Proceedings Series 19.2

The City and Complexity

Life, Design and Commerce in the Built Environment

Amps

AMPS PROCEEDINGS SERIES 19.2

City, University of London | AMPS
London: 17-19 June, 2020

The City and Complexity – Life, Design and Commerce in the Built Environment

ARCHITECTURE_MEDIA_POLITICS_SOCIETY
Amps

EDITOR:
Robert Lastman

SERIES EDITOR:
Dr. Graham Cairns

EXECUTIVE PRODUCTION EDITOR:
Eric An

PRODUCTION:
Mari Kadouri

AMPS PROCEEDINGS SERIES 19.2 ISSN 2398-9467

INTRODUCTION

The City and Complexity – Life, Design and Commerce in the Built Environment

2020 marked the 50th anniversary of Jane Jacobs' The Economy of Cities. It came a decade after her seminal work, The Death and Life of Great American Cities, and heralded a new age in thinking about the city. The city would no longer be a question of design and planning in isolation. From the early 1970s onwards, it would be seen as a complex interdisciplinary phenomenon.

The first years of the 1970s saw the introduction of a whole series of notions that would mutually inform our reading of the metropolis: social justice and the city, sustainability, defensible space, and urban centres as sites of public health. It saw the emergence of concepts such as the global city, urban economics, the post-industrial society and the cultural city. From art, design and cultural perspectives, post-modernism would critique of the whole modernist project.

Five decades after complexity theory was first applied to our reading of the city, this conference and its publications revisit its consequences. They reconsider the city as an adaptive, self-organising and unpredictable system of interconnecting interventions, forces and perspectives. They ask how these competing and mutually reinforcing factors came into play and how they operate today. They question how the city has been, and continues to be, informed by the practices of multiple disciplines.

Both the conference and this publication brought together a diverse set of theorists and practitioners to examine these questions from a range of discipline perspectives including urban design, architecture, sustainability, housing, public health and sociology. The result is a complex and fascinating journey through 'the city' defined as a complex, integrated phenomenon, both physical in its form and social and environmental in its impacts.

CLOSED LOOP OBJECT MAKING IN AND FOR COMMUNITY

Author:
BERTO PANDOLFO

Affiliation:
UNIVERSITY OF TECHNOLOGY SYDNEY, AUSTRALIA

INTRODUCTION

The way objects are made, used and discarded is under significant pressure due to the rampant efficiency of industrial production processes. Large qantities of objects are made from virgin material, transported over large distances, used for short periods of time and finally, without proper end-of-life solutions, discarded into waste streams. Circular or closed loop systems provide a possible solution to the waste problem inherent in current systems of object making. Embedding a circular approach into a context defined by community may provide a way to view object making in a different way. This paper explores how object making that incorporates, material sourcing, material transformation and specific end-use application can be imagined within, and for, a defined community context.

THE CHANGING WAYS OF OBJECT MAKING

Object making was dominated by making by hand until the industrial revolution introduced a new way of making facilitated by machines, factories and division of labour. Object making in this new context would go on to become known as industrial manufacturing. The impact was significant and widespread, economies that were largely based on agriculture transformed to became industrialised. One of the key differences between the type of making prior to the industrial revolution and the new manufacturing was that objects could now be made in large quantities. During the twentieth century as demand for manufactured goods grew, so did nationally based manufacturing sectors. Then globalisation forced the manufacturing landscape to change. Many did not survive the competition, those that did, would go on to be recognised as advanced economies because of their extensive manufacturing industries[1]. Manufacturing is widely understood as an important contributor to skills, learning and commercial activity. One person working in manufacturing delivers more economic benefit than any other sector[2] and, manufacturing stimulates innovations in other parts of the economy[3]. The success of manufacturing however has come at a price; increased production equates to increased consumption which equates to increased waste.

The increase in mass produced products corresponds with a decline in manufacturing in many western countries and an increase in other countries like China[4]. In Australia for example, manufacturing contributed less than 6% of GDP in 2018, down from a high of nearly 30% in the early 1960s[5]. There are signs however, that manufacturing in the early part of the twenty first century is undergoing somewhat of a revival. This shift is happening in two ways, the first is a return to countries of origin,

also known as backshoring, and the second is a move from making in the urban periphery, back into urban centres.

Up until the mid to late twentieth century many nations were able to provide many of the objects their societies needed. It was also common for many manufacturers to locate themselves across the urban landscape. Then, as costs rose the pressure on manufacturers forced them into more affordable industrial zones usually located on the urban periphery. Around the turn of the twentieth century manufacturing was further rationalised into foreign locations where costs, particularly those associated with labour were lower[6 7]. This process is referred to as offshoring and is a strategy widely adopted by Western manufacturing companies. Offshoring involves fragmenting a company into smaller parts and separating components into regions where reduced costs enable a company's competitive advantage to be maintained[8].

There are indicators however, that companies are re-evaluating the importance of where their business activities are located[9 10]. Backshoring is occurring because labour costs in those previously cheaper locations have increased[11], currency values across economic borders are volatile[12], the threat of company intellectual property theft remains[13] and poor quality of offshore production continues[14 15]. The advent of Advanced Manufacturing Technologies (AMT) is another factor motivating manufacturers to backshore their activities. An MIT task force on production and innovation proposed a definition of AMT as the interface between innovation systems and industrial production[16]. AMT represents increased control brought about by the digitization of equipment used in design, manufacture and/or handling of a product, examples include CNC machining, 3d printing and robotics[17]. AMT enables increased productivity and efficiency and a reduction of the benefits of low wage economies by reducing the share of labour content. AMT does not foster globalisation and fragmentation of production, but rather it leads 'to a re-concentration of production activities'[18] and a heightened importance of regional and local value chains[19]. The contribution of AMT to backshoring also recognises that it has influenced a return of manufacturing back to an urban context. While urban manufacturing suffered during the first wave of globalisation, the twenty-first century is experiencing favourable conditions to see manufacturing return to high density urban areas[20]. Next generation urban manufacturing, however, will be different, it is likely to be small and discrete, the focus will be on fast changing products, made to high specifications, customised to individual requirements and made in short runs[21].

The disruptive nature of AMT is perfectly positioned to support the radicalisation of how objects are made. AMT is not the dirty and noisy activity epitomised by large factories of the last century and it will allow for quieter modes of production that will be more suitable to high density environments[22]. Producing within the city is beneficial from an ecological[23] and social point of view and being located in the urban context offers a direct proximity to customers and highly qualified staff[24].

Object making in the city

Some object making activities have continued to operate in urban contexts because they depend on the businesses and residents of the city for their survival[25]. Examples include small fashion houses, jewellery studios and bespoke furniture makers. In recent years there has been return to urban contexts by other making based activities such as small scale brewing companies[26] and digital fabrication workshops such as Fab Labs[27]. These urban based makers distinguish themselves through their modest scale, ability to customise and strong community connection. The sense of community for these urban based makers is fundamental as it provides a platform for members to feel connected. Being a part of a community, whether it is a maker community or not, is essential to our wellbeing. A community provides a sense of belonging in the increasingly insecure conditions of contemporary life[28]. A

community supports relationship building, sharing and positive reinforcement, they are commonly defined by boundaries[29] which results in a social capital that makes actions possible[30]. Fab Labs started as a kit of tools and machines that the Center for Bits and Atoms from MIT provided to a local community in inner-city Boston, as part of its outreach programme[31]. The social capital that originated with this initiative was nutured and is now evident in the many Fab Labs located around the world.

It was the observation of how communities function that revealed the potential for social capital to drive change in material use and object creation. The community is well positioned to create a unique framework to address the linear model currently dominating the way resources are used. Additionally, the community provides new ways to view the challenges associated with scale and location.

A circular approach to object making can address the shortcomings of the linear model. A circular or closed loop model, is based on the principles of; designing out waste and pollution, keeping products and materials in use as long as possible, and establishing regenerative systems at an objects end-of-life. A circular or closed loop approach is one strategy that can reduce the environmental impact of manufacturing[32]. The linear model of take-make-dispose is replaced by a system that is *restorative by intention*[33]. The circular approach replaces the concept of end-of-life, which assumes a definitive end, to one that seeks out renewable energy, eliminates the use of toxic chemicals which complicates the recycling process and designs out waste through superior use of materials, products and systems[34].

Combining the notions of community and the circular or closed loop approach presents a possibility to view object making and associated challenges such as material management differently. If instead of considering the volumes of virgin material required by large scale manufacturers we reframe object making in a community context to consider using only the material that enters a given community, then the challenge of sourcing material becomes very different. And rather than replicate the scale of existing mass manufacturing, the scale of object making is redefined to fall within the constraints of a defined community, then the object making processes can also change. Is it feasible then to consider a model of object making that is informed by what a community consumes in terms of materials and what it needs in terms of objects? Additionally, what are the benefits of making in close proximity to where the community uses their objects? And what is the impact on the object in a context where the activities of production are confined to what the community makes available?

WORKING WITH COMMUNITY

There is an important urban dimension to the idea of community that members are physically within reach of one another[35]. The concepts of proximity and the human scale were fundamental ideas in the decision to work with a community within a defined urban context. Working with and for a community will enable this study to position itself between two opposing scales of activities. On one side, large scale manufacturing industries and material waste companies, on the other, individual object makers and waste material recyclers. The scale of a community enables a model of activity that is feasible in terms of material collection and processing and the creation of object-based outcomes that are informed by and satisfy the needs of that community. Working in this way allows for a circular or closed-loop object making approach to be designed and tested. A city-based university was seen as a suitable candidate community for this study. Its proximity to the urban centre and its scale provided a suitable platform and it is also where the author is employed. A design-led approach was adopted that was practitioner led. Design-led research is a knowledge-directed research methodology that integrates design practices, processes and tools to investigate what can be learned through practitioner action[36]. The city-based university is a medium sized public university and like other similar sized organisations, is a microcosm. Its core activities of education and research are supported by other services and activities such as commercial retailing, sporting facilities and a wide range of

social and cultural groups. Material use and material flow within the community was studied to inform the practical component which will explore which material is most suited to being reused and how the transformation from waste material to usable object can be achieved.

THE COMMUNITY, THE MATERIAL, THE MACHINE, THE OBJECT AND THE PROCESS

The Community

During teaching periods, thousands of people move throughout the university campus, they are most visible at food and beverage outlets and on principle walkways between campus buildings. Observing people at these locations revealed a not so surprising insight; a high occurrence of takeaway, single-use packaging. Single use packaging was observed being carried by people on campus, but also in bins, on tables and discarded as litter. Single use packaging is a problem because it is cheap, convenient and therefore widespread. The lack of tailored solutions to the diverse range of single use packaging means it is a dilemma, but it also represents an opportunity. Packaging material is a potential resource that if collected, reformatted and reused on campus, could represent significant savings in new object purchases, waste management and transport. Determining which of the single use packaging would be suitable for further investigation was driven by pragmatic concerns around contamination.

The Material

Single use coffee cup lids represented the most promising potential. They are easily distinguished by their form, they are limited in their colour variations, usually black or white, and they are marked with the material recycling identification number. The next challenge necessitated a collection strategy. Boxes, specially marked with clear instructions were positioned at various locations on campus; in photocopy rooms, lunch rooms and adjacent to other waste bins. Community members fully supported the collection process and contributed by aiding in collecting and encouraging others to participate. What to make using the coffee cup lid material involved an exploration into the complexity, size and function of possible objects. Contemporaneously an exploration into the various making processes available at the university was conducted. A variety of technologies were found but the most suitable was the robot arm printer. This technology locates a plastic extruder on the end of a robotic arm. The robot arm extrudes plastic in accordance with a 3d digital model, in a similar manner to how most desktop 3d printers work.

The Machine

Co-evolution of design exploration and robot test prints enabled one to inform the other. As it became clear that some geometries were not possible to print, they were eliminated. And objects that were previously considered unsuitable re-entered consideration. Like other manufacturing processes, the robot arm extruder is constrained by certain geometries, size, speed and quality of resolution, some of which were informed by characteristics of the coffee cup material. It became necessary to consider the physical limitations of the coffee cup lid material - polystyrene (PS). PS is relatively brittle, but it is used widely in single use cutlery, cups and glasses, disposable shavers and toys. It is a versatile material, it can be injection moulded, extruded, expanded and vacuum formed, (coffee cup lids are vacuum formed). Some of the challenges of PS were uncovered and will be detailed below.

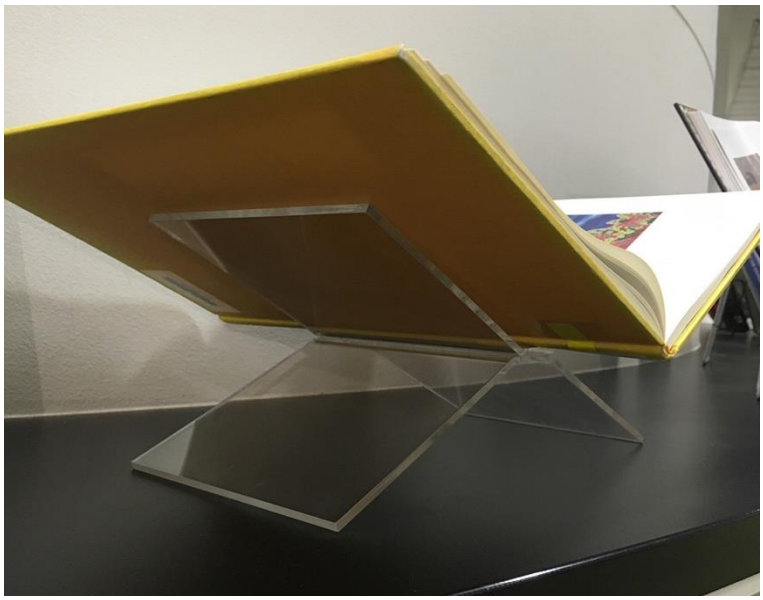

Figure 1. Bookstand

Figure 2. Test print

The Object

A short list of objects was identified, this was dominated by stationery items including; folder stands, file separators, bookstands, paper trays and leaflet holders. These items were selected because they were made from a single material, their functional requirements fell within the performance characteristics of PS and their geometries were relatively simple. Of these items, the bookstand was found to be the most suitable object as it satisfied a number of the key criteria determined by limitations of the robot arm printer. The bookstand is an object used commonly in libraries and bookstores to display books. Its primary function is to support the book in a horizontal and open format (see figure 1). To accommodate different size books, it is available in different sizes, it is made in a variety of materials including clear acrylic, polycarbonate, timber and sheet metal. Some versions are made from two interlocking halves others have the two halves glued or screwed together. In line with the constraints of printing using the robotic arm extruder, a design for a bookstand was

developed. Once a final design had been determined a three dimensional model was created using CAD. A test print was conducted to verify the suitability of the digital model and final design, this was printed using virgin plastic (see figure 2).

Figure 3. PS Shavings

Figure 4. PS Pellets

Figure 5. Delamination

Figure 6. Shrinkage and bowing

The Process

The collected PS lids needed to be converted into pellets as this is the most efficient way to feed material into the extruder. The first step was to put the PS through a material shredder to create shavings (see figure 3). The shavings were then put through an extruder to create a spaghetti like form, which was shredded again to produce PS pellets (see figure 4). Now armed with pelletised PS an attempt to print the bookstand was conducted. Unlike the test print using virgin material that was successful on the first attempt, numerous tests were required using the pelletised PS. Issues emerged that impeded the printing process, this included delamination between layers (see figure 5), uneven shrinkage and bowing (see figure 6). Pure PS is not commonly used in 3D printing, it is however used widely as a blended material such as Acrylonitrile Butadiene Styrene (ABS). Following a number of tests, a successful combination of print temperature, layer height and print speed was found which enabled a complete print to be achieved (see figure 7).

Figure 7. Successful print

CONCLUSION

When lockdown due to Covid-19 was enforced in March 2020 the impact on this study meant the evaluation stage of the project was not able to be completed. This stage had planned to produce a number of bookstands to be placed in the university library. This would have provided the opportunity to evaluate the bookstand in situ and gain feedback from the various stakeholders. Notwithstanding this unanticipated disruption, reflecting on the completed component of the project revealed a number of insights. The closed loop system of object making utilized in this project in itself is not a novel concept, but some of the outcomes observed may contribute to the broader discussion on objects in general and the idea of closed loop making. The key takeaway items relate to object complexity and object meaning.

Object Complexity

The book stand presented in this project is not a complex object in terms of its form or function. Made from a single material, it is not geometrically complex, and its function is rudimentary. This simplicity, however, does not detract from the service it provides. All around us, objects like the bookstand perform rudimentary tasks, and as much we would like to remove them in a bid to reduce the problem of overconsumption, these simple objects are useful. Overconsumption becomes a problem when objects are made from virgin material and in faraway places that require transport over long distances. When there is no connection with the user that encourages attachment and when there is no end of life plan overconsumption leads to unnecessary waste. The bookstand that resulted from this study, is still a simple object, however, how it was realised, the material used and the context of its creation and end use is significantly different to the commercially available varieties. The bookstand is made in a closed loop system in partnership with the university community using material that was consumed, collected and reformatted within the university context. The object is born out of a specific need identified within the community and made in accordance with the communities' capacity to realise an object.

Object meaning

This study highlights the value of the entire process of object making. From material collection to material transformation through to end of life. The humble coffee cup lid in the context of this project can now be viewed as part of a sustainable solution with regards to plastic waste and overconsumption. The coffee cup lid and the bookstand it became, is now linked to the community that found it, re-valued it as a resource and gave it a new life. The bookstand that was previously a non-descript object performing a rudimentary function, is transformed. It is now an object that has a strong connection to its location and the people that use it. A location where the material was farmed, reformatted and put back to service by its very inhabitants. A location that enables that object to be returned back into the closed loop system to become another object at the end of its useful life. Enriching the meaning of simple objects such as the bookstand may be one strategy to ensure against unnecessary energy use in the disposal of objects and encourage the long-term use of objects knowing a system is in place to address the moment when the object, for whatever reason, needs to be replaced.

NOTES

[1] Eamonn Fingleton, *In Praise of Hard Industries: Why Manufacturing, Not the Information Economy, Is the Key to Future* (Boston: Houghton Mifflin Company, 1999).
[2] Peter Marsh, *The New Industrial Revolution: Consumers, Globalization and the End of Mass Production* (Cornwall: Yale University Press, 2012).
[3] Jim Stanford, "Manufacturing (Still) Matters: Why the Decline of Australian Manufacturing Is Not Inevitable, and What Government Can Do About It," ed. Centre for Future Work (Canberra, Australia: The Australia Institute, 2016).
[4] Suzanne Berger, *Making in America: From Innovation to Market* (Cambridge, Massachusetts: MIT Press, 2013).
[5] The Australian Industry Group, "Australian Manufacturing in 2019: Local and Global Opportunities," (Sydney: The Australian Industry Group, 2019).
[6] Steffen Kinkel and Spomenka Maloca, "Drivers and Antecedents of Manufacturing Offshoring and Backshoring—a German Perspective," *Journal of Purchasing & Supply Management* 15 (2009).
[7] Berger.
[8] F.J. Contractor et al., "Reconceptualizing the Firm in a World of Outsourcing and Offshoring: The Organizational and Geographical Relocation of High-Value Company Functions.," *Journal of Management Studies* Contractor, F.J., Kumar, V., Kundu, S.K., Pedersen, T., 47, no. 8 (2010).
[9] L.M. Ellram, W.L. Tate, and K.J. Petersen, "Offshoring and Reshoring: An Update on the Manufacturing Location Decision.," *Journal of Supply Chain Management* 49, no. 2 (2013).
[10] Steffen Kinkel, "Trends in Production Relocation and Backshoring Activities: Changing Patterns in the Course of the Global Economic Crisis," *International Journal of Operations & Production Management* 32, no. 6 (2012).
[11] Charles Fishman, "The Insourcing Boom," *The Atlantic*2012.
[12] Steve Culp, "Supply Chain Risk a Hidden Liability for Many Companies," Forbes Media, https://www.forbes.com/sites/steveculp/2012/10/08/supply-chain-risk-a-hidden-liability-for-many-companies/#72ee88d7594d.
[13] Richard A. Clarke, "How China Steals Our Secrets," The New York Times, https://www.nytimes.com/2012/04/03/opinion/how-china-steals-our-secrets.html?_r=0.
[14] Kinkel.
[15] Filippo Albertoni et al., "Returning from Offshore: What Do We Know?," *AIB Insights* 15, no. 4 (2015).
[16] Berger.
[17] Jorge Luis García-Alcaráz et al., "Role of Human Resources, Production Process, and Flexibility on Commercial Benefits from Amt Investments," in *Optimizing Current Strategies and Applications in Industrial Engineering*, ed. Prasanta Sahoo (Hershey PA: IGI Global, 2019).
[18] Bernhard Dachs, Steffen Kinkel, and Angela Jäge, "Bringing It All Back Home? Backshoring of Manufacturing Activities and the Adoption of Industry 4.0 Technologies," *Journal of World Business* 54 (2019).
[19] Koen De Backer et al., "Reshoring: Myth or Reality?," *OECD Science, Technology and Industry Policy Papers* 27 (2016).
[20] Adrian Vickery Hill (ed.), *Foundries of the Future: A Guide to 21st Century Cities of Making*, ed. Teresa Domenech With contributions by: Ben Croxford, Birgit Hausleitner, Adrian Vickery Hill, Han Meyer, Alexandre Orban, Víctor Muñoz Sanz, Fabio Vanin and Josie Warden (Delft: TU Delft Open, 2020).
[21] Peter Marsh, "London and the New Industrial Revolution," *London Essays*, no. 2 (2015), https://essays.centreforlondon.org.
[22] (ed.).
[23] Jessica Ferm and Edward Jones, "Beyond the Post-Industrial City: Valuing and Planning for Industry in London," *Urban Studies* 54, no. 14 (2017).
[24] Tanja Tötzer et al., "How Can Urban Manufacturing Contribute to a More Sustainable Energy System in Cities?," *International Journal of Sustainable Energy Planning and Management* 24 (2019).
[25] Ferm and Jones.
[26] Rob McFarland, "City Pickers," *International Traveller: for modern explorers*2019.
[27] Tomas Diez, "The Fab City," *Making Futures Journal* 3 (2013).
[28] Gerard Delanty, Community, (ProQuest Ebook Central: Taylor & Francis Group, 2003), https://ebookcentral.proquest.com/lib/uts/detail.action?docID=1395365.
[29] Talja Blokland, *Community as Urban Practice* (Cambridge UK: Polity Press, 2017).

[30] Suzanne W. Morse, *Smart Communities: How Citizens and Local Leaders Can Use Stratgeic Thinking to Build a Brighter Future.* (San Francisco: Jossey-Bass, 2014).
[31] Diez.
[32] Max Jurascheka et al., "Experiencing Closed Loop Manufacturing in a Learning Environment," *Procedia Manufacturing* 9 (2017).
[33] Ellen Macarthur Foundation, "Concept: What Is a Circular Economy? A Framework for an Economy That Is Restorative and Regenerative by Design," Ellen Macarthur Foundation, https://www.ellenmacarthurfoundation.org/circular-economy/concept.
[34] Ibid.
[35] Blokland.
[36] Roderick Walden et al., "Developing Strategic Leadership and Innovation Capability for Manufacturing Smes Transitioning to Digital Manufacturing Technology," in *Leadership Styles, Innovation, and Social Entrepreneurship in the Era of Digitalization*, ed. Çağlar Doğru (Hershey PA: IGI Global, 2019).

BIBLIOGRAPHY

(ed.), Adrian Vickery Hill. *Foundries of the Future: A Guide to 21st Century Cities of Making*. Edited by Teresa Domenech With contributions by: Ben Croxford, Birgit Hausleitner, Adrian Vickery Hill, Han Meyer, Alexandre Orban, Víctor Muñoz Sanz, Fabio Vanin and Josie Warden Delft: TU Delft Open, 2020. doi:10.4121 uuid:8bcd1748-3c04-4c2f-96cd-e763fe3b5b63.

Albertoni, Filippo, Stefano Elia, Luciano Fratocchi, and Lucia Piscitello. "Returning from Offshore: What Do We Know?". *AIB Insights* 15, no. 4 (2015): 9-12.

Backer, Koen De, Carlo Menon, Isabelle Desnoyers-James, and Laurent Moussiegt. "Reshoring: Myth or Reality?". *OECD Science, Technology and Industry Policy Papers* 27 (26 January 2016): 1-34.

Berger, Suzanne. *Making in America: From Innovation to Market*. Cambridge, Massachusetts: MIT Press, 2013.

Blokland, Talja. *Community as Urban Practice*. Cambridge UK: Polity Press, 2017.

Clarke, Richard A. "How China Steals Our Secrets." The New York Times, https://www.nytimes.com/2012/04/03/opinion/how-china-steals-our-secrets.html?_r=0.

Contractor, F.J., V. Kumar, S.K. Kundu, and T. Pedersen. "Reconceptualizing the Firm in a World of Outsourcing and Offshoring: The Organizational and Geographical Relocation of High-Value Company Functions.". *Journal of Management Studies* Contractor, F.J., Kumar, V., Kundu, S.K., Pedersen, T., 47, no. 8 (2010): 1417–33.

Culp, Steve. "Supply Chain Risk a Hidden Liability for Many Companies." Forbes Media, https://www.forbes.com/sites/steveculp/2012/10/08/supply-chain-risk-a-hidden-liability-for-many-companies/#72ee88d7594d.

Dachs, Bernhard, Steffen Kinkel, and Angela Jäge. "Bringing It All Back Home? Backshoring of Manufacturing Activities and the Adoption of Industry 4.0 Technologies." *Journal of World Business* 54 (2019): 1-15.

Delanty, Gerard. *Community*. ProQuest Ebook Central: Taylor & Francis Group, 2003. https://ebookcentral.proquest.com/lib/uts/detail.action?docID=1395365.

Diez, Tomas. "The Fab City." *Making Futures Journal* 3 (2013): 542-48.

Ellram, L.M., W.L. Tate, and K.J. Petersen. "Offshoring and Reshoring: An Update on the Manufacturing Location Decision.". *Journal of Supply Chain Management* 49, no. 2 (2013): 14-21.

Ferm, Jessica, and Edward Jones. "Beyond the Post-Industrial City: Valuing and Planning for Industry in London." *Urban Studies* 54, no. 14 (2017): 3380-98.

Fingleton, Eamonn. *In Praise of Hard Industries: Why Manufacturing, Not the Information Economy, Is the Key to Future*. Boston: Houghton Mifflin Company, 1999.

Fishman, Charles. "The Insourcing Boom." *The Atlantic*, 2012, 44-52.

Flood, Paul, and Sharon Blair. "Men's Sheds in Australia: Effects on Physical Health and Mental Well-Being. ." Australia: Beyond Blue, 2013.

Foundation, Ellen Macarthur. "Concept: What Is a Circular Economy? A Framework for an Economy That Is Restorative and Regenerative by Design." Ellen Macarthur Foundation, https://www.ellenmacarthurfoundation.org/circular-economy/concept.

García-Alcaráz, Jorge Luis, Arturo Realyvásquez-Vargas, Emilio Jiménez-Macías, Liliana Avelar Sosa, and Aide Aracely Maldonado-Macías. "Role of Human Resources, Production Process, and Flexibility on Commercial Benefits from Amt Investments." In *Optimizing Current Strategies and Applications in Industrial Engineering*, edited by Prasanta Sahoo. Hershey PA: IGI Global, 2019.

Group, The Australian Industry. "Australian Manufacturing in 2019: Local and Global Opportunities." Sydney: The Australian Industry Group, 2019.

Jurascheka, Max, Felipe Cerdasa, Gerrit Posselta, and Christoph Herrmanna. "Experiencing Closed Loop Manufacturing in a Learning Environment." *Procedia Manufacturing* 9 (2017): 57-64.

Kinkel, Steffen. "Trends in Production Relocation and Backshoring Activities: Changing Patterns in the Course of the Global Economic Crisis." *International Journal of Operations & Production Management* 32, no. 6 (2012): 696-720.

Kinkel, Steffen, and Spomenka Maloca. "Drivers and Antecedents of Manufacturing Offshoring and Backshoring—a German Perspective." *Journal of Purchasing & Supply Management* 15 (2009): 154-65.

Marsh, Peter. "London and the New Industrial Revolution." *London Essays*, no. 2 (2015). Published electronically July 6. https://essays.centreforlondon.org. *The New Industrial Revolution: Consumers, Globalization and the End of Mass Production*. Cornwall: Yale University Press, 2012.

McFarland, Rob. "City Pickers." *International Traveller: for modern explorers*, 2019, 44-46.

Morse, Suzanne W. *Smart Communities: How Citizens and Local Leaders Can Use Stratgeic Thinking to Build a Brighter Future.* San Francisco: Jossey-Bass, 2014.

Stanford, Jim. "Manufacturing (Still) Matters: Why the Decline of Australian Manufacturing Is

Not Inevitable, and What Government Can Do About It." edited by Centre for Future Work. Canberra, Australia: The Australia Institute, 2016.

Tötzer, Tanja, Romana Stollnbergera, Roland Krebsb, Mara Haasb, and Christoph Biegler. "How Can Urban Manufacturing Contribute to a More Sustainable Energy System in Cities?". *International Journal of Sustainable Energy Planning and Management* 24 (2019): 67-74.

Walden, Roderick, Stefan Lie, Berto Pandolfo, and Anton Nemme. "Developing Strategic Leadership and Innovation Capability for Manufacturing Smes Transitioning to Digital Manufacturing Technology." In *Leadership Styles, Innovation, and Social Entrepreneurship in the Era of Digitalization*, edited by Çağlar Doğru, 164-89. Hershey PA: IGI Global, 2019.