Starting Small but Getting Big: The New Shape of Small and Medium Industries

Olalere Folasayo Enoch and A. Aziz Shuaib

***Abstract*—The global trend is shifting from the mass production era towards small brand and individualism or customized production. With the arrival of this new era (21st century) that revolves around concept development, consumers now demand to be treated individually; and manufacturers need to create the sorts of products that will meet individual wants. Such products don't fit neatly into the mass economics of the old model. Therefore, this transformation in product demand is seen as a potential *loophole* for small and medium industries (SMIs) to compete favorably in the global market. However, most small and medium scale industries are strictly local with less innovation; these make the business hard to grow. Thus, it is important for SMIs to *dream big* in bringing about product experience, and invest more time and efforts in conceptualizing ideas that are suitable; as this will help in making better value judgment. Hence, this paper investigates the new shape of small and medium industries for the 21st century economics. It highlights the *Tri-Sustainable* characteristics needed for 21st century SMIs. Based on this understanding, the paper proposed three basic approaches for SMIs to reinvent their businesses in the new era. With this, small and mediums industries that started small can get big economically and innovatively.**

***Index Terms*—21st century economics, digital and rapid prototyping, product development process, *Tri-Sustainable* characteristics.**

I. Introduction

Small and Medium Industries (SMIs) are important to almost all economies in the world, especially to developing countries and, within that broad category, those with major employment and income distribution challenges. They contribute to output and creation of jobs; for example, in America, small business has always been the largest source of new job [1]. Besides, SMIs are also nursery for the large firms of the future. According to [2], SMIs are, on average a good deal less complicated structurally than are corporations and other large firms.

Most often, small and medium scale industries are cottage firms managed by owner(s) with the assistance of few personnel. According to [3], they play a significant role in alleviating the condition of the common man; by promoting the use of local resources to sustain local productivity that meets the immediate needs of people. They also enhance the technological advancement locally [4], [5].

However, most small and medium scale industries are strictly local with less innovation; these make the business hard to grow. Couple with the shift from the mass economics of the old model to the new era, that revolves around concept development; it is important for the SMIs to *dream big* in bringing about product experience, and invest more time and efforts in conceptualizing ideas that are suitable. With these, small and mediums industries that started small can get big economically and innovatively

II. Tri-Sustainable Characteristics of 21st Century SMIs

Improving productivity has been one of the major economic growths that have developed the world; that is, getting more output per worker. However, even though productivity is increasing, manufacturing no longer creates net new jobs. This is due partly to automation and global competition that drives out smaller factories [1]. Thus, for small and medium industries to thrive in the new era, they need to change their role using their creative and innovative skills to reinvent manufacturing. This can be achieved through the *Tri-Sustainable* characteristics (Fig. 1); that is, having the ability to be both small and global; both high tech and low cost; and both artisanal and innovative [1].

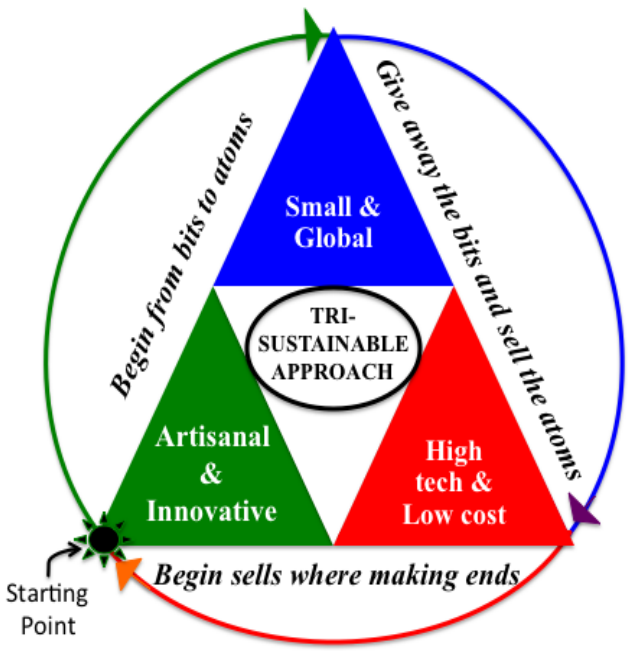

Fig. 1. *Tri-Sustainable* approach.

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However, for SMIs to have the *Tri-Sustainable* characteristics that can reinvent a mature industry; three basic approaches must be followed; first, they need to begin invention from bits to atoms; second, they should give away the bits and sell the atoms; and lastly, selling of product should start where making ends

A. *Begin from Bits to Atoms*

According to [6], up to 80 per cent (%) of total cost is often committed in the concept development phase; this is because, decisions made at the development stage play a significant role on the final product performance (Fig. 2). Thus, making the process technically sophisticated, costly and time-consuming [7].

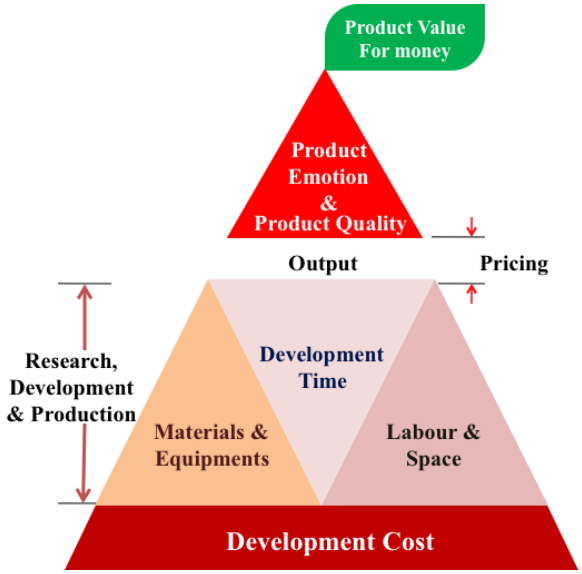

Fig. 2. Factors affecting competitiveness of produce.

However, the advent of twenty first century has brought alongside the digital revolution where the process of making things has gone digital. Thus, the manufacturing of physical products now begins as designs on screens. But then, consumers are hunger for life beyond the screen, because the quest for reality ends up with creating real things. According to [1], digital or virtual products (bits) are thrilling, but when it comes to the overall economy, it's all about real or physical products (atoms).

With the use of computer-aided design (CAD), product ideas can now be expressed all through the whole spectrum of production process; from design initiation and decision making through to technical design and subsequent link to the machinery [8]. Fig. 3 illustrates the application of CAD in product development process, along the three aspects of implementation, form and quality.

Research from the Aberdeen Group Inc. shows that manufacturers that use Digital Prototyping build half of the number of physical prototypes as the average manufacturer, get to market 58days faster than average, and experience 48 percent lower prototyping cost [9].

Atoms (physical prototypes) are weighty, and so are the consequences of their failure [1]; therefore, instead of building multiple physical prototypes and then testing them to see if they'll work, companies can conduct testing digitally throughout the process by using Digital Prototyping to catch design problems up front. With this, manufacturers often can reduce the number of physical prototypes they need to create before a product can be manufactured, which will reduce the cost and time needed for physical prototyping [9].

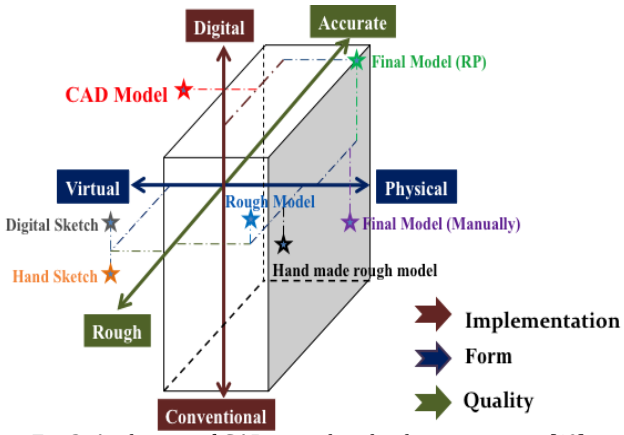

Fig. 3. Application of CAD in product development process [10].

B. *Give Away the Bits and Sell the Atoms*

The weightless economics of bits can reshape everything from culture to economics. That is, a production process where customers helped in developing products and then pays for them. Since those digital designs (bits) can be done on regular computers and shared online as files, designing and modification are now possible on consumer desktops. Thus, customers are now industrializing the do-it-yourself (DIY) spirit. And with the increasing powerful digital technology tools like 3-D printers and rapid prototyping technologies, physical product can be easily made either in small or large batches. Therefore, customization and small batches are no longer impossible; according to [1], they are the future.

Thus, the new century SMIs are expected to give away the bits (digital designs) by sharing with other professionals and allowing potential customers to contribute in developing products. As opines by [1], project shared becomes inspiration for others and opportunities for collaboration. The simple act of sharing the idea to the public can become the engine of innovation.

C. *Begin Sells Where Making End*

The availability of interactive design software coupled with the web that has democratized both the invention and production tools, consumers can now turn their ideas into a product. According to [1], the path from inventor to entrepreneur is so foreshortened that it hardly exists at all anymore. Both the consumers and the manufacturer can now collaborate in inventing and selling products.

Hence, the biggest transformation is not in the way product is developed, but in who is developing it. In an open market where customers design their products themselves or involved during the development process, they won't be just loyal purchasers, but fully committed to the product.

III. Discussion

The resulting outcome of a well-implemented *Tri-Sustainable* approach is as follows:

- Small and Global: In the weightless economic of bits (digital products), manufacturers can adopt "*production on order*" where physical products are only produced based on order. Thus, production can start with small capital commitment and small risk and reduced manpower (Fig. 4). Since the idea and product development begins on screen, designers can easily iterate, improve design and customize product based on order at little or no cost. Besides, with the World Wide Web (WWW), manufacturers can go global, advertise their products digitally and reach all potential customers, get their feedbacks before producing physical product. This will help to minimize the risk of product failing.

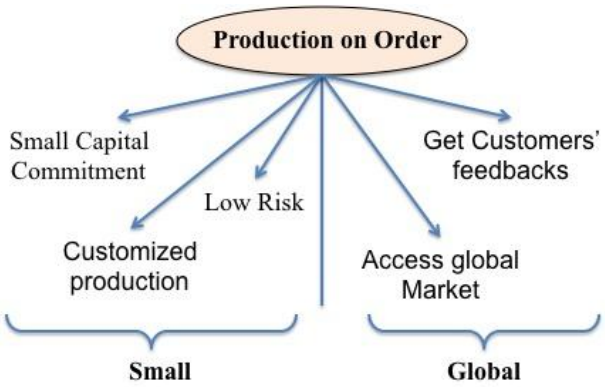

Fig. 4. Outcome of SMIs being small and global.

- High-Tech and Low Cost: With the advance in technology such as rapid prototyping technology, manufacturers can now produce their designs in few units (limited editions) or in volume. Besides, the use of high tech will help increase product quality, and reduce delivery time (Fig. 5). Moreover, since testing and iteration can be done digitally, manufacturers can reduce the number of physical prototypes produced during development stage, which will indirectly reduce the cost of product development.

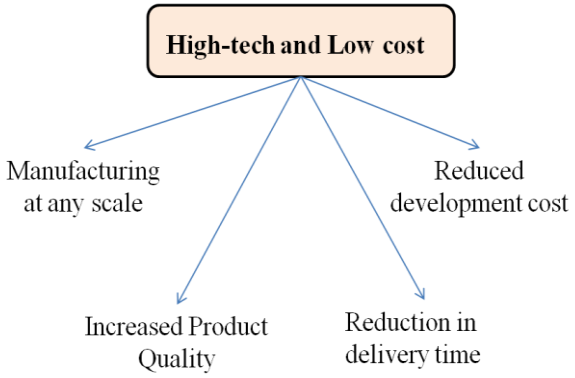

Fig. 5. Outcome of being high-tech and low cost.

- Artisanal and innovative: The aim of introducing High-tech is not to eliminate the convention skills of SMIs, but to bring the craftsmanship into the modern world, where the artisan techniques and contemporary technology can fuse harmoniously (Fig. 6). This will enhance the development process, sustain the craftsmanship skills, encourage the craftsmen to think outside the box and eliminate any manufacturing barriers.

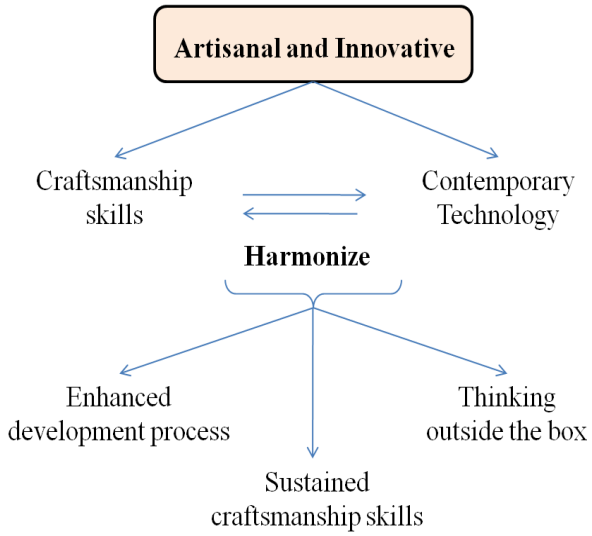

Fig. 6. Outcome of being artisanal and innovative.

IV. Conclusion

The process of developing physical products has started to look similar to the process of making digital designs. With the advent of computer-aided design (CAD), 3-D printer, 3-D scanner, laser cutting and CNC machines; designers can design 3-D objects on-screen and choose to either print them locally (few units) or globally (manufactured in volume). Besides, with just a keystroke on the Web, the global market can be accessed with billions of people. Thus, manufacturing is now possible at any scale, from units of one to millions. Therefore, this new shape in industrial world can bring the craftsmanship of SMIs into the modern world; where artisan craftsmanship and contemporary technology merge and fuse harmoniously. With this fusion, all small and medium industries may not be able to invent great things, but each SMI will be able reinvent their businesses, by starting small, but getting global (big).

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