

**BLACK AMERICANS PAST AND PRESENT CREATED FRUGAL
INNOVATIONS AND EMBRACED CIRCULAR ECONOMY PRINCIPLES:
THE MARKETING DILEMMA**

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ABSTRACT

Frugal innovation is the practice whereby the rich learns from innovations developed in poor countries, and there is purportedly a current rivalry between India and China in the frugal innovation arena. This research advocates that the concept of frugal innovation did not originate in Asia or India. The practice of the rich taking the poor's innovations is not new. In particular, Black American slaves and freed slaves developed a number of inventions in poverty conditions. It is imperative that frugal innovation research be more historically accurate so as to reduce the marginalization of contributions developed by poor innovators and to increase the more widespread embrace of circular economy principles. If a poor innovator resides in a rich country, then that innovator should not be excluded from the frugal innovator category if frugality was indeed used to innovate.

Keywords: intellectual property, black inventors, African American inventors, frugal innovations, circular economy, technology commercialization, research and development, technology development, entrepreneurship

INTRODUCTION

"And when one considers the enormous part played by American inventors in the economic, industrial and financial development of our country, it became a matter of importance to ascertain what share in this great work is done by the American Negro. The average American seems not to know - Not knowing it, he does not believe it, and not believing it he easily advances to the mental attitude of being ready to assert that the Negro has done absolutely nothing worthwhile in the field of invention."

- Henry E. Baker

Assistant Examiner, US Patent and Trademark Office (Baker, 1917)

Several definitions of frugal innovation have been published. Such definitions include the use of local resources to develop and deliver affordable, functional technological products that provide value

(Chakrabarti, 2014, Prabhu, 2017). Frugal innovation involves innovating cost effectively and quickly under severe resource constraints with local resources in an affordable way (Chakrabarti, 2014, McNicoll, 2014, Radjou, 2012). Frugal innovation is not merely a representation of the Indian concept of Jugaad which is focused on makeshift, short term problem solutions. Instead, it is focused on innovating with efficiency, low cost, safety standards and quality standards (Chakrabarti, 2014). Add to this the tall order of sustainability which includes profitability, the support of environmental aims, and the social benefits such as affordability (Rao, 2013, Chakrabarti, 2014, Wohlfart, 2016).

Frugal innovations strip away complexity, are simple changes that improve stakeholders' experiences, deliver great value at low costs, and can help companies generate new revenues (Hemsley, 2016). Frugal innovations make use of reduced amounts of materials, repurpose, reuse and are cheaper (McNicoll, 2014). Frugal innovations are products and services created by local innovators adopted to the needs of their local population (Lehner, 2016). Further, frugal innovations apply human ingenuity, create faster solutions, create better solutions, create cheaper solutions, and are scalable (Prabhu, 2017). Frugal innovations require little financial investments (Prabhu, 2017, Hemsley, 2016). Researchers have acknowledged that while frugal innovations are usually associated with emerging countries including India and China, it is not a new phenomenon because companies in Silicon Valley and Santa Clara University's Frugal Engineering Innovation Lab has been innovating frugally as well (Wohlfart, 2016). Yet, these researchers do not go far enough back in American history. To Other researchers have recognized that in times of craftsmanship and hand production before the industrial revolution, material waste was unknown (Strasser, 2000, Lieder, 2016). This research study provides examples of frugal innovations found in India and in Kenya. It compares these innovations to innovations developed by Black American inventors. It is argued that Black inventors during slavery and the reconstruction period post-slavery were indeed frugal innovators. Further, these frugal innovators also embraced circular economy principles. The current scholarly emphasis on frugal innovations originating in India and Asia is harmful because perhaps much can be gained in achieving the mainstream implementation of circular economy principles if more diverse populations were studied.

EXAMPLES OF FRUGAL INNOVATIONS IN DEVELOPING COUNTRIES

There are numerous examples of frugal innovations in India and China. Ways to improve the efficiency of the frugal innovation product development process have been published. The goal is to find ways to transfer and accelerate the development of frugal innovations perhaps in a cookie cutter manner (Lehner, 2016, Rao, 2013). For instance, a systematic problem solution pattern approach has

been developed (Lehner, 2016). The goal is to find ways to transfer and accelerate the development of frugal innovations perhaps in a cookie cutter manner.

Examples of frugal innovations in India are provided in Table 1. While some of these innovations have improved the lives of their frugal innovators, some have not. For example, Mohamed Saidullah, the inventor of a floating bicycle still lives in poverty (McNicoll, 2014). Looking to frugal innovations to eradicate rural poverty is being researched. In fact, since one percent of the world's population holds more than 35% of the wealth, it has been advocated that frugal innovations may be the key to eradicating economic inequality (Prabhu, 2017).

Frugal Innovator	Frugal Innovation	Source
Tata Chemical	No power drinking water filter Low cost of \$0.65 for a family of five	(Caploe, 2010)
India Institute of Technology	Laptop Low cost of \$35	
Ayas Shilpa	Suspension bridge Low cost of 1/10 conventional price	
Muruganatham	Sanitary napkins Low cost	
	Waterwheel carries 50 liters of water; low cost \$25-30 at 1/3 conventional price	
Prajapati	Miticool Fridge made of clay that cools food up to 5 days with no electricity	(McNicoll, 2014)
Bharti Airtel	Mobile phone calls; low cost	
Mohammad Saidullah	Award winning floating bike	
M-Pesa	Service enables unbanked people to send and receive money through mobile phones	(Prabhu, 2017)

HISTORY OF BLACK FRUGAL INNOVATIONS IN NORTHERN AMERICA

Although American history lessons teach that Eli Whitney invented the cotton gin, some historians believe that a slave named Sam invented this combing device to alleviate the harsh laborious conditions associated with removing seeds from picked cotton. In addition, the slave named Ned of inventor Oscar J.E. Stuart developed the innovative double plow (Aoki, 2007, Yancy, 1984). In 1858, the United States Attorney General confirmed a court decision refusing to grant patents to slaves' inventions to the slaves or their slave owners. Yet, when the slaves Isaiah and Ben Montgomery invented a boat propeller, their slave owner recommended to the United States Congress an amendment to the patent law to allow the slave owner to receive patents for inventions by slaves

(Baker, 1917). Although America's poor Black slaves were not allowed to file for patent protection, many poor white inventors between 1739 and 1819 were able to achieve wealth and recognition with patented inventions (Aoki, 2007).

Blacks were impoverished during slavery and during the reconstruction period when slaves were emancipated. They had no choice but to be frugal when engineering and inventing solutions to problems that they faced in harsh work conditions. The Black American southern Norbert Rillieux invented a way to refine sugar by developing a vacuum pan in 1846 in Louisiana. James Forten invented a better way to handle sails on sail boats in 1842.

In 1853, Jan Matzeliger developed a way to hold shoes on their lasts, grip and pull the leather down to the heel of the shoe, and drive in nails (Kaplan, 1955, Baker, 1917). This invention was bought by the United Shoe Machinery Company and reduced the cost of making shoes by more than fifty percent. This certainly meets the definition of frugal innovation. It resulted in increased worker wages, decreased worker hours, improved factory conditions and made the President of the United Shoe Machinery Company a multi-millionaire (Baker, 1917).

American slavery persisted between 1619-1865. The American Civil War over whether or not to continue the institution of slavery in American was from 1861-1865 (Williams, 2004). From the beginning, the titans of industry looked to Black ex-slaves for a source of labor and assistance. Interestingly, when slavery ended, 4.4 Million freed slaves needed to be educated. The titans of industry provided charity to Historically Black Colleges and Universities because they wanted a say in how the former slave laborers would be educated since they had a continued need for this labor force (Hamilton, 2016). The industrial titans included, but were not limited to:

- Investor George Peabody (1867 Peabody Fund),
- Textile tycoon John Slater (1882 Slater Fund),
- John D. Rockefeller (1902-1964 General Education Board (GEB) for rural schools and the modernization of farming),
- Sewing machine tycoon Thomas White, and
- Sears Roebuck's Julius Rosenwald (Williams, 2004).

Elijah McCoy invented a way to hold lubricant for locomotive trains with a novel cup in 1872. Granville T. Woods invented the steam boiler furnace and air brakes in 1884 and 1902. Purvis invented a method of making paper bags; A.P. Albert invented a cotton picking machine; Andrew Hilyer invented the hot air register; Andrew Washington invented the shoe horn; and Joseph Lee invented a dough kneading machine (Baker, 1917).

In an 1894 speech before Congress, the United State House of Representative member George Washington Murray read the names of 92 southern American Black inventors who contributed to

America's southern economic and technological progress. The list of 92 inventors came from a Black man, the United States Patent and Trademark Office's Assistant Patent Examiner Henry E. Baker's research (Sinclair, 2004). All of these innovations were developed under resource constraints. There were common instances of financial hardships as part of the hard challenge Black Americans faced to earn livings. It was particularly hard given the amount of time it takes to secure patents. Many of the Black inventors did not get any reward for their inventive genius (Baker, 1917).

Given that the contributions of Black inventors has been well researched and documented (Ives, 1987, Jenkins, 1996, Sullivan, 1998, Williams, 1978); and the claims that frugal innovations were newly discovered in 2006 by Ghosn with observations of frugal engineering in India (Chakrabarti, 2014) is historically problematic. Frugal innovations clearly go back to the period of slavery and reconstruction in America and perhaps even earlier in history.

Renault-Nissan has developed electronic cars and low cost vehicles using frugal engineering observed among India's frugal innovators (Radjou, 2012, Radjou, 2015). General Electric and Tata Sons are also multi-national companies producing low cost products by harnessing frugal innovations. For 12 years, Professor Anil Gupta's Honey Bee Network has searched rural India for frugal innovators and inventions to commercialize (McNicoll, 2014). During slavery and the post-slavery period of reconstruction, American slave owners and factory owners did the same. As aforementioned, an example is the use and commercialization of the Black inventor Jan Matzlinger's frugal shoe lasting device.

Although many of the Black frugal innovators were not called entrepreneurs or known for having so-called startups, through necessity they worked to exploit limited resources and create new market opportunities. They did so in a manner which is closely aligned with the proposed *Autotelic Capabilities Framework* (Karagouni, 2013). This framework has the three (3) dimensions of bricolage, improvisational and transcendental capabilities. The bricolage capability helped the Black American frugal innovators to successfully tap their competence and knowledge, re-employ, reframe and recombine creatively. The improvisational capability is the ability to repeatedly rework initial concepts until a venture was launched. The transcendental capability of Black American frugal innovators helped them recognize and analyze their limited material resources; and tap into their knowledge and technical abilities. In some instances, entrepreneurial results were achieved. But often, the Black American frugal innovators were merely striving to make their strenuous workloads lighter.

BLACK AMERICAN FRUGAL INNOVATORS EMBRACE CIRCULAR ECONOMY PRINCIPLES

A circular economy embraces material and product reduced use, reuse, recycling, redesign, remanufacture, and the repair of old goods. There are three (3) specific principles advocated in the Ellen MacArthur Foundation's Outline of a Circular Economy which include:

1. Preserving and enhancing natural resources by controlling and balancing the stocks of renewable resource flows through regeneration, virtualization and exchange;
2. Optimizing resource yields by circulating and optimizing the use of products, components and materials to regenerate, share, and creating a close loop economy; and
3. Revealing and designing-out negative externalities to foster system effectiveness (Ellen MacArthur Foundation)

These practices close the loop in industrial ecosystems and minimize waste (Stahel, 2016, Winans, 2017). Certain features of the circular economy principles such as the more efficient use of resources, combined with waste prevention and regional job creation were introduced by Stahel and Reday in 1976 (Stahel, 1981, Geissdoerfer, 2017). These principles were popularized in China in the 1990s (Winans, 2017). Over the past 12 years, the United States, China and South Korea have been researching reuse and remanufacturing. In addition, since 2010, the Ellen MacArthur Foundation has researched and advocated for the implementation of a circular economy. Further, since 2015, the European Parliament has been researching the topic.

Although there has been a lot of activity in recent years, again, Black American frugal innovators have embraced material and product reduced use, reuse, recycling, redesign, remanufacture, and the repair of old goods for hundreds of years. They had limited resources that they coveted and saved. They strived to save energy and their contributions created jobs. While some believe that the implementation of the circular economy idea is purportedly 'slow to gain traction' (Stahel, 2016), others believe that at least the term *circular economy* is gaining traction among academia, industry, and policymakers (Geissdoerfer, 2017). Most authors that have researched the circular economy principles focus on environmental performance related to resource inputs, waste and emission outputs, rather than a holistic view of sustainability (Geissdoerfer, 2017). Yet, perhaps researchers are not looking in the right places to find frugal innovators like those among Black Americans that have embraced circular economy principles for hundreds of years out of poverty conditions, necessity, scarcity and as part of their cultural identity.

The purported slow widespread, mainstream embrace of the circular economy idea is due to fear and unfamiliarity of embracing product reduced use, reuse, recycling, redesign, remanufacture, and the repair through socialization (Stahel, 2016). This is because the American economy is incredibly

focused on the linear supply chains and economies of product manufacturer, use and disposal. This is an imperfect economic framework which fosters a lack of corporate accountability. With regard to sustainability, the lack of corporate accountability does not adequately respond to societal ecological issues and economic issues such as poverty (Mohammed, 2013). In our resource constrained world, accountability needs to be to all stakeholders, not just shareholders. Corporations need to become more like truly 'social businesses' that recognize their important role in providing potential solutions for sustainability (Mohammed, 2013). Herein, it is argued that researchers of frugal innovations and advocates of the circular economy idea need to broaden their search for examples well beyond India and China. The study of Black American and other culturally diverse frugal innovators past and present can be a way to find potential solutions.

This more inclusive approach is related to the notion of *inclusive development* which advocates going beyond applications of the social pro-poor theory, and embracing social, ecological and relational theories that inclusive development can build on (Gupta, 2017). The pro-poor theory advocates that enhanced human wellbeing can be achieved if poor people are empowered to establish their own priorities with a human rights-based approach. Circular economy principles and frugal innovation practices are examples of ecological theories and approaches supportive of inclusive development (Gupta, 2017).

Reused, recycled, redesigned, remanufactured, and repaired goods are viewed as lacking quality. New, brand products are viewed as having better quality. Mainstream Americans are inordinately comfortable with materialism, status symbols and therefore are squeamish when considered circular economy principles (Hood, 2016). Yet, arguably, there is more to this circular economy image problem. In order to make the embrace of circular economy principles mainstream, there needs to be improved green marketing to improve the aforementioned image problem. Moreover, this green marketing will require a closer study of the ecologically conscious consumers (ECCs) market segment (Tilikidou, 2013). The Black American frugal innovators seem to be marginalized and not included in studies of this market segment. There is a limited understanding and incomplete profile of ECCs. This is a problem that needs to be addressed in order for the most appropriate marketing and business communication strategies to be chosen (Tilikidou, 2013).

DISCUSSION OF FINDING

First, there is a need for a closer study of frugal innovators and ways to make frugal innovations more appealing to consumers in a more widespread manner. There has been advocacy toward increasing academic research for ways to implement a circular economy more widespread (Stahel, 2016). Herein, it is recommended that instead of studying large industrial corporations and small to medium size

enterprises, the focus should be on the study of individual consumers' cultural identities. For example, it is hypothesized that individuals such as Black American frugal innovators, both past and present, are frugal and embrace circular economy principles because these principles have been embraced and valued in the Black American culture since slave days and perhaps earlier in Africa. The examples of Black American slaves and freed slaves that were frugal innovators has been provided herein. Examples of present day Black American frugal innovators can be found through grassroots searches and a concentration in academia can be found among emerging research institutions that were established once slaves were freed. There are approximately 100 of these Historically Black Colleges and Universities that are still in existence today. Although many are focused on teaching rather than research and development, there is a growing number of Black inventors that serve as faculty in these institutions (Hamilton, 2016, Hamilton, 2017a, Hamilton, 2017b). In addition, there are other examples among other diverse groups such as Hispanics and American Indians.

Second, there is a need for more widespread marketing of frugal innovations and circular economy principles that showcase a diverse population of frugal innovators. This research advocates that frugal innovators who live in poverty conditions are not limited to just people from India and Asia. The way Black Americans, past and present, and other diverse populations innovate under frugal conditions should be studied much more closely and marketed more readily. The identification, marketing and promotion of diverse populations of frugal innovators and innovations need to be added to the Outline of a Circular Economy promoted by the Ellen MacArthur Foundation as noted in the amended Outline of a Circular Economy System in Figure 1.

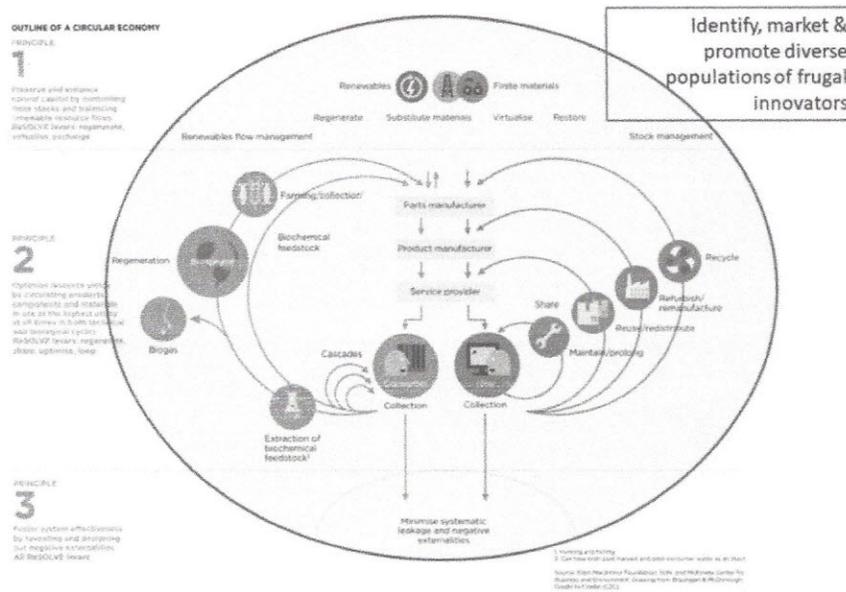


Figure 1. Outline of a Circular Economy System Amended

It is hypothesized herein that improved research and marketing will help these innovations become more popular and more widely embraced. For example, transformational marketing which drives organizational, social and environmental changes can have a more strategic role as an interface between organizations and consumers in sustainability and environmental protection since it requires a study of human behavior and consumption (Baker, 2013). With regard to children’s socialization in consumption, it is particularly important to market circular economy principles and examples of these principles in practice. Since it is established that children can identify brands while watching television and surfing the internet (Carlos Estrela, 2014), circular economy principles and examples of these principles in practice like the Black American frugal innovations should appear in television and internet marketing advertisements.

Further, as these examples of specific value chains, material flows, and frugal product development are identified and aligned with circular economy principles, they need to be introduced into environmental policy. An example of an environmental policy would be to certified frugal innovative products and practices. The certification of sustainably managed timber products in Greece was studied and the capture of green consumers through green marketing was advocated (Papadopoulos, 2010).

CONCLUSION

Frugal innovation is the practice whereby the rich learns from innovations developed in poor countries and there is purportedly a current rivalry between India and China in the frugal innovation

arena. This research advocates that the concept of frugal innovation did not originate in Asia or India. The practice of the rich taking the poor's innovations is not new. In particular, Black American slaves and freed slaves developed a number of frugal inventions in harsh poverty conditions with limited resources. It is imperative that frugal innovation research be more historically accurate so as to reduce the marginalization of contributions developed by poor innovators. If a poor innovator resides in a rich country, then that innovator should not be excluded from the frugal innovator category if frugality was indeed used to innovate.

Further, it is argued that Black American inventors during slavery and the reconstruction period post-slavery were indeed frugal innovators. Further, these frugal innovators also embraced circular economy principles. The current scholarly emphasis on frugal innovations originating in India and Asia is harmful because perhaps much can be gained in achieving the mainstream implementation of circular economy principles if more diverse populations of frugal innovators were identified, studied, marketed and promoted. In addition to recognizing the frugal innovations that are being developed in rural developing countries, it is important to recognize the contributions of Black frugal innovators because doing so may help inspire young people to follow this path. Carrying this torch from generation to generation may bolster the sustainability of the frugal innovation movement.

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