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Digital Fabrication Labs (FabLabs) for Implementing Sustainable Development Goals (SDGs) in Solidarity and Social Economy (SSE) in Sri Lanka

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Abstract

Digital Fabrication and 3-D Printing are changing the way the world has seen manufacturing. By sharing designs and blueprints over the internet, it is possible to digitally print 3-dimensional objects locally from anywhere and print “almost anything”. Started as a project at Massachusetts Institute of Technology (MIT), the concepts of digital manufacturing are spreading all over the world in the form of Fabrication Laboratory (FabLaB), a non-profitable as well as an open development movement. A group of Sri Lankan Social Scientists from Sri Lanka and the United States has been collaborating to explore the opportunities for digital fabrication as a part of Social and Solidarity Economy (SSE) in post -conflict economic development in Sri Lanka. As a result of this work, FabLanka Foundation, a not-for-profit social enterprise launched in 2016 for socio – economic development through promoting Digital Fabrication Technology with the emphasis on 3-D Printing. The aims of the Foundation are to share knowledge, enhance innovation and transfer technology in community development while contributing to Solidity and Social Economy (SSE) in Sri Lanka. This will be done by setting up a network of FabLabs as National Innovation Centres (NIC’s) spread across the island. A FabLab provides widespread access to modern means of innovation. It is also a technologically advanced globally connected local workshop offering Digital Fabrication. This paper discusses the objectives, process and challenges faced in this project and how digital fabrication technologies can be used in achieving some of Sustainable Development Goals (SDGs) in the SSE of post-war context of Sri Lanka.

Keywords

Digital Fabrication, 3-D Printing, FabLab, SSE, SDGs, Sri Lanka

Bio

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1. Introduction:

Sri Lanka as a developing nation in Asia has a very interesting story of economic development. After gaining independence from the British in 1948, Sri Lanka followed a mixed economic model with very high emphasis on human welfare. A country once considered “a model crown colony” of the British Empire¹, continued high spending on education, health and other sectors of public expenditure. The major change however occurred in 1977 with the introduction of the open market economic policies introduced by the President JR Jayawardene government². With the opening up of the economy of the Island nation, Sri Lanka became one of the earliest countries in Asia to adopt open market liberal economic policies while neighbouring countries such as India took two more decades to do so. However, Sri Lanka as an early starter could not reach its full economic potential due to reasons such as the 30-years long civil war which erupted in the early 80s, poor implementation of open economic policies and unstable governments.³ Regardless of such issues, all successive governments maintained the similar liberal economic policies. Even though economic reforms continued for a long period, Sri Lanka still has a high welfare orientation, strong public sector and long traditions of sharing economy. This is evident from the fact that the official name of the country is The Socialist Democratic Republic of Sri Lanka while some argue that there is nothing socialist about Sri Lanka anymore. Therefore, Sri Lanka has an established tradition of shared economic practises which can broadly come under the definitions of Solidarity and Social Economy (SSE). The country’s strong affiliations to Theravada Buddhism, economic policies of the post-independent governments and also the country as a small Island can be listed as the main reasons for such a history. Some practical examples of traditional shared economic models can be seen in the strong and long established co-operative movement in Sri Lanka and in the successful national economic and social movements such as *Sarvodaya* based on Buddhist Economics⁴. Sri Lanka also ranks high internationally on philanthropy and donations according to the World Giving Index 2017⁵. Therefore, the inheritance and background for SSE remains sound in Sri Lanka even though it is not formally recognized.

2. The Need for Systemizing SSE in Sri Lanka

The Sri Lankan economy officially has been structured as per the standard economic policies. The country’s Central Bank was formed with the initial guidance of the Bank of England and still follows the same systems and economic principles. Even though the country has followed such economic models for more than 40 years, Sri Lanka has not been able to realize its full economic potential. According to the Central Bank’s own statistics, the Sri Lankan economy has been growing less than 5% annually during the last few years and it is well below the desired growth rate for Sri Lanka to reach to newly industrialized country status in the near future⁶. The country has a high unemployment rate and it is higher among youth and highly educated people. Sri Lanka

¹ Encyclopædia Britannica, accessed Jan.25,2019, www.britannica.com/place/Sri-Lanka/British-Ceylon-1796-1900

² “Towards an Open Economy 1977 – 2005,” Ministry of Finance Sri Lanka, accessed Jan.25, 2019, <http://www.treasury.gov.lk/towards-an-open-economy-1977-2005>

³ Nisha Biswal, “ Progress and Promise: Building Sri Lanka’s Economic Future”, *US Embassy in Colombo*, July 13, 2016, accessed on Jan.25,2019, <https://lk.usembassy.gov/progress-promise-building-sri-lankas-economic-future-remarks-assistant-secretary-nisha-biswal-sri-lankas-economic-potential/>

⁴ A.T. Ariyaratne, *Buddhist Economics in Practice in the Sarvodaya Shramadana Movement of Sri Lanka* (Colombo, Sri Lanka: Sarvodaya Support Group, 1999),20

⁵ Charities Aid Foundation, *CAF World Giving Index 2017*, https://www.cafonline.org/docs/default-source/about-us-publications/cafworldgivingindex2017_2167a_web_210917.pdf

⁶ “GDP Growth,” Central Bank of Sri Lanka, accessed Jan.26, 2019, <https://www.cbsl.gov.lk/en/economic-and-statistical-charts/gdp-growth-chart>

also has one of the highest rates of students studying overseas due to lack of educational opportunities locally. According to the University Grants Commission (UGC), the apex body for higher education in Sri Lanka, only around 30,000 students were admitted to the state Universities for the year 2018 from a pool of around 200,000 eligible students⁷. Therefore, many thousands of students annually leave the country looking for higher educational opportunities and greener pastures elsewhere while taking away a significant amount of revenue of the national economy. During the last few decades, the income gap among different social groups has widened making the poor impoverished than before. Even though the annual GDP per capita income of Sri Lanka has exceeded US\$12000 (*PPP basis*) recently, still the country has a 5% of the population living below the national poverty line⁸. In addition to this, the war has paralysed the provincial economic activities in war-affected North and East provinces making them high in poverty indicators among all other regions. The Island nation's centralized government has concentrated the wealth creation of the nation to the Western province where the commercial capital Colombo is located. It is estimated that about 50% of the GDP of Sri Lanka was produced in the Western province as per the Central Bank Annual Report 2018. The rural regions of Sri Lanka remain poor while the situation has caused a high migration of population to urban areas where the infrastructure of the cities such as Colombo are already under heavy pressure for quality transportation, housing and other facilities required for comfortable urban living. It is therefore very clear that liberal economic policies have not been and will not be able to drive Sri Lanka into a prosperous nation. After realizing this development dilemma even after a considerable time lag, the policy makers and political leaders of Sri Lanka are looking for alternative economical ideas which focus on human wellbeing rather than just maximizing the economic value.

Sri Lankan development plans hence look at new economic models which will be suitable for maximizing human wellbeing of the country. As a way of achieving this vision, Sri Lanka has adopted the UN's Sustainable Development Goals (SDGs) into its policymaking and currently the country is in the process of adopting them locally⁹. The policymakers are looking at sustainable economic modelling for the next few years. In this context, the Sri Lankan government has also introduced a national co-operative policy as a strategic document. A country which has long-traditions of Buddhist values of economics is now trying to adopt them in more modernized and updated ways. In this context, the significance of defining the concepts and systemizing the Solidarity and Social Economy (SSE) is very relevant and significant.

3. What is FabLanka?

FabLanka Foundation is a not-for-profit social enterprise launched in 2016 for socio – economic development by promoting Digital Fabrication Technology with the emphasis on 3D Printing. Through the Foundation, it is expected to share knowledge, enhance innovation and transfer technology in community development. The objectives are to be achieved by setting up FabLabs as National Innovation Centres (NIC's) spread across the island¹⁰.

⁷ "Admissions to Undergraduate Courses of the Universities in Sri Lanka," University Grants Commission Sri Lanka, accessed Jan 26, 2019, http://www.ugc.ac.lk/downloads/admissions/Handbook_2017_18/ENGLISH%20HANDBOOK%202017-2018.pdf

⁸ "The World Fact Book: Sri Lanka," Central Intelligence Agency (CIA), accessed Jan 26, 2019, <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/ce.html>

⁹ Yolanthika Ellepola, "From Planning to Implementation: Raising Awareness on the UN Sustainable Development Goals in Sri Lanka," Think Tank Initiative, Oct, 22, 2018, <http://www.thinktankinitiative.org/blog/planning-implementation-raising-awareness-un-sustainable-development-goals-sri-lanka>

¹⁰ "FabLanka Official Website," FabLanka Foundation, accessed on Jan. 27, 2019, <http://fablanka.org/>

A FabLab (an abbreviation for Fabrication Laboratory) is a concept developed at the Massachusetts Institute of Technology (MIT) in 2001. Today, FabLab is an international movement with widespread presence in many countries in the world. A FabLab provides wide – spread access to modern means of innovation. A FabLab could also be defined as a technologically advanced, globally connected local work shop offering Digital Fabrication. FabLabs are also considered an effective way of serving and empowering under-privileged communities using digital technology at the grassroots level¹¹.

Digital Fabrication is a type of manufacturing process where the machine used to fabricate parts is controlled by a computer. The geometry of the object to be fabricated is defined by the Digital Model. The manufacturing process could either be subtractive or additive. 3-D Printing is a process where a digital file directs a 3-D Printer to create an object by laying down successive layers of material such as molten plastics, powder, cement, glass, resins or metal until the entire object is created. Hence it is an additive process and virtually creates no waste.

Apart from this there are lots of other benefits that make 3-D Printing a viable option (as opposed to other manufacturing technologies) for transforming Sri Lanka into a manufacturing based economy. 3-D Printing reduces supply lines and inventory while increasing product options. It will outdate ‘economies of scale’ of conventional manufacturing and enhance ‘economies of scope’ of flexible manufacturing. These are among the other key benefits that make 3-D Printing an ideal technology for a country like Sri Lanka which does not have strong conventional manufacturing capabilities or large internet markets to serve with high-scale production quantities. Sri Lanka is more suitable to specialize on high value adding, customized and order to build production processes, an ideal combination for 3-D Printed products.

FabLanka was incorporated as a Guaranteed Limited, a not-for-profit social enterprise in 2016. It was an initiative of a few engineers which was later supported by professionals of other disciplines such as psychology, law, finance and accounts. The first step was to create a dialogue throughout the island as to why Sri Lanka should adopt this technology. Lectures and seminars were conducted in schools, Universities and at various professional forums to introduce this concept. Setting up of the pilot FabLab in Makandura in the North Western Province in May 2017 was a milestone achievement. Some electronic media coverage was given to the event to reach a wider audience. FabLab Makandura is the first ever FabLab in Sri Lanka which offers services in education (FabEducation), new product development, community collaboration, SME business development and also support youth empowerment and rural development using digital technology¹².

Though the initial investment was managed through seed funding by co- founders, a substantial amount of capital is required to set up fully-fledged initial FabLabs. FabLanka is mainly relying on potential international and national donors to cover the initial investment. For the long term sustainability and future expansion, a suitable business model is required to keep generating revenue. Membership fees, fees from special educational programs, providing of incubation facilities for industries, production of items addressing the needs of the country for sale are some of the business models identified in the organization’s business plan. Successful operations require collaboration with the government, the private sector, educational institutions, non-governmental organizations, schools, financial institutions, etc. FabLanka’s vision is to transform Sri Lanka into a manufacturing based economy.

¹¹ “What is a FabLab,” FabLab Foundation, accessed on Jan. 27, 2019, <http://www.fabfoundation.org/index.php/what-is-a-fab-lab/index.html>

¹² “FabLab Makandura,” FabLanka Foundation, accessed on Jan. 27, 2019, <http://fablanka.org/fablabs/makandura>

4. How Digital Fabrication Technology can Help in Achieving the SDG goals

Digital Fabrication can be used in manufacturing “almost anything”. This means that 3-D Printing itself is driving a revolution on how people look at manufacturing as a process. Therefore, what can be produced will only be bound by what one can imagine on a computer screen. In other words, 3-D Printing will remove all conventional barriers of manufacturing technologies such as complexity of achieving high machining accuracy, difficulties of producing odd shaped items and even diseconomies of small size production quantities. Since the 3-D Printing can be done by non-traditional large scale manufacturers, it is a way of democratising production by converting average consumers to a ‘prosumer’ who will actively engage in design and production process. Digital Fabrication also expands the horizon of manufacturing by getting rid of industry-specific production to produce “almost anything by anybody, anywhere at any time”. As a result, Digital Fabrication technology will have multiple roles in development related applications. Therefore, digital fabrication can be used in numerous ways in reaching different Sustainable Development Goals (SDGs).

FabLanka as a non-profit social enterprise mainly involves in rural empowerment of unemployed youth in Sri Lanka. This covers No Poverty (SDG1) and Good Jobs and Economic Growth (SDG8) goals. FabLanka recently started a project on Food Printing which will serve the No Hunger (SDG2) goal. Its current projects include digital fabrication of healthy drinking water vessels for Cholera, a common health problem in Sri Lanka. This project is compatible with Good Health (SDG3) and Clean Water and Sanitation (SDG6) goals. One of the first main activities of FabLanka is FabEducation where young students of different age groups are educated free of charge on new knowledge of digital fabrication technologies. FabEducation covers Quality Education (SDG4), Economic Growth (SDG8) and even Industry, Innovation and Infrastructure (SDG9) goals. Furthermore, FabLanka collaborates with small and medium enterprises in the community mainly covering the goal on Industry, Innovation and Infrastructure (SDG9). Under the new product development ventures of FabLanka, focus has been to produce solar panels locally using 3-D Printing thereby reducing the imports from countries like China and enhancing the Renewable Energy goal (SDG7). FabLanka is currently collaborating with the European Union to work under SWITCH-Asia II Programme - Promoting Sustainable Consumption and Production covering the Responsible Consumption (SDG12) goal¹³. From the inception FabLanka has been working on multiple projects with various not-for-profit organizations in using Digital Fabrication as a way of promoting peace and reconciliation particularly among war affected areas of the Island covering the Peace and Justice goal (SDG 16). As a core value of the organization, FabLanka follows the rules of inclusiveness and non-discrimination in conducting all programs and projects covering the goal of Reducing Inequalities (SDG 12). FabLanka by definition is a networking organization collaborating with both local and international partners on shared basis without any profit motive. This qualifies the organization to Partnerships for Goals (SDG 17). Currently, FabLanka does not cover remaining goals of Sustainable Cities and Communities (SDG 11), Climate Action (SDG 13), Life Under Water

¹³ “New Call for Proposals for SWITCH-Asia Grants Programme,” Switch-Asia of European Union, accessed on Jan. 31st, 2019,

<https://www.switch-asia.eu/news/new-call-for-proposals-for-switch-asia-grants-programme/>

(SDG 14) and Life on Land (SDG15). However, there are other FabLabs around the world which are working on such goals.

Therefore, it can be concluded that Digital Fabrication Technology can be used in achieving all 17 SDGs and they are already transpiring practically. It is hence the responsibility of the policy makers of the country to streamline such initiatives, scale up the operations and integrate them into national policy formation of meeting SDGs under the overall domain of the SSE.

5. Challenges and a way ahead

Digital Fabrication has a broad scope of achieving SDGs as a part of SSE in Sri Lanka. However, there are many key challenges faced in this process. Firstly, Digital Fabrication Technology is comparatively new to Sri Lanka. It is true that there are many businesses and applications that are increasingly using the 3-D Printing technology around the country. However, lack of awareness, fear of new technology, poor skills and many other obstacles should be overcome in order to make Digital Fabrication a streamlined manufacturing technology at national level. Based on historical trends on previous technology adaptation, it may take a few more years for the technology to become widespread in the island. Secondly, FabLanka as a social enterprise, established only in 2016 is still in the start up phase of the organizational life cycle. So far FabLanka has been able to reach only selected segments of the Sri Lankan society and it has managed to establish only one FabLab presently. The next phase of expansion of FabLanka has been to set up a network of FabLabs around the country. However, this remains a difficult target due to the need of high capital requirements, poor social acceptance and slow network effect. Therefore, the challenge of scaling up the FabLabs remains a real issue to have a national impact on Digital Fabrication Technology for significantly contribute to SSE. In addition, the current business model of FabLanka as a not for profit social enterprise remains a tremendous challenge for sustainability. FabLanka started with the support of the seed capital contributed by the co-founders themselves. It is currently depending on donor funding although securing them has not been very successful. According to the business plan of FabLanka, future funding for the venture should come from new product development and services which are offered to the community and other clients. However, this is yet to happen and it has also restricted the growth of FabLanka as a national organization. The growing of 3-D printing technology as a profit-oriented industry can also be seen as a threat to FabLanka as a contributor to SSE in Sri Lanka. A broader challenge will be the success of implementation of localised SDGs in Sri Lanka. It has been a standard practise that Sri Lankan policy makers make very elaborate plans and policies when new international concepts are introduced. However, when it comes to real implementations, the results are not so encouraging and it can also happen to the implementation of SDGs in Sri Lanka. Systemizing SSE and integrating it to formal economic planning into the Sri Lankan economy also remains a challenge.

As discussed above, the country has a long tradition and hence a high potential to recognize and streamline SSE activities and “re-invent” them with new digital technology. However, some argue that the overall failures of government sponsored SSE schemes in the past have created negative perceptions about the whole concept of SSE and hence it will have negative effects on implementing formal projects of SSE in the country. Therefore, the final success of the use of Digital Fabrication Technology for achieving SDGS in the SSE depends on overall acceptance of SSE by the people of Sri Lanka.

Hence, going forward needs real patience, long-term orientation and strategic approach in planning. FabLanka should target short term and small-scale achievements and they should

celebrate such results. People should be informed about their success, power of Digital Fabrication for community building and social change and engage communities in not only planning but also implementing such programmes and projects. Timing also plays a vital role. Since Digital Fabrication is an evolving technology, the rapid changes should be studied, updated and included in project planning. Policy makers should introduce the technology as a social solution to as many domains as possible particularly into school education. In brief, the country should consider Digital Fabrication as a tool to find solutions to social problems they face and not just to adopt it for the sake of the technology itself. This principle should be reflected on national policy formation.

6. Conclusion

Sri Lanka has a unique history and a rich culture of early forms of Solidarity and Social Economy thanks to the acceptance of Buddhist concepts of economic values, early adaptation of welfare policies by post-independent governments and some successful social movements. The failure of liberal economic policies adopted by recent governments during the last four decades to bring economic prosperity to Sri Lanka have opened a national discussion and an enthusiasm for new economic models which focus on human well-being of the entire society beyond pure economic value creation for a selected few. This remains a priority policy area for the Sri Lankan policy makers when rebuilding the nation after a devastating 3-decades long civil war while facing other external global challenges. Sri Lanka's effort in adopting SDGs and trying to find out ways of implementing them in a localized context is an encouraging trend in that direction. Therefore, well defined and systematically integrated Solidarity and Social Economy (SSE) for Sri Lanka remains very relevant and effective. FabLanka, a not-for-profit social enterprise is trying to use the latest Digital Fabrication technology as a way of solving some of the urgent socio-economic issues faced by Sri Lanka. Some projects of FabLanka are trying to use the technology to reach several SDGs as a part of overall SSE in Sri Lanka. The business model and working principles are also compatible with few other SDGs. It has also been discussed that Digital Fabrication Technology can be used in achieving almost all SDGs as shown in examples from other countries. However, Digital Fabrication is comparatively a new technology and also FabLanka as an organization is relatively a young one. Therefore, these implementations are still in early stage, small in scale and face several challenges in rolling out to national level. Limitations of capital for developing a network of FabLabs around the country, Lack of awareness and the expertise of general public on how Digital Fabrication can solve their social problems and barriers of mainstreaming Digital Fabrication in national planning are some of main challenges. Therefore a long-term approach in implementations, strategic orientation in adaptation, people friendliness in applications and continuous education of the general public are some of the ways to move forward for the successful adaptation of Digital Fabrication Technology to solving social problems and development challenges faced by Sri Lanka.

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