudson \(2000\)](#) [Hudson \(2000\)](#) [Hudson \(2000\)](#) and

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