



# Chapter 1

## Developing Transition Research for Disruptive Technology: 3D Printing Innovation


**Jennifer Loy**

 <https://orcid.org/0000-0001-7153-0699>  
*Deakin University, Australia*

**James I. Novak**

 <https://orcid.org/0000-0003-4082-4322>  
*Deakin University, Australia*

**Moira Scerri**

 <https://orcid.org/0000-0001-8358-9778>  
*University of Technology Sydney, Australia*

**Md Maruf Hossan Hossan Chowdhury**

*University of Technology Sydney, Australia*

**Katrina Skellern**

*University Technology Sydney, Australia*

### ABSTRACT

*There is a disconnect between technical research into digital manufacturing processes supporting the development of product innovation and research into the adoption of these technologies and subsequent products into existing business practices. One of the reasons is the level of technical and business knowledge required for an integrated response to the challenges involved in their adoption into established industrial contexts. This chapter introduces transitioning companies' issues to working with emerging digital manufacturing technologies through the example of 3D printing (additive manufacturing). The chapter provides an argument for the development of transition research across disciplines that identifies and explores the integration challenges involved in maximizing the opportunities of 3D printing. Examples discussed are from the surgical, dental, and hearing aid industries. The recommendations are based on the authors' research into supply chain management and operations in medical devices manufactured using 3D printing for the Association for Supply Chain Management (ASCM).*

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## **INTRODUCTION**

Transition research is currently dominated by longitudinal studies that monitor and evaluate conditions as they change over time (Zolfagharian, Walrave, Raven, Georges, & Romme, 2019). Whilst worthwhile, this can result in a body of research that is observational in nature and lacks proactive impact. An issue for transitional research as a discipline, therefore, is how to support the development of Action Research in transition studies, supporting researchers in proactive engagement with a problem (McNiff, 2013). This is a pertinent question at this time due to the complex problems identified for society by researchers, such as sustainability, the rising cost of healthcare and globalization, and because of the difficulties of predicting future practice in a period of intense change. According to Cameron (2017, p.83), society's ability to imagine the future is being overwhelmed by the myriad of changes in interaction and organization that digital technologies are creating over a short period of time: "Our leaders need to be able to think on new, fast-moving timetables. The education/skills training implications of engaging seriously with the disruption scenario we are discussing stand out as immediate challenges for policymakers thinking ahead." Proactive transition research is needed to help anticipate, and effectively manage, change in a digital era.

Over the last two decades, developments in digital technology have facilitated disruptive innovation in business practices across industries. The challenge for companies is no longer in recognizing the disruptive potential of digital technologies, but rather in pre-empting its negative impacts and maximizing the opportunities for their industries and business practices. This is not an easy task. There are numerous examples of companies that tried, but ultimately failed, to understand an emerging digital landscape. Other companies have responded effectively, but still face unexpected consequences for their businesses, requiring radical operational reorganization. Professional development is required to help organizations when they need to shift from incremental to paradigm change strategies in their response to the opportunities and challenges of disruptive digital technologies. There is a need for better integrated transition research across academic disciplines. This chapter highlights this need, through the lens of 3D printing (additive manufacturing) and provides an argument for additional education for interdisciplinary teams on:

- Technical knowledge on digital fabrication technology for all transition research team members.
- Appropriate transition research methodologies and methods.
- Working practice for cross-disciplinary teams.

## **Background**

Transition research provides a historical review of specific periods of significant change. This allows for an objective review of the signs and signifiers that preceded the change, the drivers for that change, the perspectives of stakeholders and the activities involved in the change and the consequences and differences that followed. It is a valuable tool for understanding the turning points for large events, such as political and industry, or company specific events. One of the difficulties for researchers in this field is defining the start and end points of a longitudinal study. Described by the Gartner Hype Cycle (Fenn, & Raskino, 2008), the graph made famous for describing the adoption of new technologies, following initial excitement there may be a lull in activity that is subsequently revitalized. As a result, most studies are ten to thirty years and in some cases over thirty years to capture this entire cycle of adoption (Zolfagharian et al., 2019).

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