Innovation, entrepreneurship and textiles

A Blanton Godfrey¹ and S Pourmojib²
¹Joseph D. Moore Distinguished University Professor, North Carolina State University, College of Textiles, Textile and Apparel, Technology and Management Department, 1020 Main Campus Drive, Raleigh, North Carolina, 27526, United States of America
²Ph.D. Candidate, North Carolina State University, College of Textiles, Textile and Apparel, Technology and Management Department, 1020 Main Campus Drive, Raleigh, North Carolina, 27526, United States of America

E-mail: blanton_godfrey@ncsu.edu

Abstract. Innovation and entrepreneurship have become increasingly important parts of economic development in almost every country, region, and community. In this research we investigate the reasons people become entrepreneurs in the textile and apparel industries and compare entrepreneurship in these industries with other industries looking also at the success factors for start up companies. During our research we found many disrupters, people entering the textile and apparel industries from outside often having no prior experience in textiles or apparel. We also investigate the impact of government intervention on entrepreneurship. In recognition of the large economic impact entrepreneurial companies have on economic development and job growth, almost all federal governments, regional governments, and community governments have created support for innovation and entrepreneurship.

1. Introduction
Almost every country, region, and community now have innovation and entrepreneurship as a priority [1]. In the U.S. between one-third to one-half of economic growth can be attributed to innovation. There are national and world innovation indices, conferences on innovation and entrepreneurship, and numerous articles about the importance of innovation and entrepreneurship in driving economic development [2]. Although innovation and entrepreneurship have been studied extensively, very little research has focused on the textiles and apparel industry. The few published articles on innovation and entrepreneurship in the textiles and apparel industry have not elucidated differences with other industries that have been far more extensively studied.

There are many definitions of innovation. In our work we have used a modified definition first proposed by Mervin Kelly of Bell Labs in the early 1920s. Innovation is a fundamental breakthrough in science and/or technology, followed by a reduction to practice, followed by a practical and economical means to produce the innovations in products or services, followed by a widespread acceptance in the marketplace of the products or services [3] and [4]. There are also many definitions of entrepreneurship with many of the older definitions focused on the desire to produce a product to make a profit. We find that newer definitions that include goods, services, raw materials, and organizing methods fit our findings better [5]. Definitions that include social entrepreneurship and including pursuing opportunities without regard to resources that the entrepreneur controls also seem to fit current entrepreneurship better [6]. Our working definition for our research thus includes the creation of any business, for profit or for common good, without regard to resources under the entrepreneur’s control, in order to seize a new opportunity for needed or wanted products, services,
materials or business models. What we found in our research is a willingness to identify opportunities made possible by new technologies to create entirely new business models. In the past, many fortunes were made in textiles and apparel by sourcing globally and selling locally. An easy example of this is the growth of enormous department store chains such as Macy’s, Target or Wal-Mart in the U.S. Many new textile and apparel companies are turning this totally around and producing locally and selling globally using the Internet and existing package delivery services such as FedEx and UPS as their distribution channels. We find other entrepreneurs putting together app technologies with sensors, LEDs, new fibres, fabrics, and materials to create innovative products and services.

2. Basic Research Questions
There are three major research questions that are our primary focus. What are the critical success factors for entrepreneurial companies? What are the major disruptions driving innovation and entrepreneurship today? What is the impact of government interventions in stimulating innovation and entrepreneurship? For each of these basic questions, we are focusing our research on the textile and apparel industries.

Are the success factors for textile and apparel companies the same as for companies in other industries? Are the success factors the same for apparel companies as they are for textile companies?

What are the major disruptive factors driving innovation and entrepreneurship in textile and apparel companies? What are the major factors underlying these disruptions? Who are the primary players in creating successful, start-up entrepreneurial companies in the textile and apparel industries?

How are government interventions changing the landscape of textile and apparel innovations and entrepreneurship? What is the impact of these government interventions in stimulating innovation and entrepreneurship in the textile and apparel industries? How can we measure the impact of these interventions?

3. Research Methodology
In addition to reviewing the existing literature on the basic research questions described below, we are basing many of our preliminary conclusions on our review of personal interviews of over 400 entrepreneurs conducted by our colleagues, in-depth studies of over 50 textile and apparel entrepreneurs, and data collected by our state government of over 400 other entrepreneurial start-up companies in North Carolina. Our research is U.S. focused and for the most part, North Carolina focused. In the future we plan to compare our findings with similar research in other countries.

In this paper we describe the success factors that have been mentioned by the entrepreneurs in our review of the interviews. We have supplemented our personal reviews by using Nvivo, a qualitative data analysis package, to identify success factor frequency in our data set of personal interviews. We are testing our preliminary findings and conclusions through personal in-depth case studies with a smaller number of successful start-up companies in North Carolina. Some of these companies are quite new but have already created strong economic gains for their regions with several hundred new jobs. Others are just beginning to grow and build local, national and international markets.

4. Literature Review
In addition to our findings based on our primary sources, we have conducted a review of the literature on entrepreneurship. Research in this field has received much attention in recent years. Qualitative research is the most popular method used in the field and is based on surveys, interviews and case studies.

On entrepreneurship definition, Gartner [7] used Delphi method to construct a series of three questions to produce definitions of entrepreneurship. In conclusion, the author indicates that the definition of entrepreneurship has yet to emerge [7]. There are many definitions of entrepreneurship in the literature, Kirzner defines entrepreneurship as a mechanism to discover and reduce inefficiencies in the economy [8]. In another study based on collective theory, Shane and Venkataraman introduce a framework to study entrepreneurship. In this article, entrepreneurship is defined as a mechanism by
which society converts technical information into products and services. The authors also claim that entrepreneurship in a capitalist society is a main engine of innovation. The field of entrepreneurship is defined as the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services and discovered, evaluated, and exploited [9].

Most studies about disruptive change and disruptors in the entrepreneurial world have been conducted in the last decade. Christensen, Cook and Hall discuss the challenges of disruptive change. They argue that you build a brand by “attaching the customer to products” that mean something to them. They discuss how to create these products and finally, they describe how new, valuable brands can be built to truly deliver sustained, profitable growth [10]. Later, Baron discusses behavioral and cognitive factors in several key behaviors of entrepreneurs by reviewing entrepreneurial theory and investigating the context [11]. Dyer, Gregersen, and Christensen develop a theory using exploratory interviews and active experimentation, that innovative entrepreneurs differ from executives on four behavioral patterns through which they acquire information: (1) questioning; (2) observing; (3) experimenting; and (4) idea networking [12].

Chandra and Yang developed a theoretical framework by deep study and literature survey using content analyzing tools, which explains disruptive innovation as a co-evolutionary entrepreneurial process at the firm, product, and customer level. This framework offers a set of testable propositions to advance theory and practice in the field [13]. Another qualitative study is about understanding of both disruptive innovation and the nature of opportunity generation [14]. An innovation becomes disruptive when the basic opportunity has a certain demand [15]. The importance of innovation, data mining in innovation, and also why and how customers need the product are discussed in this article [16]. Christensen and Overdorff define disruptive innovation in its core, which is about competitive responses to innovation [17].

There are few entrepreneurial studies in the literature focused on the textile and apparel industry. Yusuf determines the South Pacific entrepreneur’s critical success factors for small businesses. He concluded that both individual factors (such as having a certain skills and good character) and environmental factors (such as government support, political and traditional demands, and the need for balancing these demands with business commitments) are critical to small business success [18]. Hardill and Wynarczyk inspect the relationship between technology, entrepreneurial human capital, and company performance in a sample of textile and clothing SMEs in Great Britain [19]. Their findings are based on computer network usage in 1996. Yu discusses success factors of Hong Kong entrepreneurs in the textile and garment industry [20]. This study suggests that Hong Kong’s industrial vitality mainly depends on a large number of adaptive entrepreneurs who are continuously aware of opportunities, keep a high degree of flexibility in their production, and embrace change rapidly. Based on this research the textile and garment industry firms in Hong Kong survived by pursuing a product imitation strategy, operating at a small-scale, extensively utilizing subcontracting networks, producing customer label garments as well as performing 3-D arbitrageurship [20].

5. Our Findings
The reasons people become entrepreneurs seem to be similar across all industries. The success factors are also similar. True passion seems to be a universal success factors. Many of the entrepreneurs in our interviews just want to get their idea into the marketplace successfully no matter what it takes in hours per day, days per week or even years. Whether their original intent is to make money, to provide job independence for themselves, to create employment for the people in their community, or to turn their idea into a practical business, these entrepreneurs have a true passion for what they are doing.

The differences we find between companies in the textile and apparel industries and other industries appear to be far more due to the costs of creating a business and the existing regulatory environment. For example, start up companies in the medical device industry require considerable capital for laboratory space and equipment and even more for the animal and clinical trials required for regulatory approval before entering the market. On a smaller scale, starting a textile company versus an apparel company often also involves far more capital. We have found successful apparel companies
starting with only a few hundred dollars of person investment being able to use existing resources and equipment, go “viral” on the Internet, and grow quickly investing revenues into the business as it expands. We have also discovered three major shifts in textile and apparel entrepreneurship. In the past, many textile and apparel companies, especially in retail, became successful importing globally and selling locally. The Internet seems to be flipping this completely. New companies are manufacturing locally and selling globally.

There have been many studies about disruptions in almost every industry. For many years existing, often family-owned, textile and apparel companies expanded internally or by acquisition of other companies. Today, outsiders – disrupters – are creating many of the new, rapidly expanding textile and apparel companies. We find that disruption is a major factor in entrepreneurial textile and apparel entrepreneurship. Many of the new, successful companies are being created by people far outside the textile and apparel industry, many of these people having absolutely no prior experience or even education in textiles and apparel. How textiles and apparel are sold is changing rapidly. In the first week of 2017, Macy’s, one of the leading retailers announced it was closing 100 stores, and Sears, another icon of American retail, announced it was closing over 150 stores. The 2016 holiday season Internet sales were up 17%, but both of these major retailers had disappointing sales in their stores.

Another type of disruptions are created by people with existing brands capitalizing on these “brands” or name recognition to enter the textile and apparel markets. Historically, textile and apparel companies spent many years building a brand and brand loyalty [21]. These new entrepreneurs have created their name recognition through cinema, television, books, sports, music or even as a swimsuit model to build large textile and apparel businesses. Kathy Ireland’s home furnishings offerings are now an over two billion dollar business. Martha Stewart has parlayed her catering business, books, and TV shows into home products revenues of over a billion dollars. Venus Williams spent over eleven years getting her fashion and textile degree part time during an extremely long and successful tennis career to build her athletic wear apparel line.

The question of whether government interventions are having an impact can be answered with a resounding yes. Our review of over 300 companies supported by federal grants and matching state funds shows clearly that for many entrepreneurial companies these funds were absolutely critical for their success. In the U.S., the federal government created the Small Business Innovation Research (SBIR) program in 1982 with the purpose of strengthening the role of innovative small business concerns in Federally-funded research and development [22]. The last data available indicates over 112,500 awards have been made totalling more than $26.9 billion. The State of North Carolina provides partial matching grants to companies receiving SBIRs that provide further funding for turning these research ideas into viable businesses. In addition to the SBIR program, the U.S. government also created the Small Business Technology Transfer (STTR) program in 1992 to facilitate the transfer of technology developed by a research institution through the entrepreneurship of a small business concern. Many communities in the U.S. have created entrepreneur spaces (incubators) to further facilitate the creation of new companies. In North Carolina over 300 start-up companies have space in American Underground in Durham, over 70 are in the Innovation Quarter in Winston-Salem, and more than 50 in American Underground and Raleigh HQ in Raleigh.

At the national level in the U.S. the best-known program is the National Network for Manufacturing Innovation now known as Manufacturing USA [23]. The National Manufacturing Innovation Institutes (NMIMI) are a collection of nine industry-academic partnerships focused on key technologies for the near future bringing together significant federal and industry funding supporting research, development and commercialization of new technologies to rebuild the manufacturing base of the country. While the goals are far broader than supporting entrepreneurs, many believe that the technologies coming out of these institutes will form the backbone of new entrepreneurial activities for many years to come. In the textile and apparel world, the most relevant of these institutes is the Advanced Functional Fabrics of America (AFFOA) led by the Massachusetts Institute of Technology. AFFOA’s mission is to enable a manufacturing-based revolution by transforming traditional fibres, yarns, and fabrics into highly sophisticated, integrated and networked devices and systems [23].
state level there are also many programs led by many different entities. For example, in our state the North Carolina Board of Science, Technology and Innovation produces a tracking innovation report [24], develops policies and methods to support entrepreneurial growth, and administers the state’s One North Carolina Fund providing matching funds for entrepreneurial start-up companies. The state of Rhode Island voters recently approved borrowing $45.5 million to finish building a new engineering school at the University of Rhode Island and to fund a new innovation campus. This new affiliated innovation campus will pair cutting edge research with private sector investments to create the jobs of the future [25]. Understanding how to measure the impact of these programs is part of our continuing research.

Entrepreneurs need far more than space, funding and friendly networks. They need a variety of support services. Many universities are moving quickly to provide academic courses, consulting services, laboratory space, and professional networks providing in-depth workshops on critical issues. For example, North Carolina State University has a Learning and Living Village for entrepreneurs, a “Garage” open 24/7 with well-equipped labs, and a number of special events supporting student and other entrepreneurs. Other universities have created similar programs. The Winston-Salem Innovation Quarter brings together over 7,000 students from six universities with more than 3,000 employees from 70 entrepreneurial companies [26].

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