

Innovation by design

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Hodges, N.J., Link, A.N. Innovation by design. *Small Business Economics* **52**, 395–403 (2019).
<https://doi.org/10.1007/s11187-018-0098-1>

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Abstract:

In this paper, links between creativity, design, and innovation are explored through the literature specific to the textile and apparel industries. We discuss the ways that the apparel industry embodies entrepreneurial innovation through creativity and design that makes it an exemplar of the idea of “Main Street” entrepreneurship, albeit one that relies in part on “Silicon Valley” innovation via its relationship with the textile industry. We conclude with a discussion of the need for more research on the topic and offer recommendations for future empirical investigations. Further research specific to the apparel industry would augment the thin foundation of existing literature and shed light on how innovation occurs through creativity and design within a key global industry and “Main Street” endeavor.

Keywords: entrepreneurship | textile and apparel industry | creativity | design

Article:

Introduction

The value chain in the US textile and apparel industries is an example of the relationship between “Silicon Valley” entrepreneurship and “Main Street” entrepreneurship. Industrial research and development (R&D) in the textile industry often mirrors “Silicon Valley” entrepreneurship because of the emphasis on R&D-led innovation through technology that tends to characterize textile firms. However, going from R&D-based and technology-based fabrics to innovative apparel involves creativity in design, which is a hallmark of “Main Street” entrepreneurship.

In this paper, we review the extant literature on creativity, a dimension of entrepreneurial innovation (Kirzner 1985; Shackle 1966), and design with specific reference to the US apparel industry. Recent data provided by the US Bureau of the Census reveal that 49% of the country’s textile- and apparel-related manufacturing firms (NAICS 313, 314, 315, and 316) are small in size, employing approximately 59% (around 350,000) of the total number of employees in this sector (US SBA 2013). Start-ups are common in the industry, and examples abound in the literature of many that achieved sustained success founded on a single design innovation. For

example, in 1906, William J. Riley founded what would become the global athletic shoe and sportswear brand, *New Balance*, with a simple yet innovative arch support. Created to provide comfort and support for the body while standing, the design was inspired in part by the physiology of the chicken's foot and was comprised of a three-prong construction that Riley believed offered ideal overall balance (Deuel 2015). We argue that, in contrast to Silicon Valley entrepreneurship that characterizes innovation in textiles, in the apparel industry, the creativity → design → innovation process is more closely aligned with “Main Street” entrepreneurship; innovative design ideas are perceived through creativity and delivered through entrepreneurial design action.

In the next section, we offer a brief historical overview of the apparel industry with an emphasis on US activity. In the section that follows, we review the foundational entrepreneurship literature related to creativity as a characteristic of perception and alertness. Then, we review a subset of the broader management literature that is related to design, also from an apparel industry perspective. To bound this subset of the literature, we allow the theory of creativity to motivate the review of the design literature as it relates to the apparel industry. In the subsequent sections, we focus on the literature that associates apparel design with innovation. Because we are focusing on “Main Street” entrepreneurship uniquely through the lens of perception (i.e., creativity) and action (i.e., design) by entrepreneurs in the apparel industry, the extant literature that we review is thin in comparison to the general literature within the broader field of management. In our concluding section, we tie our contributions to the “Main Street” entrepreneurship literature to an important segment of the broader literature on innovation and economic performance, namely the endogenous knowledge production literature. Then, we use the extant literature related to the apparel industry that we have identified and summarized as a springboard to suggest that future management research related to “Main Street” entrepreneurship adopts an industry perspective in an effort to identify subtleties within the academic approach to the study of entrepreneurship.

An industry overview to set the stage

When it comes to US industrial history, the apparel industry is perhaps the quintessential example of “Main Street” entrepreneurship. Beginning with the textile communities of Lowell, Massachusetts, in the early 1800s, mill towns eventually moved south to states like North Carolina, South Carolina, Georgia, and Mississippi where they helped to rebuild some of the infrastructure that was destroyed during the Civil War (Carlton and Coclanis 2005; Glass 1992). Many late nineteenth and early twentieth century entrepreneurs built mills and/or manufacturing facilities and established towns around them (Simpson 1948).

Apparel, that was once sewn together by tailors and seamstresses, themselves entrepreneurs, soon became mass produced. Apparel hubs developed on both coasts, as well as in many states in between (Zingraff 1991). With the advent of globalization, by the end of the twentieth century, much of apparel manufacturing activity moved off shore to Latin America and Asia (Gereffi 2000; Hodges and Karpova 2008). However, there are signs that the US apparel industry is repatriating itself, primarily due to Internet technology and the demands by consumers for access to a wide selection of innovative products available in a short period of time. Small start-ups continue to emerge throughout the states, selling apparel to niche markets and marketing

through lifestyle goals and values, such as a transparent supply chain, for the delivery of innovative and sustainable products manufactured through a responsible production process (Gardetti and Muthu 2015).

Although the channel is twenty-first century (i.e., based on Internet technology), the outcome (i.e., apparel) is the product of a stepwise process that has remained consistent through the years. That is, two-dimensional fabric is cut into pieces that are then stitched together to form a three-dimensional garment, typically resulting in the form of pants, shirts, dresses, skirts, jackets, and the like. However, this simplistic description is not meant to suggest that, as a “Main Street” entrepreneurial venture, the making of apparel does not involve innovation. Rather, as will be discussed herein, the process relies on innovation as consumers look for and expect new and novel styles on a regular basis. In the apparel industry, innovations tend to revolve around processes of manufacturing the product; components, such as fibers, fabrics, and garment design, that make up the product itself and strategies, such as consumer input/insight, branding, and customization, involved in attracting consumers to the product. Creativity, and particularly as it is managed through the design process, is prerequisite to keeping the flow of fashion moving forward.

To understand how creativity and the design process are intermingled when it comes to the apparel industry, the stereotypical image that might resonate is that of the mythological figure of the fashion designer, sitting in her studio, sketching design after design and then giving instructions to her cutters and stitchers on the details. The designer has a creative vision that, through her own unique, and somewhat mysterious, process of design development, is ultimately made real by those who are skilled in translating and transforming two dimensions into three. In other words, innovation in fashion design is often characterized as an approach requiring only a pencil, a sheet of paper, and the creative genius of the designer (and, of course, a pair of scissors and a sewing machine). Although this is the process that may still be followed in the upper echelons of the fashion design world, most global apparel companies cannot afford to have ideas generated by a somewhat nebulous and potentially slow and costly process. Instead, product developers and designers are employed to start with ideas that already exist in the marketplace, as well as with their own product mix, and then seek imaginative ways to improve them through design. The process is relatively straightforward and relies less on the trodden use of paper and pencil and more on the creative use of Adobe Illustrator and Photoshop.

In contrast to apparel, twenty-first century textile innovations emanate from “Silicon Valley” entrepreneurship as they often require greater access to technical capital for production capacity. Textile innovations can happen at the level of the fiber makeup through R&D-based explorations in chemistry and nanoscience, in the fabric itself through the adoption of technology-based weaving or knitting processes, or in the fabric through technical applications to make the finish water, stain, or insect repellent. Barriers to entry involve resources that include R&D, that support employees with complex knowledge of inorganic chemistry and polymer chemistry, and that ensure access to equipment that allows for structural changes in fibers at the molecular level. Thus, while creativity may be as important to textile innovation as it is to apparel, it is costlier to translate ideas into reality and therefore firms typically must engage in “Silicon Valley” entrepreneurial strategies based on the results from R&D investments to perform in an innovative manner.

Textile innovations are important to many industries, and when viewed through Ansoff's (1965) matrix of strategies addressing both old and new products/markets, can and do result in a variety of end uses, such as automotive, aeronautic, and medical. Undoubtedly, many of these innovations can, in turn, foster "Main Street" entrepreneurship. We acknowledge that what makes for an innovative apparel product often stems from the materials that are used to create that product. Innovations in materials can involve the development of entirely new kinds of fibers and fabrics, or a combination of existing materials in new ways. It was the latter approach to innovation that prompted the creation of *L. L. Bean* in 1912, when its founder, outdoorsman Leon Leonwood Bean, combined a leather upper with a rubber bottom, thereby creating the *Maine Hunting Shoe* and the foundation upon which the apparel company would eventually build its iconic outdoor lifestyle image (Westbrook 2015). However, we also acknowledge that innovations in apparel often come from more than just the materials used. As we discuss in this paper, creativity in the production, marketing, and distribution of apparel products is equally important to entrepreneurial innovation in this industry. It is for this reason that, in the review of literatures that follows, we focus our attention primarily on creativity and design in apparel as it is one of the largest product-driven, yet "Main Street," industries in the USA today.

Origins of creativity

Hébert and Link (2009) previously traced the evolution of thought about who the entrepreneur is and what he/she does. Their analysis begins with the early French philosophers, such as Cantillon and Quesnay, and concludes with contemporary scholars, such as Shackle, Schultz, and Kirzner. Over time, the entrepreneur has been thought of in terms of pursuing many different roles, and thus entrepreneurship has come to be defined in terms of what an entrepreneur does. However, a careful reading of Hébert and Link (2009), and the foundational sources upon which they, as well as other researchers (e.g., Casson and Casson 2014), rely shows that over the centuries, with few exceptions, the sources of knowledge that influence the roles ascribed to an entrepreneur have all but been ignored.

This void in the entrepreneurship literature does not mean that others have not thought in general terms about the genesis of ideas and the creativity that follows as Audretsch and Link (forthcoming) have argued. John Locke (1623–1704), for one, penned that one's experiences form the genesis for one's ideas (1979, p. 59):

All ideas come from sensation or reflection. ... How comes it to be furnished? To this I answer, in one word, from EXPERIENCE.

David Hume (1711–1776) refined Locke's ideas about the experiential genesis of ideas. Hume referred to experiences in terms of impressions, feelings, and sensations (1993, pp. 7–8):

All our ideas or more feeble perceptions are copies of our impressions... . Even ideas that at first glance seem to be the furthest removed from that origin are found on closer examination to be derived from it.

Contemporary scholars have hinted at the genesis of entrepreneurial creativity, and their hints are not at odds with the experiential foundations established by Locke and Hume. For example, Shackle (1966), who like most of the classical writers on entrepreneurship, understood that uncertainty bounds the actions of an entrepreneur, and more generally it bounds human action. He (1966, p. 86) maintained that “[i]t is only a bounded uncertainty that will permit [an entrepreneur] to act creatively.”

Schultz bridged the connection between the genesis of ideas and entrepreneurship in terms of the connection between entrepreneurial actions and education (1975, p. 843):

There is enough evidence to give validity to the hypothesis that the ability to deal successfully with economic disequilibria is enhanced by education.

And, Kirzner (1985) realized that entrepreneurial perception and alertness to opportunity is not a static phenomenon; rather, it has a time dimension. Entrepreneurial perception and alertness is a fluid process and the purveyor might even be considered a dynamic entrepreneur (Audretsch, Kuratko, and Link 2016). With that in mind, Kirzner (1985, pp. 63–64) expressed the view that:

... entrepreneurial alertness must include the entrepreneur’s perception of the way in which creative and imaginative action may vitally shape the kind of transactions that will be entered into in future market periods.

In other words, understanding the market process, which shapes one’s experiences, is requisite to an entrepreneur being perceptive, alert, and thus creative.

As we discuss next, the creativity that prompts innovations in apparel emerges through the design process. This process is one of trial and error. To refer again to the aforementioned *Maine Hunting Shoe* example, Bean’s initial version of the shoe was not fully waterproof, and as a result, nearly all of the 100 pairs sold were returned for a refund. As the story goes, he went back to the proverbial drawing board, developing a better way to adhere the rubber bottom to the leather upper which would ultimately prove to be waterproof. Each of the original customers received a pair of the new and improved shoes at no cost (Westbrook 2015). We posit that “Main Street” entrepreneurs, like Leon Leonwood Bean, are dynamic entrepreneurs who rely on perception and imagination to shape creative action, which emerges through design and within the context of experience. Bean’s determination to innovate by design provides just one example of how creativity is a requisite for “Main Street” entrepreneurship.

Creativity as antecedent to design

Creativity is foundational to the development of new ideas. Although creativity generates new ideas, many if not most do not result in innovations in the apparel industry. Through the design process, creative efforts can be turned into ideas that can be operationalized through a firm’s capabilities. Thus, creativity and the creative process require managing so that it does not result in greater costs than benefits to the firm (Karan, Terwiesch, and Ulrich 2010; Perry-Smith and Mannucci 2017).

The design process can be thought of as an entrepreneurial strategy. It has been suggested that this aspect of entrepreneurial strategy can be approached in one of three ways: by offering a new perspective or interpretation of an existing design (Fort-Rioche and Ackermann 2013), by exploring a dominant design out of a need for new market alternatives (Brem, Nylund, and Schuster 2016), or by starting with consumer insight (e.g., asking consumers what they like and do not like about a product) (Price and Wrigley 2016). Innovation is generated by creative ideas, and in the apparel industry, creativity is filtered through the design process (Wang and Yang 2014).

Managing creativity plays a significant role in improving firm performance through innovation (Liedtka 2015). That is, producing countless creative ideas offers little benefit unless the process is managed in a way that results in value for the firm (Cohendet and Simon 2015; Danskin et al. 2005; Meutia and Ismail 2015).

Bonvillian (2017, p. 15) makes this same point, but applies it to many industries in the manufacturing sector besides apparel “that still require a close connection between research [that is, creativity], design, and production.” In such industries as aerospace products, energy equipment, and pharmaceuticals,

... production and R&D/design are the yin and yang of innovation. Here, the production infrastructure provides constant feedback to the R&D/design infrastructure. Product design and innovation is most efficient when tied to a close understanding and linkage to manufacturing processes.

According to Garel (2015, p. 34), “innovation requires knowledge and creativity.” A variety of knowledge sources are important, including those that are internal and external to the firm (Vila and Kuster 2007). Del-Corte-Lora et al. (2016) posit that firms with greater creative capacity generally have a wider range of knowledge sources from which they draw. Apparel firms should thus extend their knowledge networks to increase creative capacity and in turn, to profit from their innovations (Walter, Kartsounis, and Carosio 2009). One way to do this is through education. College graduates might be able to improve an apparel firm’s innovation performance provided they developed skills to do so during their degree programs. Gaps in students’ creativity and innovation skills might be addressed through design education, specifically related to developing problem solving abilities, communication skills, and commercial understanding (Doloswala et al. 2013, p. 418).

Design as antecedent to innovation

Entrepreneurship and innovation performance have been investigated relative to the fashion industry. Higher levels of innovation intelligence or capacity offer a competitive edge among entrepreneurs within the fashion industry (Ünaya and Zehirb 2012). As Ünaya and Zehirb (2012, p. 315) write:

The fashion industry provides numerous examples of individuals who are simultaneously inventors, owners and managers of fashion business firms.

Given the importance of creativity to innovation, expertise in managing creativity and the design process can be considered components equally important to a firm's innovation capacity (Ward, Runcie, and Morris 2009).

Based on the literature, there are at least six types of design-induced innovations that are pertinent to the apparel industry: product-driven innovation, process-driven innovation, technology-driven innovation, culture-driven innovation, brand-driven innovation, and consumer-driven innovation. We recognize that these types of innovations can also be R&D induced; however, when examined relative to the apparel industry, each points to the importance of creativity as an antecedent to innovation. Although crossover can occur between one or more types, we discuss each of these individually below.

Product-driven innovation

Apparel firms tend to rely on creativity and the design process to achieve functional and esthetic goals of consumers. Textile innovations can be used as a foundation for either goal, but are primarily approached from a functional perspective. For example, performance fabrics are widely used in activewear, necessitating innovation in fiber and fabrics to achieve functional demands (e.g., moisture wicking for sweat, stretch capabilities). However, sometimes, functional demands merge with esthetic, as in the recent trend in athleisure, where performance (yoga) apparel crossed over into everyday wear for women, necessitating innovation in style through creative design (Liao and Lee 2010; McCurry 2008; Monget 2014).

Small firms can differentiate their products through design. An innovative design is a competitive advantage in the apparel industry (Landoni, Dell'Era, Ferraloro, Peradotto, Karlsson, and Vergant 2016). Innovations in fibers and fabrics allow designers to create novel products with new properties (e.g., performance fabrics) or new silhouettes (e.g., stretch wool suiting fabrics allow for a narrower silhouette) (Baker 2005; Szymdke 2014).

Process-driven innovation

Creativity is important to the process of producing apparel, and that process generally tends to be intertwined with technological advancements pertinent to engineering and manufacturing (Hauser 2015). Technology has allowed for innovation in the process of designing apparel. Specific processes to emerge include customization and personalization, to self-design (Seybold 2007). Such offerings permit firms to achieve consumer satisfaction with the design of the product as well as to meet the consumer's expectations of novelty through innovation (Liao and Lee 2010). Co-design, or co-creation, is another type of design that involves the consumer and that can be directed to a product (custom shoes) or a business process (customer input and response leading to a change in return policies) (Fernandes and Remelhe 2016). Innovations in technology allow for altering the production process to introduce elements of the consumers' creativity through co-design (e.g., Vans shoes allow the consumer to select from a variety of design options to put together a unique shoe) and mass customization (products that are slightly customized). Innovations in technology also enhance the concept of fast fashion; firms like Zara (Spain) have proven that a supply chain that is closer to home is better for meeting consumer needs more quickly (Doeringer and Crean 2006).

Technology-driven innovation

Technology is what often helps creative ideas to ultimately be implemented into product innovations. Technology can prompt both functional and esthetic innovations in apparel products. Designers may be inspired by technology to create novel designs, and it can help expand the scope of a designer's thinking (Ng and Zhou 2009). Technology-driven innovation also fosters the idea of the "technology push and market pull" philosophy of innovation (Cantarello et al. 2011), be it undertaken individually by firms or collaboratively among firms (Ferguson 2015; Nike Vision spring 2016).

Innovations can occur at the level of the fiber, the fabric, or the finish (Colombi 2012; Hauser 2015). When used in apparel products, these fabrics enhance the innovativeness of a product of typical versus novel design (e.g., stretch denim jeans). Fit and performance considerations of apparel can also be addressed through innovations in technology (e.g., 3D fit avatars, Nike 3D printing) (Gerber bringing the latest innovations 2017).

Culture-driven innovation

Bertola et al. (2016) were among the first to recognize that innovation in the apparel industry can also emerge through the meanings that are ascribed to apparel. That is, as a "culture intensive industry" innovation can be shaped by cultural symbols associated with apparel, and particularly brands. New cultural environments can also drive product innovation as found in the study by Dell-Era and Verganti (2009) on a designer's background as related to a firm's innovation performance in the Italian furniture industry. The authors found that the cultural diversity or background of a designer can have a positive impact on the development of innovative products, which in turn, increases a firm's innovation capability. Thus, collaboration with international designers is recommended for creative industries, including apparel.

Brand-driven innovation

Design plays a role in brand innovation as it allows brands to develop unique products and services in the marketplace (Abbing and Gessel 2008; Fort-Rioche and Ackermann 2013). Typically in apparel, brand innovation occurs through the product (e.g., Ralph Lauren started out his career in the late 1960s by offering a wider tie to go with the wide lapels on men's suits during the period, and then later, the brand achieved recognition by placing the embroidered logo design prominently on the front of the shirt). But, it can also occur through the marketing of the brand image (e.g., UnderArmour as an innovative performance brand).

Consumer-driven innovation

Related to product-, process-, and technology-driven innovation as outlined above, consumer insight can be useful to both the supply and demand sides of apparel. This application ranges from providing ideas for product innovations and expressing product-related needs or problems to be solved, to offering insight and suggestions during the actual design process (co-design) (Rayport 2007; Wilson 2006).

Consumers' apparel needs can be addressed through innovative product designs as well as innovative approaches to brand management. Consumers can provide insight into how design can be used to solve problems such as apparel fit, as well as insight into new styles and consumer relationships with brands. Apparel firms must maintain consumer enthusiasm and engagement with their brands or else the brands (and the firms) become irrelevant (Greig 1990). Innovations in retail, particularly related to service, can also help address consumer needs (e.g., same day shipping, free returns for products purchased online, apparel product rental versus purchase) (Landoni et al. 2016).

Discussion and implications for future research

While our paper adds to the “Main Street” entrepreneurship literature through its specific focus on the apparel industry, our paper also bridges the “Main Street” literature with an important segment of the broader literature on innovation and economic performance. While much of the early research, at least in the economics literature, focused on knowledge as an exogenous force influencing innovation and thus economic performance, the knowledge production function literature, introduced by Griliches (1979), linked the innovative activity of firms to endogenous knowledge inputs such as R&D and human capital.

A significant portion of the extant literature focused on entrepreneurial innovations is based on a “Silicon Valley” view of the processes that result in innovations. That body of literature implicitly assumes that the entrepreneur, or his/her firm, either invests in R&D or adopts others R&D-based technologies as a strategy for developing and bringing innovations to market. It is therefore not surprising that related public policies emphasize incentives for additional endogenous investments in R&D by firms.

However, as we have reviewed in this paper, there are important industries that do not follow the “Silicon Valley” approach to innovation; rather, they follow a “Main Street” approach. Here, we have identified the apparel industry as one such industry, and we have reviewed what literature there is to illustrate the creativity → design → innovation paradigm. By so identifying the apparel industry in this way, we have emphasized the role of human capital, in addition to R&D, as an endogenous input to innovation. Human capital results from both the entrepreneur's experiences as well as from his/her creative spirit. This is true not only for apparel entrepreneurs but also for all entrepreneurs. Audretsch and Link (forthcoming, p. 8–3) write:

[T]he intellectual breakthrough, for both scholars, including economists, as well as thought leaders in management and policy, was a new focus on knowledge-based entrepreneurship as shaping the performance at virtually every level of the economy, ranging from individuals to firms and industries, and to cities, states and entire regions and nations.

Future research that seeks to understand the innovation process might therefore look toward “Main Street” paradigms to glean the subtleties that also fall under the rubric of entrepreneurial action, and might realize that the innovation process is, as in the apparel industry, heterogeneous in both antecedents and performance consequences.

Despite the importance of innovation to success in the apparel industry, few studies examine creativity, design, and innovation specific to this industry. Empirical research is needed that investigates the key innovation drivers and strategies used to manage creativity that are most prevalent in the apparel industry. Also needed are analyses of trends in creativity and the design process in the apparel industry over time, as well as how the role of creativity and the design process in the apparel industry may differ from that of other industries. Exploration of the role of creativity in evaluating innovation performance among apparel firms is also suggested by this review of the literature.

To parallel the policy research that is attendant to “Silicon Valley” innovation, we discovered that very little research has been done on public policies in the USA that offer support for understanding and encouraging creativity and the design process as antecedents to entrepreneurial innovation. Support for design through national, regional, or local centers that provide entrepreneurs education in commercializing creative ideas and the design process through innovation is one option that has yet to be fully considered at the policy level. Such policies could help to foster the burgeoning cottage apparel industry that has emerged in the USA with the advent of the Internet. And, it could help to make a “renaissance” in the US apparel industry a reality.

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