Sri Lanka Export Development Board

Business Lanka

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Innovation

Taking Sri Lanka to the Next Level

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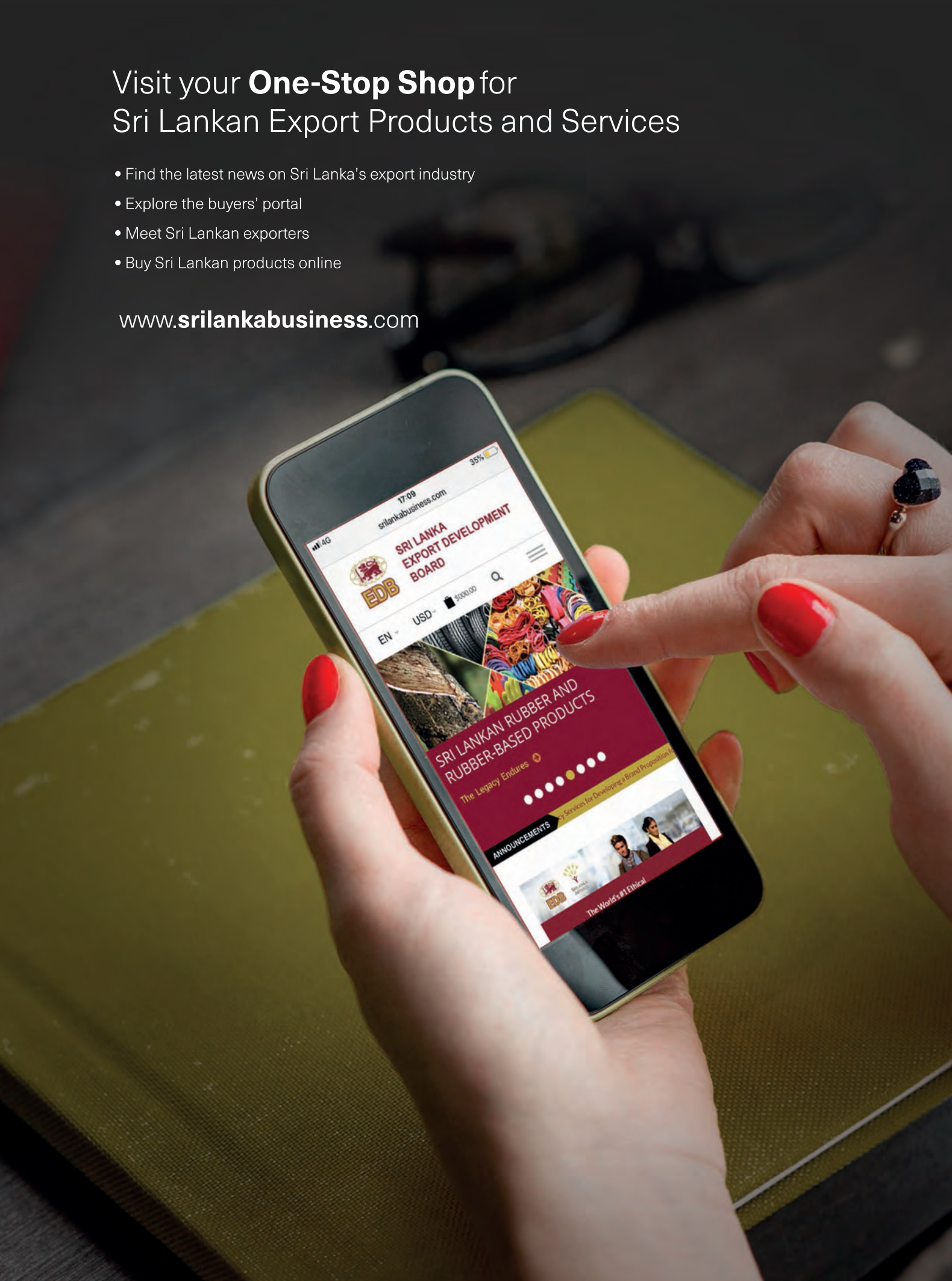

WELCOME

Innovation: Taking Sri Lanka to the Next Level

Innovation is a priority in the development journey of Sri Lanka, where solutions must be provided and demand created for Sri Lankan creations.

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Direction
Chitranjali Dissanayake
S R P Indrakeerthi

Project Coordinators
Upul Galappaththi
Asela Gunawardena

Circulation
Gayani Nadeeshani

Design and Production
BT Options
20-2/1, Lauries Place
Colombo 4, Sri Lanka
General : (+94) 112 597 991
Fax : (+94) 112 597 990
E-mail : info@btoptions.com
Web : btoptions.com

Ayubowan!

The word 'Innovation' literally means a new idea, which is then transformed through various processes into reality. The theme of this issue of Business Lanka is 'Innovation', which focuses on the many industries in Sri Lanka that are constantly innovating to introduce novel products to the market.

Innovation is essential to a developing economy such as Sri Lanka where new products and services need to be introduced to make the country a global player. Furthermore, at a time when the entire world is facing the COVID-19 pandemic, new thinking is necessary to face the challenges brought about by the current situation. As we adapt to the 'New Normal', we will need to find new ways of performing tasks that were part of day to day life.

With innovation, entrepreneurship is inculcated and many cumulate into start-ups. There are various types of innovation mechanisms, at times these are developed in research and development units of large organizations, where innovation is inherent to their culture. Others could be at university level or specialized institutions as well as individuals who develop new ideas.

Hon Bandula Gunawardena, Minister of Trade, and former Minister of Higher Education, Technology and Innovations, in an interview with Business Lanka, discusses areas related to innovation and exports, where he says there is great potential in the e-commerce and ICT sectors. Sri Lanka Inventors Commission, Sri Lanka Institute of Nanotechnology, University Business Linkage Center such as at the University of Moratuwa, and Venture Frontier Lanka provide dynamic spaces for innovations. Prof Rangika Halwatura, Commissioner, Sri Lanka Inventors Commission stresses on the need to create demand within Sri Lanka for locally invented and manufactured products. SLINTEC's public-private partnership puts the organization in a unique position with Government stability and private sector market access and orientation. The article features many of the institute's current innovations. The University Business Linkage Cell (UBLC) at the University of Moratuwa was established to nurture startups to their full potential by providing the necessary facilities, guidance, and expertise. Prof Rohan Munasinghe, Director, UBLC speaks on the many activities completed thus far. Venture Frontier Lanka aims to grow the number of and quality of startups and aspiring entrepreneurs and is focused on being a partner to every aspiring Sri Lankan entrepreneur seeking to scale their venture nationally and globally. In Sri Lanka many private sector organizations in the agriculture, manufacturing, and IT & digital spheres engage in innovations. GRI, Ceylon Graphene Technology, Bio Foods, HDDES, Arimac and LiveRoom, explain the manner in which innovation is inherent to their respective organizations, which enables continuous growth.

The extensive reading material enclosed in this issue of Business Lanka will provide an insightful look at the innovation sphere in Sri Lanka.

Sri Lanka Export Development Board

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Hon Bandula Gunawardena, Minister of Trade.

EXPORT AND INNOVATION

Fostering innovation in Sri Lanka

Sri Lanka's Minister of Trade, Hon Bandula Gunawardena, is a veteran political leader in the island. He is now the minister who is responsible for promotion of Sri Lanka's exports. Gunawardena was first elected to the Parliament of Sri Lanka in 1989. A man of bold and creative ideas, he created a paradigm shift in the education system of Sri Lanka by introducing the technology stream to the nation's school curriculum when he was the Minister of Education from 2010 to 2014. Prior to Sri Lanka's General Election last August, Gunawardena was the Minister of Higher Education, Technology, and Innovations. The Business Lanka was fortunate to obtain an interview from him on matters primarily related to innovation and exports.

Are you satisfied with the performance of Sri Lanka's exports during the first nine months of this year amidst this challenging environment due to COVID-19?

Firstly, I must say that what we are now witnessing is a very novel experience. The global economy had not contracted before to such a great extent like at the moment due to a pandemic in the human history. More than 46 million people have been infected while 1.2 million have died due to the pandemic. In the USA alone, deaths due to COVID-19 total more than 200,000 and the number of casualties in Brazil and India are alarmingly high. Factories have been closed. The global supply chain is broken. Airlines are grounded while ships are docked in ports. Due to travel restrictions, the tourism industry has been confined to hotels devoid of guests. A crisis of this kind had never occurred for the world. Therefore, export income has increased only in areas where transactions are carried out in digital platforms such as e-commerce. Under such an unfavorable global environment, I am extremely pleased about our exporters because they have tried to venture into market diversification, product diversification, and products with unique and innovative features during this crisis period. As those efforts have brought some success,

the merchandize export income has remained close to USD one billion during the last few months. Although we cannot expect a huge progress in exports during this year, I think it is possible to achieve USD 15-billion exports next year. It would be a realistic target if the tourism industry can be restarted in 2021. Compared to other countries, Sri Lanka has managed the COVID-19 situation very well.

What are the Government's plans to diversify Sri Lanka's export basket?

There are many modes to diversify our export basket. There is a tremendous potential to increase the export income generated via ICT and software-related exports, which is now at USD one billion to USD five billion, as the ICT-related professions and industries have been exempted from income tax by our Government. We have to send skilled laborers abroad and by doing so we can generate a substantially higher amount of earnings even though the number of workers we may send is small. There is a huge requirement for skilled workers worldwide. For example, we should look to send workers for jobs in Japan by training people in nursing and caretaking and making them fluent in Japanese language in addition to sending Montessori and kindergarten teachers for overseas jobs. Children and elders form two main segments of societies in developed countries. I believe there is a huge scope for us to train our people for vocations that

satisfy the requirements of those two age groups and earn a significant foreign exchange. With regard to agriculture, instead of sending raw materials, we need to export value-added products. Take coconuts, without sending coconut nuts, attempts must be made to send coconut water and virgin coconut oil. Recently, the Sri Lanka Institute of Nanotechnology (SLINTEC) with a private sector partner embarked on a project to convert graphite into graphene. Graphene has the capacity to store energy for a long duration, and SLINTEC has built Lead Acid Batteries by making use of graphene. Those are the type of things we should do more to diversify our export basket. Given that our country has a long association with ayurveda, ayurvedic and herbal treatments and products must be vigorously promoted in order to target high-end markets like Germany. Although Sri Lanka is an island nation, we have not yet exploited the benefits of our ocean resources. There is a great demand for Sea Cucumber, and it is a high-value commodity that we must look to exploit. Likewise, so many avenues are available to diversify our export basket.

Compared to other countries, our country's focus towards innovation is not ideal. Due to the exam-centered education system in our country, the motivation of our students for innovation is somewhat limited. However, when I was the Minister of Education, I introduced technology stream to the school curriculum.

What is this Government's vision towards promoting innovation in Sri Lanka?

The National Intellectual Property Office (NIPO) – which issues patent licenses – comes under the purview of my ministry, and it is one of the key Government institutes, which foster innovation in Sri Lanka. Few weeks ago, I submitted a cabinet paper and obtained approval to amend the existing Intellectual Property Act to enable us to obtain Geographical Indication (GI) certification for Ceylon Cinnamon, Ceylon Pepper, Ceylon Coconut, and other agricultural products. The Government also provides financial incentives to inventors through the Sri Lanka Inventors Commission. Compared to other countries, our country's focus towards innovation is not ideal. Due to the exam-centered education system in our country, the motivation of our students for innovation is somewhat limited. However, when I was the Minister of Education, I introduced the technology stream to the school curriculum. As a result of it, students are now learning about Engineering Technology, Bio-systems Technology, and Science for technology. Unlike in our days, there are Technology faculties in universities. As students in those faculties have liberated themselves from the exam-centered education system and focus more on practical activities, innovations could flourish in the future. Furthermore, we are expanding the activities of SLINTEC, the premier nano and advanced technology research institute in Sri Lanka, which was established under the Government of former President Mahinda Rajapaksa. The National Institute of Fundamental Studies, another Government research institute, undertakes research and experiments at the university level. Hence, I believe there is a renewed enthusiasm and vigor for innovations at the moment compared to earlier. I must also mention that it is necessary for the mass media to provide more

coverage on innovations in order to create an interest among the public for innovations.

How does the Government intend to increase investments in research and development (R&D)?

Government budgetary allocations towards R&D are not sufficient. In order to address this constraint, I have requested for the allocation of funds collected from CESS taxes through imports and exports to exports-related research. Funds collected via CESS taxes have to be transferred to the Export Development Fund (EDF). I am hoping that in the future, we would be able to make use of the money in the EDF to carry out R&D activities pertaining to exports-related industries.

You were the Minister of Innovations prior to the recently concluded Parliamentary election. Could you describe us the initiatives you undertook with regard to innovations during that time period?

It was during the time when I was the Minister in charge of Innovation, that the COVID-19 crisis emerged. At that time, school students, university undergraduates, and doctors

came up with so many COVID-19 related inventions. I together with the Sri Lanka Inventors Commission helped find investors to launch those products. Some of them were successful, and I hope that momentum would continue into the future as well.

One of the complaints we hear from new inventors is that they face numerous hurdles in obtaining patent licences for their products. How do you plan to resolve this issue?

New inventors in this country must understand that granting patent licences is a very long and arduous process, as NIPO has to follow internationally recognized conventions and practices. We need to be cognizant of the fact that what is an invention locally might not necessarily be an invention internationally. To establish whether some product is actually a new invention, it has to be determined that particular invention had not been done anywhere else in the world. The Government is also planning to strengthen the Intellectual Property Act to safeguard proprietary rights in order to attract foreign investors.

I feel that we could recover in two years provided this pandemic is brought under control. But as I said earlier, making forecasts is somewhat impractical under this present scenario.

Are you satisfied with the level of interaction that exists between universities and the private sector related to innovations?

To be honest, I am not satisfied with the level of interaction that exists between the university system and the private sector in respect of R&D when compared to universities in other countries. Universities have now begun to send undergraduates to private companies for internship and training for a year or six months. This should be expanded even further. It is the private sector, which contributes most to the national production, and the university system is responsible for creating graduates who match the requirements of the private sector. Our university system must undergo a paradigm shift, and they must equip graduates in English and IT. We need to learn from the education systems in countries such as Finland and Japan.

What are the Government's intended strategies to increase the number of graduates from Science, Technology, Engineering, and Mathematics disciplines?

The Government has a number of plans in that regard. It is essential for parents and teachers to undergo changes in terms of attitudes if we are to forge ahead in innovation as a country. Nations such as Japan and South Korea achieved tremendous progress in exports due to the high emphasis they have placed on innovation and research and development.

How do you forecast the performance of our economy in the foreseeable future?

Well! It is impossible to make projections about the economy under a chaotic environment, which we are going through currently. The World Bank had said that it would take five years for the global economy to return to normalcy. Nevertheless, I feel that we could recover in two years provided this pandemic is brought under control. But as I said earlier, making forecasts is somewhat impractical under this present scenario. BL

NOVEL PRODUCTS

The importance of focusing on real issues

The Sri Lanka Inventors Commission provides the platform for inventors to create new ideas and generate innovations that would fulfill the requirements of society. From concept to commercialization, the Commission provides support every step of the way. There is a need to create demand within Sri Lanka for locally invented and manufactured products and the Commission has taken the steps to address this gap.

Prof Rangika Halwatura, Commissioner Sri Lanka Inventors Commission.

Difference between an invention and an innovation

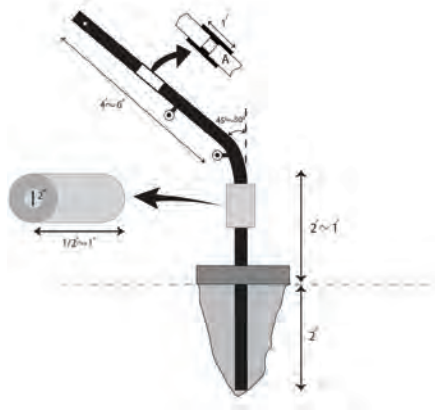
There is a difference between an invention, innovation and a redesigned object/product or a reproduction. An invention is something that has been created for the first time in the world, where there has been no common knowledge on the invention and a person can claim intellectual property rights for the creation and obtain a patent. A reproduction is where someone owns the knowledge, and the product is manufactured with minor modifications. For example, during the COVID-19 situation, we were required to produce certain items within Sri Lanka because imports were restricted or else the same product could be modified and reproduced.

An innovation is entirely different from these two entities. An invention may be a very basic level idea. From invention to innovation there is a large process, where one needs to think about making a prototype, scaling up, developing a marketing process and taking the product to the consumer. It is a process where many people are involved. An innovation is where you basically start from the invention and build up until it reaches the business world.

The Inventors Commission of Sri Lanka provides support to this process from the seed, that is from the idea for the invention, which is then converted to an innovation and thereafter commercialization. When an idea is converted to an invention research has to be done. Once you have applied and received the patent, the invention needs to be tested and developed. The Inventors Commission supports inventors to link up with various people as well as funding sources.

Demand for Innovations

There is a vacuum in the demand for local products. Thus, even though inventions and innovations are created there is a gap in the innovation ecosystem because the Sri Lankan consumer is not geared to purchase Sri Lankan products. If there is no demand in the market, then no one will invest in inventions. An investor will always first look at



The fence developed by the community together with the Sri Lanka Inventors Commission to address the human-wildlife conflict.

the return on investment (ROI) before committing any funds. Sri Lankan universities and schools have good inventors but since we do not have a strong innovation ecosystem many do not reach their full potential. Sri Lanka needs to develop a sustainable system in the country to create demand for our products.

Furthermore, in most instances people do not know that they are innovative or inventive and thus they do not apply for a patent for the new knowledge they have created. Then it becomes common knowledge. Lack of information in the country on innovation, intellectual property rights, patents and commercialization results in many inventions not appearing in the public domain. As there is a lack of demand you cannot convert an invention into an innovation.

The Inventors Commission is looking at introducing a brand for Sri Lankan invented products so that interest is created within society for local products.

While Sri Lankan inventors are creative they are not addressing any particular requirement of the community. That is if an inventor focuses on fulfilling a gap, then the consumer will come automatically and further promotion would not be necessary. For example, if the drug to cure COVID-19 is found, it will be required not only by the people of this country but the entire world. When an inventor does not create to address a need, then it is difficult to promote that product. Therefore, it is essential to identify the community issues that need solutions in the country. This is a challenge and the responsibility does not lie solely with the inventors. They need to be provided with the required information.

There are two strings on either side of the inventor that are broken already. We are trying to link them together by creating a Sri Lankan brand to market the product and create a demand in the country. And, providing the real issues to the inventors so that they can find the solutions.

The Inventors Commission is looking at introducing a brand for Sri Lankan invented products so that interest is created within society for local products.

New Approach for Inventions

We had a very general approach to inventions until this year, where we held exhibitions and screenings. We had to change our system as a result of the COVID-19 pandemic. We started with pandemic related inventions. We received about 400 inventions, which is a very large number and we conducted the initial screenings. We checked the level of development and also the real need or use of that particular invention. Based on that we selected inventions

New innovations were introduced to fight the COVID-19 pandemic by the Sri Lanka Inventors Commission in the presence of Hon Mahinda Rajapaksa, Prime Minister of Sri Lanka at the Gangaramaya Temple. Hon Bandula Gunawardana, Minister of Trade, Prof Rangika Halwatura, Commissioner, Sri Lanka Inventors Commission and Ven Kirinde Assaji Thero are also in the photograph.

and conducted further screening to reach about 150 inventions. Out of this we sponsored and assisted 40-50 inventions. We built prototypes and we supported them in the commercialization process as well. About two percent of the inventions will enter the industry. That is the practice in the world. If you can focus on actual issues, then we can tailor make solutions and take them to the community.

One such successful story was the work we did to mitigate the situation with regards to the wildlife and human conflict. We focused on the real issue and we requested the community to provide solutions. We conducted screenings, funded the prototyping and thereafter did the field testing. We tried 11 inventions and all were successful.

We are now proceeding with a tailor-made approach. We will be focusing on one industry per year and touch on the entire process. For example, this year we focused on the tea industry and categorized the whole tea industry from land preparation to value-added tea. We identified ten segments. Next year, we will be focusing on another industry. It is a very slow process, but there is a high impact on the work that we do.

We work very closely with the private and the state sectors. While the Inventors Commission comes under the purview of the State Ministry of Skills Development, Vocational Education, Research and Innovation, we work with all ministries as well as all public and private institutions. Every sector in the country needs innovation for their processes. Therefore, we link with the private sector and the state sector and we work with the community, which is very important. In order for us to take an invention to the innovation level, we need the support of various types of organizations.

Invention is not about technology, nor science. There are many inventions happening in all fields, whether it be social, political, science, or engineering. There is no age barrier, no knowledge barrier or a particular field for invention or innovation.

Younger generation of inventors

An inventor has to go to the field and to the community. It is my belief that village students are more creative than city students. City students are restricted to their time table and do not have as much social exposure. When such an inventor goes into the community they would

Low cost open source ventilator.

New innovations to fight against the COVID-19 pandemic.

The semi automated telepresence robot is used to provide treatment for COVID-19 patients.

not be able to gather the issues or requirements of the society. An inventor should go into society, and into nature if they really want to become an inventor.

At the Inventors Commission, we are currently focusing on the school level and forming school inventor's clubs. The idea is to allow students to create their ideas. We are linking up schools with industry businesses as their CSR projects. The businesses will fund the students to develop their facility, and provide them with training. In most instances village schools do not have access to knowledge. For example, robotics is a very alien subject for them. Thus, we are trying to provide the knowledge and facilities to them.

Another approach that we are looking at is encouraging university students to teach school children. Thereby we want the university students to get their social exposure and for them to understand their social responsibility. We link with the university students and we have many volunteers. They link with the Inventors Commission and conduct online seminars and create YouTube videos.

I have converted my office into a mini studio, where we have created an idea incubator. University students, staff or even school children can form teams, and start working together to discuss their ideas, it is not research.

For the first time in the history, a Memorandum of Understanding (MoU) was signed between Sri Lanka Inventors Commission and Ministry of Education to create an innovative culture among school students irrespective of their discipline by introducing a set of activities, competitions or any other suitable initiative to enhance the creativity.

Through these mechanisms, the students will interact with the Inventors Commission, and that interaction is very important. There is a huge knowledge gap in the community because they do not know where they should go for information. We are linking schools with the industry, as well as with the university students. Through this process we are aiming to strengthen the pyramid of social responsibility. BL

Prof Rangika Halwatura, Commissioner
Sri Lanka Inventors Commission

SCIENCE AND TECHNOLOGY

Sri Lanka Institute of Nanotechnology: A catalyst for science and technology innovation in Sri Lanka

Sri Lanka Institute of Nanotechnology (SLINTEC) is the first public-private partnership with the Government of Sri Lanka (The Ministry of Science, Technology and Research) and private sector institutes consisting Brandix Lanka, Browns, Camso Loadstar, Dialog Axiata, Hayleys, Lankem Ceylon, LOLC and MAS Holdings and came into existence in 2009. SLINTEC's public-private partnership puts the organization in a unique position with Government stability and private sector market access and orientation.

The company is engaged in scientific research and development in the fields of nano and advanced technologies. It aims to develop products and services, that benefit the economy while optimizing the use of natural and human resources available in the country. SLINTEC's R&D activities are also in line with the present National Policy Framework of the Government - "Vistas of Prosperity and Splendor (Saubhagyaye Dekma)".

SLINTEC's research is primarily focused on six areas, namely: advanced materials, smart textiles, advanced agriculture, graphene technologies, energy research as well as process and engineering systems. These areas were selected upon careful consideration of macro trends, local and international trends and SLINTEC's core competencies.

SLINTEC focuses on both market demand-driven research targeting commercialization and public good research to uplift the social, environmental and economic conditions of Sri Lanka.

Innovation, the need of the hour...

In the increasingly competitive global economy, science and technology is an important strategic driver to achieve balanced national development through innovation. It is therefore imperative that a strong

SLINTEC Nanotechnology and Science Park premises in Homagama.

commitment is made to harness the potential of science and technology as a key driver in raising the national capacity to acquire and utilize knowledge, to foster innovations and simultaneously ensure economic development and human welfare. The way to do so is to accumulate a critical mass of a science and technology base within the country. Such a base will generate new innovations, which are the seeds for future economic growth and SLINTEC as an institute has accomplished that target. In recent times, SLINTEC has developed several innovative solutions for the betterment of Sri Lanka.

GRAPHENE TECHNOLOGY

Commercial-scale Graphene Production

SLINTEC was a pioneer in producing Graphene from local Graphite. SLINTEC's research success in developing a method for exfoliation of Graphene led to the commercialization of the said research through a joint venture with a private sector partner. Ceylon Graphene Technologies (CGTL) was a successful spinoff of SLINTEC adding value to local mineral Graphite. CGTL is involved in producing Graphene through an exfoliation procedure developed in-house from research conducted at SLINTEC. Value addition from Graphite to Graphene is significant. CGTL has a current capacity of supplying 1.8 tons per year and it will be extended to four tons per year.

Graphene is currently being used in many industries including automotive, battery, electronics, and construction. SLINTEC has also ventured in to new Graphene-based applications.

Lead-acid Graphene battery

Graphene-based, Lead-acid battery is a product developed together with Associated Battery Manufacturers' (ABM) Exide Battery. This graphene-based battery is a 40 percent improvement in charge

"SLINTEC is the catalyst for current research and innovation culture in Sri Lanka. We thrive to increase Sri Lanka's high-tech exports by more than one percent by supporting local industries with cutting-edge research"

Heminda Jayaweera, Chief Operating Officer (SLINTEC), Eisenhower Fellow.

Graphene-enhanced battery prototype.

Sri Lankan Graphite.

Smart mask sensor mock-up.

acceptance (ability of a battery to accept and store energy in a given time, temperature and state-of-charge) having significant life-cycle improvement, which directly improves the life of the battery. Furthermore, Graphene reduces water loss by about 35 percent. Water loss is a major drawback in current Lead acid batteries, which results in reduced battery life. Graphene also improves overcharge endurance. The product will be introduced to the Sri Lankan market by early 2021.

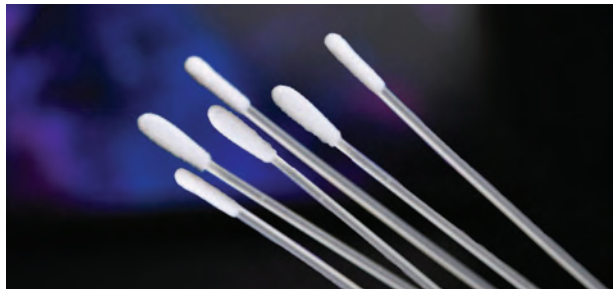
Smart-mask sensor

SLINTEC in collaboration with CirQ technologies have developed a Graphene-based respiratory detention sensor, which can be

"One of the key lessons in the economic development of successful nations during the past two decades has been the pivotal role of innovation in economic growth dynamics. Building the national innovation capacities including the knowledge/research base in key areas is crucial if our firms are to compete globally in technologically intensive markets.

Fostering active collaboration between universities, R&D institutes and industry is therefore important if we are to translate research results to economic returns. However, this requires not only active collaboration between them but also effective mechanisms and instruments to lubricate their collaborative efforts. Hence, institutions such as the EDB can and should play a pro-active role by introducing both financial and non-financial systems and instruments that are required for such vibrant collaborations among the key stakeholders of the innovation ecosystem."

Dr Azeez M Mubarak, Chief of Research and Innovation (SLINTEC).



SLINTEC Swabs: Nylon flock swabs for nasopharyngeal and throat sputum collection.

LAMP-PCR kit prototype.

SLINTEC science team headed by Dr Sanjaya Bathige and University of Sri Jayewardenepura science team led by Prof Neelika Malavige involved with the development of LAMP PCR kit.

integrated to any face mask in order to enable users to detect the face mask life, mask fit and respiratory behavior. Hirdaramani Group partnered with SLINTEC to commercialize this technology by integrating the sensor to their products. This marks the very first high-tech value addition to face masks undertaken by a Sri Lankan apparel manufacturer.

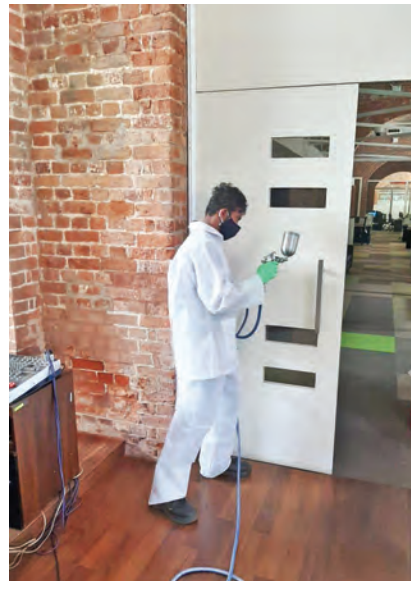
COMBATING COVID-19

Swabs

SLINTEC was able to reverse engineer COVID-19 testing sample collection swabs and have been producing them in collaboration with the Medical Research Institute (MRI), Lady Ridgeway Hospital and High Fashion Holding Sri Lanka. SLINTEC has also obtained NMRA approval for swabs. Thus far, over 100,000 of these sample collection kits, each containing a nasopharyngeal swab and a throat swab, have been made and handed over for the fight against COVID-19 in Sri Lanka at a time where Sri Lanka had limited stocks. The innovation has saved at least 55 million rupees for the country as an import replacement.

LAMP-PCR

In an effort to increase the diagnostic capacity for COVID-19 virus in the country, SLINTEC rapidly repurposed its staff and facilities in late March 2020 to develop cost-



SLINTEC scientists and technicians treating office spaces with the antimicrobial coating.

"We envisioned to carry out high-tech research, which would ultimately help Sri Lankan industries to compete in the global landscape. SLINTEC's innovations with high-'technology readiness level' always pave the pathway for industries to grasp and achieve greater heights."

Dr Rangika De Silva, Head of Technology Transfer (SLINTEC).

effective COVID-19 diagnostic test kits, including RT-LAMP PCR to detect viral RNA. SLINTEC has successfully demonstrated the use of loop mediated isothermal amplification PCR coupled with reverse transcription (RT-LAMP) as a robust method for SARS-CoV-2 detection in clinical specimens in a collaborative effort with the University of Sri Jayewardenepura (SJP). After demonstrating the proof of concept, SLINTEC RT-LAMP assay was validated against the existing RT-qPCR test at SJP team by analyzing RNA extracted from patient specimens supplied by SJP using GELDOC at SLINTEC. This was followed by analyzing virus samples isolated from positive patients supplied by the National Institute of Infectious Diseases (IDH) using RT-qPCR available at SJP. Further studies are continuing to determine the specificity and sensitivity of the SLINTEC RT-LAMP assay followed by NMRA registration before transferring the technology for commercialization.

Antimicrobial coating

SLINTEC sterile – is an antimicrobial nano-coating that can be applied on numerous surfaces without tarnishing its aesthetical appearance. This technology can eradicate microorganisms on the coating applied surface, as well as

T-hues natural textile dying technology.

"As a nation who is anticipating to thrive, Sri Lanka should focus on bridging the gap between exports and imports, which can only be achieved through disruptive Innovations where R&D plays an important role. Also, with all the serious potential implications caused by COVID-19 in the global economy, Sri Lanka should seriously align export strategies to source new markets."

Dr Lakshitha Pahalagedara, Head of Business Development (SLINTEC).

the surrounding air, with its protective effect lasting up to six months. The product can be commercialized via hotels, hospitals, airports, residential houses, offices, and supermarkets. This product is now being used by Atlas Axillia, on their exercise book range with antibacterial properties in safeguarding the school children: the future of Sri Lanka.

NATURAL TEXTILE DYEING

SLINTEC has carried out research projects with several blue chip companies in Sri Lanka. Dynawash's T-hues brand clothing is a technology developed by SLINTEC where it uses tea dye from waste tea as a natural colorant and as a result it reduces the carbon footprint compared to that of the synthetic dyeing. The project was partially funded through the research funding support scheme of the Sri Lanka Export Development Board (EDB). Commercialized research has benefitted both organizations in terms of income through sales and/or royalties. Dynawash was able to introduce their respective technologies to the international markets and bring export revenues with innovations done in collaboration with SLINTEC.

Ravinda Soysa
Executive Strategic Planning at Sri Lanka Institute of Nanotechnology (SLINTEC)

STARTUP

Nurturing innovation and startups

The University Business Linkage Cell (UBLC) at the University of Moratuwa was established to nurture startups to their full potential by providing the necessary facilities, guidance, and expertise. Many new products and ventures have been developed in a short span of time under the guidance and supervision of a professional network.

The UBLC is a World Bank funded project and provides students and academics collaboration with professional expertise in technology transfer and business model development, establishing innovation spaces and providing business incubators.

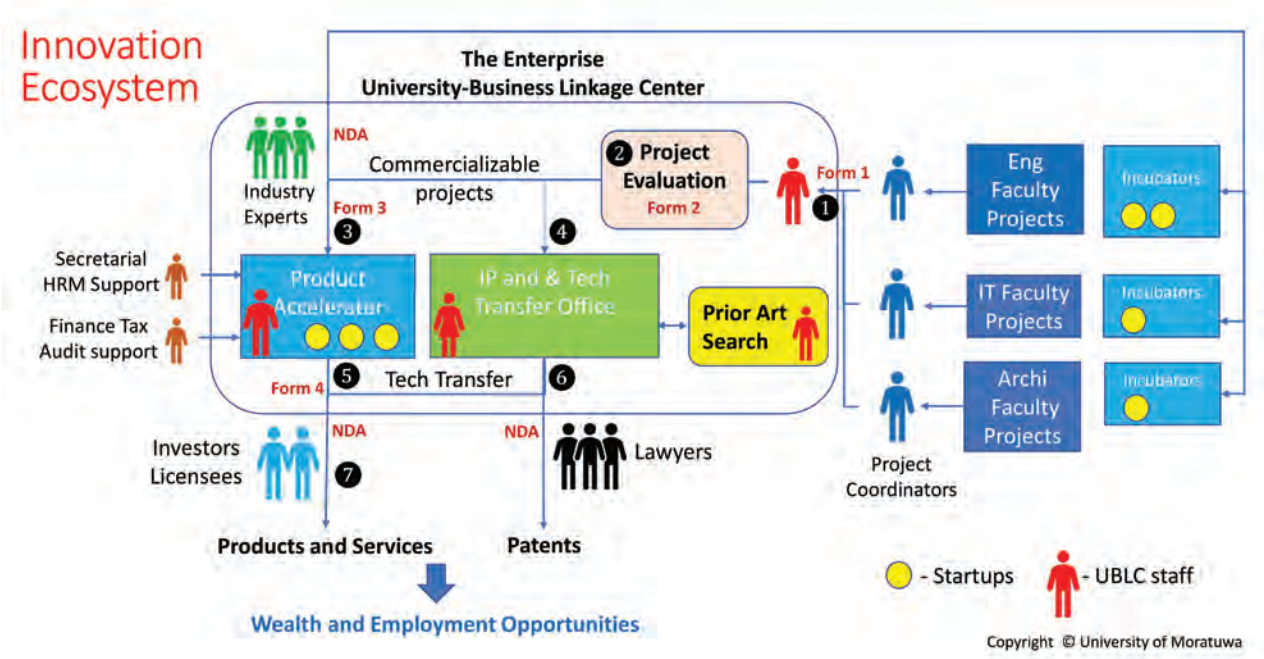
Accelerating Higher Education Expansion and Development (AHEAD) is a joint venture by the Government of Sri Lanka and the World Bank to support higher education. AHEAD has three result areas: (1) increasing enrollment in priority disciplines for economic development, (2) improving the quality of higher education, and (3) promoting research, development and innovation. The third result area's objective is to nurture a culture of research and development, innovation and commercialization (RDIC) in universities. The program will develop a system for multi-year, competitively funded research and innovation programs. There are two types of RDIC programs, one is Development-Oriented Research (DOR) and the other is Research Innovation and Commercialization (RIC) programs. World Bank, not only funds the UBLCs but also provides training, supervision, guidelines, and evaluation through the Operational and Monitoring Support Team (OMST) headed by Prof Thusitha Abeythunga.

ECOSYSTEM

The innovation ecosystem within the UBLC was established in 2019. It has a series of operations that are handled systematically. The practicality of each phase has been tested and is well mechanized to the university system.

Initially, the UBLC requests for Invention Disclosure Forms (IDF) from the students and staff who are engaged in innovative product development. Individuals who are part of the university as well as external individuals can send their innovations to the UBLC using the IDF. Upon receiving the IDF, the UBLC sends a team of experts to the laboratories where invention groups are developing their prototypes to evaluate the technology readiness and potential for commercialization. Invention groups are then summoned for meetings to plan necessary services and support for the product development and commercialization. Project evaluation is done largely

Prof Rohan Munasinghe, Director
University Business Linkage Cell
University of Moratuwa.



with the external experts and mentors, local and foreign. Patent drafting services and training are offered to those who have patentable inventions. Startup space is provided for those who plan for product commercialization. Interactive sessions and services on company incorporation, financial handling, market analysis, product packaging and branding, startup management, human resource management and labor law are offered to the startup companies during the two-year fostering period at the product accelerator. Startup groups receive common as well as individual mentoring sessions as required. Mentors from private sector visit the premises and the interaction with them provides startup groups an ideal platform to exchange ideas, personal experiences and to self learn.

The ecosystem has separate incubators inside faculties and departments where early stage of development takes place. The UBLC has linked up with the Department project coordinators through whom the information of those early stage developments are received, which are thereafter commercialized. The basic working core of the UBLC comprises the director, manager, and patent and technology licensing officer. The Executive Operational Committee (EOC) comprises academics and professionals from industry who immensely contribute to UBLC with their experience and expertise.

We have linked up with the following allies to obtain their guidance for high-tech product development and commercialization; Ernst&Young, Neilson, Sudath Perera Associates, Publicise Groupe, You-Lead USAID, and Employers Federation of Ceylon. We have overseas resource persons such as John Fraser (USA), Dr Ashley Stevens (USA), Dr Richard Cahoon (Cornell University USA), Mark Tejtel (Dept of Commerce, USA), Prof Steven Kowalsky (University of New Hampshire, USA), and Dr Hina Metha (George Mason University, USA) who share their knowledge and experience in university technology transfer. Some of our selected inventions are mentored by these foreign experts through World Intellectual Property Organization (WIPO) consultation program. These experts share with the UBLC their years of experiences and lessons learned and it helped UBLC to develop fast and achieve a significant level of maturity within a short period of time.

PATENT RELATED SERVICES

The UBLC has recently built a stringent patent process. This includes training on accessing patent databases including some commercial databases, conducting prior art search, novelty and claim identification, patent drafting, and filling.

UBLC has capacity to process four patents at a time taking ten-week till filing at the National Intellectual Property Office. A thorough search is done for each patentable innovation and is checked and compared against the prior art in global patent databases. This is time consuming and requires a significant effort and commitment. Not every innovation needs patent protection, nor is it worthy to invest time and money on patenting if the innovation does not have a significant commercial value. However, patent protection is crucial for every serious innovation with significant commercial potential because it is the patent that gives investors the confidence and security

Innovations by startups at the UBLC. Top row (L-R): Elephant tracking collar, Drone to address the public, and RTK GPS surveying drone. Bottom row (L-R): Currency note disinfection machine, Remote monitoring system for COIVD-19 patients, and Steam inhaling machine for COVID-19 patients.

to invest in commercialization of that invention. The patents that are being processed by the UBLC include a radio collar to locate wild elephants, a drone system to perform real-time spaying based on crop health, an aggregate development to fast curing of mixed concrete using waste sludge materials and a method to control traffic lights adaptively as traffic levels change.

Startups

Those who are looking for a space in the UBLC product accelerator can submit their information using the IDF anytime. In addition, UBLC conducts startup boot camp branded 'Mora Ventures' time to time through which startups and budding entrepreneurs are identified and selected. Each startup gets a custom mentoring program based on their peculiar needs. UBLC provides mentoring from local and foreign experts as well as through the special attention of WIPO consultants. UBLC supports them to build their business models, explore and adopt to different markets, and alternative packaging with better commercial prospectus. While being fostered at the product accelerator, startups also get access to the resources of the university for free or at nominal costs. No rent or subscription fee is involved. Each startup will undergo a quarterly progress review by a UBLC nominated panel. Unsuccessful performance will result in termination of UBLC support, which could hardly happen. Else, after two years, startups will spin out giving their spaces for the new startups entering the product accelerator. UBLC ensures that the startups receive the required facilities to ensure their success.

Following startups are being fostered at the UBLC Product Accelerator

Magicbit

This startup has developed an integrated development platform for students for learning, prototyping, coding, electronics, robotics, IoT and solution designing. It provides hardware and software support with interoperable interferes to adopt technology more quickly regardless of the knowledge level of the user. Magicbit enables to practice and learn on a wide range of applications using the same platform as well as to scale it up for practical applications.

AgXspot

This group has drones and IoT solutions for the upliftment of agriculture sector. Their drone is able to see plant health and spray the right amount of chemicals on to the right plants on the fly. They also develop RFID and machine learning solutions for fruit management, sensor development for perimeter security and monitoring electric fences, and NBIoT solutions for tracking elephants.

ThermaIR

ThermaIR Industries is a limited liability company founded in 2018. It provides products and services in the fields of sustainable energy and transportation. The company has developed an electrical conversion kit for gasoline powered Tuk-tuks. They also build electric foot cycles and offer services for large establishments for their internal commutation.

Pristine Technologies

This is an aerial surveying company with several drones ready for operations. Their drones have RTK-GPS technology that gives very high surveying accuracy.

Top: Tech evaluation, business development and industry exposure. Centre: WIPO online consultations on university tech transfer. Bottom: USAID YouLead for startup mentoring.

INNOVATIVE PROJECTS AT THE UBLC

Smart radio collar for elephant tracking: as a result of deforestation and recent reservoir projects in Sri Lanka, the elephant corridors have been disturbed. Hence, it is a need to identify the new elephant corridors by way of tracking the herd of elephants. After a successful project last year, a team has been able to develop a radio collar for elephants. This collar is now been commercialized as a collaboration between Mahaweli Authority, Mobitel, Department of Wildlife Conservation and University of Moratuwa. This collar has more features for a lower cost and could be sourced through a local startup company. The MoU for this project is being finalized at present.

Another innovation is the steam inhaling machine. This is the modern way of inhaling steam and it could help mitigate COVID-19.

This machine is electrically powered, temperature controlled, user-friendly, and affordable for every family. One needs to put water and herbs into the container, set the temperature and duration, and inhale the steam flow coming out of the ergonomically designed mask. This innovation was made for the Vocational Training Authority. UBLC invites local manufacturers to come forward and commercialize this innovation.

The remote monitoring system for COVID-19 patients has a novel respiratory rate sensor, thermometer, SPO2 sensor and pulse rate sensor for the patient to take his own measurements that will immediately be uploaded to a Cloud server for the doctor to examine.

University Business Linkage Cell is working on collaborative projects with many industry partners such as Dialog Axiata, Sri Lanka Telecom Mobitel, Mahaweli Authority, and Nelna Agri.

Prof Rohan Munasinghe, Director
University Business Linkage Cell
University of Moratuwa

INITIATIVE

Venture Frontier Lanka

Venture Frontier Lanka is a four-year nationwide entrepreneurship initiative launched with the collaboration of OviBees Ventures, USA aimed at identifying and nurturing Sri Lanka's most promising for-profit entrepreneurs. We aim to create a collaborative community, both online and offline, by providing in-depth venture development content that supports entrepreneurs build startups and learn how to create and run global businesses. Venture Frontier Lanka aims to grow the number of and quality of startups and aspiring entrepreneurs and is focused on being a partner to every aspiring Sri Lankan entrepreneur seeking to scale their venture nationally and globally.

Since its launch in March 2018, Venture Frontier Lanka has brought a series of events designed to support entrepreneurs to build local products and services that have the potential to reach global levels, by conveying the main actors of a local and international startup scene.

We reach out to bring know-how from around the world to Sri Lanka and in doing so, we look to involve international experts in our initiatives created for local entrepreneurs. At our previous activities, there were speakers and mentors from the United States, South Africa, Germany, Israel, and South Korea who shared their experience in international expansion, scaling up, exponential growth, pitching to investors, how and where to get funding.

Since its launch in March 2018, Venture Frontier Lanka has brought a series of events designed to

Heminda Jayaweera, Co-Founder and Director, Venture Frontier Lanka.

Prosperity through entrepreneurship; unleash Sri Lanka's entrepreneurial potenial by 2027.

Above: Entrepreneurship Caravan in Galle.
Below: Entrepreneurship Caravan in Kandy. Manju Gunawardana, CEO, Research and Innovation, LOLC in the photograph.

support entrepreneurs to build local products and services that have the potential to reach global levels, by conveying the main actors of a local and international startup scene.

We represent one of the biggest online entrepreneurship community in Sri Lanka, with over 16,000 members. Our community was built in partnership with Facebook, which supported the program with a grant and know-how.

Entrepreneurship Ideation Caravan

The Entrepreneurship Caravan is an initiative designed as a great avenue to bring experts in entrepreneurship from around the country to cities throughout Sri Lanka. The main goal of these caravans is to train local entrepreneurs to think differently about the ventures they will start. All events are done free of charge and Venture Frontier Lanka bear the expenses of managing the event.

A caravan stop consists of different sessions about creating unique ideas for startup ventures and strategies for developing and financing those ideas. The first series was launched in two cities, Galle at the University of Ruhuna (September 23, 2019) and Kandy at the University of Peradeniya (October 6, 2019) and continued in Colombo at SLIIT and at the University of Vocational Technology in December and January. There have been over 20 caravans in the

We represent one of the biggest online entrepreneurship community in Sri Lanka, with over 16,000 members. Our community was built in partnership with Facebook, which supported the program with a grant and know-how.

Startup Boot Camps; selection of startups.

Our goal is to create a collaborative culture meant to provide knowledge that can help you create future initiatives, but also a culture that enables an exchange of ideas and resources.

past two years, with over 1,300 participants.

Startup Boot Camps

The selection of the startups was based on the application information submitted and fitting the eligibility criteria published in advance.

After receiving over 100 applications, we announced the participation of 37 startups in Colombo and 19 in Jaffna. The entrepreneurs selected had the chance to pitch their business idea in front of a panel of judges and only the top six startups in Colombo, top three in Jaffna, made it to the final round of pitching. The top ventures from each Startup Boot Camp then participated in three months of mentorship support from leading local and global entrepreneurs. They will qualify for investment consideration from the Venture Frontier Seed Fund.

Founders in Action; a monthly event dedicated to learning through experiences.

Founders in Action

This is a monthly event dedicated to learning through unique experiences. It brings together fellow entrepreneurs, mentors, speakers, Venture Frontier Lanka members and other important actors of the startup scene. Our goal is to create a collaborative culture meant to provide knowledge that can help you create future initiatives, but also a culture that enables an exchange of ideas and resources. BL

Heminda Jayaweera
Co-Founder and Director
Venture Frontier Lanka

MANUFACTURING

GRI: Innovation with agility and adaptability

Manufacturing high-performance agriculture, construction and material handling tires, GRI is a leading producer of specialty tires in Sri Lanka with primary markets in Europe and USA. Innovation is inherent to the organizational DNA and thus, GRI ensures their commitment to sustainability and environmental protection in product development, manufacturing and all operations of the organization.

GRI was established in 2002 and presently has offices in nine countries and sales in over 50 countries around the world. The Founder/Chairman of GRI, Prabhash Subasinghe, decided to establish the company as Sri Lanka was not manufacturing its own brand of tires at that time. Our drive from day one was to produce a high performance product.

We are an organization driven by our vision to be the global leader in our niche inspiring greatness across all stakeholder eco-systems that we touch. This visionary DNA in us naturally taps into our creativity to innovate not only products and services but also our internal systems and processes as well as our business model to serve our customers. The continuous evolution of each of these areas is a virtuous cycle of events that we spend our life at work.

From the beginning itself a foundation was built on innovation on specialty tires, new tread designs as well as new compounds that gave the tire higher performance and kept the same cost factor. There was innovation on two fronts, tread designs and compounds. A solid tire consists of different layers of compounds and it is full of rubber.

We have a system where we set objectives, which are stretched so that our employees need to think beyond their normal way of thinking. It is a means of unleashing their creativity. Regardless of innovation, the priority is to first tap into their creativity. We are practicing our objectives and key results measurements system by stretching everyone's targeted goals. There is no passing or failure it is merely a performance measurement to see how much a person can expand their thinking horizon. We are taking this approach as a company to unleash the staff's creativity. This leads to employees developing new ways of working, new ways of servicing the customer, managing a process, new ways of running a system, all these are part and parcel of innovation. The innovation boundary therefore is looking beyond product innovation.

We decided that we will produce tires that would challenge the best tires in the world. That is produce tier II plus that would challenge the tier I tires. From the beginning we introduced innovation into our

Dr Mahesha Ranasoma, Chief Executive Officer, GRI.

factory as well. We installed the best machinery/equipment in the world. Some of the equipment were brought into Sri Lanka for the very first time. We became the largest specialty tire producing factory in Sri Lanka. We installed solar panels on the entire roof of the factory. One of the key drivers for us is to be green and environmentally friendly. From power generation to water recycling to steam generation where we use biomass burners not furnace oil burners. There are many such systems in the factory that are environmentally friendly.

We have two factories; the solid tire factory since 2002 and the new factory, which is the pneumatic tire factory since 2018. We have R&D teams in both facilities and there is a common ground because both manufacturing processes use rubber, but in terms of technology there is a difference between producing pneumatic tires and solid tires. Thus, we have different R&D teams working on the separate product types.

One of the recent developments in solid tires was that we listened to the customers from different parts of the world and they wanted a slightly wider tire. We designed a special tire with a wider footprint, but we kept the same weight, shape, and structure of the tire. It is one of the widest tires in the industry today. The second development in terms of solid tires is a winter tire that we worked with our Japanese partners to produce. This is a solid tire to be used on snow. We have developed samples with special compounds that function in sub zero temperatures. We had to design a very special tread. The samples will be tested this winter and we will enter commercial production next year. In

This visionary DNA in us naturally taps into our creativity to innovate not only products and services but also our internal systems and process as well as our business model to serve our customers.

State-of-the-art tire manufacturing plant in Badalgama with solar panels on the entire roof.

Globestar WT is a universal solid tire that consistently delivers assured performance. It is one of the widest tires in the industry.

Left: Green XLR – ensures high traction on and off road. Right: Grip EX Snow – ability to function in sub zero temperatures.

terms of pneumatic tires, we focused mainly on innovative tread designs. We have studied all our competition. We identified the types of treads that work in different terrains and so on, and we have optimized the angles of the lugs, the pitch and depth of the lugs as well.

There is another very special pneumatic tire that we have manufactured; it is known as a floatation tire. It is a very wide tire that seemingly floats on the earth. We came up with a very unique tread design, which increased the performance and the roll of the tire to carry the heavy weight of the trailer. That was a unique product we designed from the very beginning as well. It is working perfectly where we have tested it in the market and we will commence the commercial production soon.

The second pneumatic tire, is also a winter tire, we launched it recently. It is for snow ploughing and snow removing equipment and trucks that need to perform in very low temperatures. We designed the tread so that it moves automatically, and optimized the tread design. Here too we worked with our partner in Japan. We recently launched the product and the tires have been shipped and will be used during winter in Japan this year.

Our foundation for innovations is built on sustainability principles. This makes GRI a global stakeholder in participating actively in the agendas of Climate Change, UN's Sustainability Goals, Continuous Reduction of Carbon Footprint as an organization plus helping our customers to achieve their sustainability goals, use of green energy, social equity, productivity via investing in future technologies and extending the concepts through the end to end value chain.

When we do an innovation, we look whether it would reduce the carbon footprint, does it lead to a reduction in wastage, and whether it leads to better recyclability. We focus on ensuring that there is a reduction in the customer's carbon footprint as well. Energy consumption decreases as a result of using GRI Tires. Even within our own manufacturing systems we look at energy efficiency. In our organization everything in innovation has a sustainability foundation.

We are in a supply chain to a customer, we are providing their tire needs to run their vehicles or machinery. We are supplying a core component of the machinery, which is the tire that provides mobility to the machine/vehicle. Therefore, from the beginning of manufacturing, distribution, and marketing the entire chain is also a part of our innovative thinking. That is with the product itself how do we innovate the service we provide as well. It helps our customers to create more value by working with us.

We also look at the sustainability angle of the raw material we use, which is rubber. One of our key products is agricultural tires. We are investing significantly in this area where we are gathering momentum in terms of market growth.

Looking at the supply chain the first link is the rubber farmers. It is about how to create a value chain that becomes innovative from the rubber farmer to the farmer on the other side using our tires in their farming machinery. It is connecting a farmer to farmer; two ecosystems. This is another innovative concept that we are trying to drive, connecting our end to end supply chain while focusing on sustainability principals.

We are currently forming a farmer base, where we are identifying farmers that work in a sustainably manner while increasing their productivity. We use that process to make an agriculture tire using our systems, once again founded on sustainability. We have energy systems powered by solar power, waste recycling systems, and rainwater harvesting, which are all part of the manufacturing process that is sustainable. The tires are then used by agriculture farmers where we can extend the sustainability concepts to those farmers as well. We launched one of our key innovative initiatives last year in Germany, named Green X Circle connecting the end to end farmer eco-systems between the rubber farmers and the agricultural farmers who use tires made from natural rubber. This is an example where we use creative thinking innovation, and sustainability in an end to end manner. We use innovation to drive different boundaries. It is not only the product boundary.

The current situation demands more service innovation to serve customers even more efficiently. It is a situation where the markets are down, and growth is low. Therefore, customers require us to be more efficient and far more innovative than before to supply their products so that they can also sustain their business through this difficult period. Such situations help us in our innovative thinking on how do we support our customers to add more value in a difficult environment rather than take a back step and say let's stop and wait for the situation to improve. The pandemic situation is a crisis but we have realized that we need to stay closer to the customers and provide more value for them during this period, which requires us to be more innovative.

In this situation where some markets are struggling, you can also make a big differentiation when you become the most reliable supplier. We see bigger players having issues. There are supply chain disruptions everywhere. In such a situation, we are able to be as a Sri Lankan company, a reliable supplier where we have thought of ways on how to assure reliability to the customers.

One of our core strengths is to make innovative products that perform well in line with anticipated performance. Our products are always made at the upper limits of performance and quality tolerance rather than at the middle or lower end. This guarantees the utility value to the end user beyond what they expect. It leads to our virtuous cycle of continuously pushing the customer's value creation boundaries.

Dr Mahesha Ranasoma
Chief Executive Officer
GRI

INVESTMENT

Ceylon Graphene Technologies: Converting Graphite to Graphene

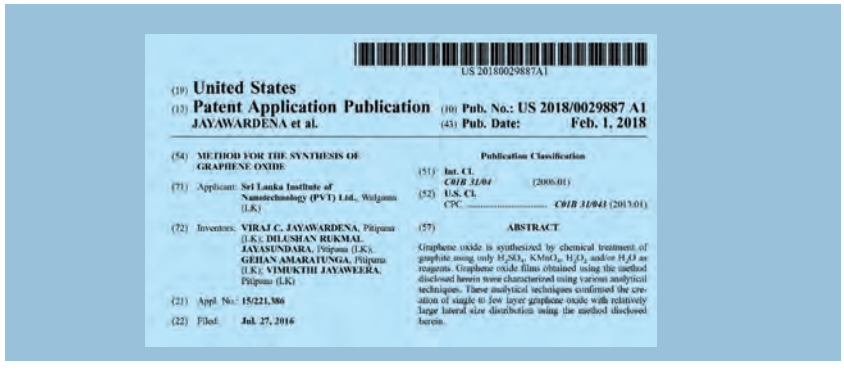
Ceylon Graphene Technologies (CGT) is a joint venture between LOLC Group and Sri Lanka Institute of Nanotechnology (SLINTEC). With a US patent for the technology to convert Graphite to Graphene, CGT is producing a high value addition, which is Graphene and its associated products for the export market.

Manju Gunawardana, Chief Executive Officer – Research and Innovation, LOLC Holdings.

Pure Graphite from the Kahatagaha Graphite mines.

Graphene's unique combination of extraordinary properties offers a fascinating material platform for the development of next generation technologies in many areas – superfast high capacity batteries, sensors, anti-corrosion coatings, water treatment, medicine and technologies. Graphene is a sheet of carbon atoms in a honeycomb structure and many stacked graphene sheets create graphite. The material was first discovered in 2004 by two researchers at The University of Manchester, Professor Andre Geim and Professor Kostya Novoselov.

Above: Graphite is converted to Graphene within the specialized equipment.
Right: The US patent received by SLINTEC for the unique technology.



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(54) **METHOD FOR THE SYNTHESIS OF GRAPHENE OXIDE**

(71) Applicant: **Sri Lanka Institute of Nanotechnology (PVT) Ltd.**, Waligama (LK)

(72) Inventors: **VIRAJ C. JAYAWARDENA**, Pitipana (LK); **DILUSHAN RUKMAL JAYASUNDARA**, Pitipana (LK); **GEHAN AMARATUNGA**, Pitipana (LK); **VIMUKTHI JAYAWEERA**, Pitipana (LK)

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C01B 31/04 (2006.01)

(52) **U.S. Cl.**
CPC *C01B 31/043* (2013.01)

(57) **ABSTRACT**

Graphene oxide is synthesized by chemical treatment of graphite using only H_2SO_4, $KMnO_4$, H_2O_2 and/or H_2O as reagents. Graphene oxide films obtained using the method disclosed herein were characterized using various analytical techniques. These analytical techniques confirmed the creation of single to few layer graphene oxide with relatively large lateral size distribution using the method disclosed herein.

Ceylon Graphene Technologies has the largest and the most sophisticated factory in the region to convert Graphite into Graphene.

The duo subsequently won the Nobel Prize in 2010 for their discovery.

Sri Lanka is the only country in the world that produces vein graphite and it is one of the country's main mineral products. Sri Lankan vein graphite is mainly sourced from three mines located in Ragedara, Kahatagaha and Bogala, these sources have ultra-pure highly crystalline vein graphite with more than 98 percent carbon purity. Graphite is converted into Graphene through a unique process, which includes both chemical and physical processes.

Graphene products include Graphene Oxide, Reduced Graphene Oxide, Functionalized Reduced Graphene Oxide, and Expanded Graphite. The price of Graphite is approximately USD 2/kg and six kilograms are required to produce a kilo of Graphene, which is worth over 3,000 US dollars. Through our process we are adding massive value addition to the raw material, and therefore expecting to earn high revenues to the country through export.

Ceylon Graphene Technologies has the largest and the most sophisticated factory in the region to convert Graphite into Graphene. CGT holds the patent for the technology to convert the raw material to the

Right: The Graphene manufacturing plant.
Below: One of the Graphene products– reduced Graphene Oxide.

final product. Amongst its ambitious goals, CGT plans to be the High-Quality Graphene and Graphene Derivative manufacturers in the market whilst improving research and acquiring commercial advantages in the energy storage industry for high performance graphene additives for battery manufacturers worldwide. Graphene exhibits excellent mechanical, electrical, thermal and optical properties and is particularly suitable for the implementation in electrochemical applications. Thus, during 2019, CGT launched the first ever Graphene applied Lead Acid Battery Technology together with Associated Battery Manufacturers (Ceylon). This product is already in the market under the Lead Acid Battery range of Exide.

CGT also has many ongoing projects in areas such as; plastics, and different composite materials like clay, as well as using Graphene in drug delivery.

CGT is the only company to export Graphene commercially, with many contacts requesting our products in US, Brazil, Russia, and Japan.

While Graphene production is only done at CGT, Graphene research is conducted at all universities including Colombo, Peradeniya and Wayamba as well as the National Institute of Fundamental Studies in Hantana.

The National Institute of Fundamental Studies is researching on Graphene applications and they are now working on developing Lithium Ion batteries with Graphene.

I am a Board Member and an Advisory Committee Member of The National Graphene2D Association (NGA2D), the leading organization in the US advocating and promoting the commercialization of graphene and graphene-like materials. Through this Association we receive great exposure and also network with many companies worldwide and are able to exchange knowledge with universities in the US as well.

Graphene is the greatest innovation of this century, with the capabilities of Graphene increasing by day. It is very important to Sri Lanka because we have the raw material Graphite in the country. With this advantage, CGT has the technological edge and we are driven by our innovative spirit to cater the worldwide graphene demand. BL

Manju Gunawardana
Chief Executive Officer
Research and Innovation
LOLC Holdings

ONLINE

LiveRoom: Creating the new normal for business

LiveRoom was established in 2015. Currently the Company's Technology Development Center is in Colombo, and R&D and Design Center is in Bandarawela. Specializing in Augmented Reality (AR), Virtual Reality (VR), Computer Vision and Graphics Solutions with a focus on 3D, LiveRoom has created the Cloud platform solution, OGMO, which brings augmented reality to any e-commerce platform.

L-R: Sameera Nilupul, Director and Achala Weerasooriya, Chief Operating Officer, LiveRoom.

Above and below: OGMO was created by LiveRoom and allows customers to bring augmented reality (AR) to their products especially on e-commerce platforms.

The LiveRoom team at the CEBIT conference.

The key markets that LiveRoom serve are Japan, Europe and Singapore while also providing services to other markets. Within the scope of the four areas that the company specializes in, LiveRoom focuses on artificial intelligence (AI), AR, VR, computer vision, graphics based software development, digital human technology, 3D scanning and content creation.

Innovation is integral to the functioning of the organization. LiveRoom designed and developed a digital human design studio for a Japanese client, which is essentially used for ergonomics designs as a whole. Generally, a large number of prototypes need to be made to test a design. However, with the digital human design studio that is not required. Actual scenarios under real conditions are simulated using computer generated content applying even the minute details of physics as well. Other novel innovations include, the virtual fitting room developed for a US fashion tech company, the core software that generates the 3D graphics in Japanese vehicles on its dashboard, and, utilizing AI the automated damage protection system for an Australian client, which were also developed by LiveRoom. The Fit app was developed for a Swedish company where the body size can be determined when shopping online as there are numerous size standards. To use this app, one only requires to take a photograph of the front and side view and the app would determine the clothing size with confidence.

OGMO is LiveRoom's own product to which the patent has been received as well. The platform allows companies to bring augmented reality to their products. For example, if you are a manufacturer in Sri Lanka and you wish to send your sample to a customer in the US, generally, you would have to ship your product. That is time consuming and it is costly. But with OGMO you can scan the product and create a digital twin. Thereafter only the link needs to be emailed to the customer and they can view and experience the product prior to purchasing. There is a diverse clientele in Sri Lanka ranging from porcelain to garments and tires that are using this platform.

Augmented reality provides the opportunity to visualize products in a more realistic manner. For example, if you are a porcelain exporter in Sri Lanka and you want to showcase your products to a foreign client, the best option is to first share the product with augmented reality so that customers can see it in their own environment given the right scale with lighting conditions and the right material properties. Furthermore, OGMO is useful for online sellers as well. In most instances a buyer would only be able to see a photograph of the product and they would go away without purchasing because they do not have the confidence. OGMO assists them in visualizing their products better so they can experience the product in their own environment, using augmented reality and make their buying decision. E-commerce is the main platform for OGMO, where it creates the customer confidence in the product they

Experiencing a virtual showroom on Oculus Quest, same experience available for web and mobile.

wish to purchase. The main market segment for LiveRoom is companies that wish to create an experience to their customers. In a post COVID-19 world, Augmented Reality Shopping, Virtual Showrooms and Product Configurators are the best way of providing the next level experience to customers and LiveRoom is capable of developing such solutions.

With the COVID-19 pandemic, there has been an increased interest in OGMO as more customers acquire online services. Online vendors were keen to have a digital product of their own as it would be easier for them to share their product without doing so physically. It is very convenient as well as time saving. OGMO created a huge difference in this segment. Many online vendors and clients saw the need for augmented reality to promote their products but to build an app from the start is very costly. Therefore, a readymade platform like OGMO with a subscription model helps them. It is a plug-and-play solution. The client has to install a plug-in into their platform and thereafter they can visualize the products. While larger conglomerates may have their own software development teams, for small businesses OGMO provides an essential service.

All apps developed by LiveRoom, whether it be OGMO, or solutions for clients the content needs to be created in 3D so it can be visualized in the outer environment. In terms of innovations in the future, LiveRoom is looking at reducing the cost associated with creating 3D content. A solution is being considered where the online vendor himself can scan the product and the 3D image to be created automatically with a minimum amount of design interaction. Currently a portable 3D scanner is being developed similar to a mobile 3D app where the 3D reconstruction will happen and stored on Cloud. The clients/online vendors can create their own 3D content to give an augmented reality experience for their customers.

Computer graphics, computer vision and 3D are mutually connected with Artificial Intelligence. A solution cannot be presented without an AI component in it. 3D scanning is done using AI as well. All that needs to be done is that a one-minute video needs to be recorded of the product, which is uploaded to the OGMO Cloud and the AI will generate the 3D model.

The Colombo office of LiveRoom focuses on technology development while the facility in Bandarawela is focused on 3D designing where internship programs are provided as well. The reason as to why Bandarawela was selected as a location was that it is situated between three good universities; Uva Wellassa, Sabaragamuwa and Peradeniya. While Bandarawela and Badulla have good talent, there was a gap in opportunities and access to resources. Thus, LiveRoom decided to provide the internship program to these graduates. We wanted to close the gaps between Sri Lankan and international standards of designing and content creation.

Sameera Nilupul
Director
Achala Weerasooriya
Chief Operating Officer
LiveRoom

SUSTAINABILITY

BIO FOODS: Organic, biodynamic and Fairtrade

**Built on the foundational values of sustainability, traceability, reliability and food security,
Bio Foods has been able to proudly provide customers all around the world with truly organic and sustainable food products for nearly three decades. Established in 1993, by Dr Sarath Ranaweera as a family owned business based in Kandy, Bio Foods is now the leading processor and exporter of organic, biodynamic and Fairtrade food products in Sri Lanka.**

Bio Foods was the Winner of the German Sustainability Award for Corporate Partnerships (Jointly with GLS Bank, Germany) – 2020 (Düsseldorf, Germany). Dr Sarath Ranaweera, Chairman, Bio Foods is in the centre.

Operating with the vision of becoming the best environmentally friendly organic food producer in Asia and achieving global customer satisfaction – we have provided our customers with a variety of products ranging from organic tea, spices, herbs, coconut products and frozen fruits and vegetables, keeping in line with global demand for chemical free, healthy food and beverages. Due to our high quality and innovative product range, our international customer base has grown from markets in the European Union to North America and Asia.

Owing to his commitment towards the company vision and ethical standing Dr Sarath Ranaweera was awarded the first ever "World Fairest Fair Trader Award" in 2014, presented by the Fairtrade Labeling Organization (FLO). Further we take pride in securing many other local and international awards and recognition for our unparalleled commitment and unwavering focus on Fairtrade and sustainability, including the following:

- **Winner of the German Sustainability Award for Corporate Partnerships (Jointly with GLS Bank, Germany) – 2020 (Düsseldorf, Germany)**
  Europe's most prestigious award in the field of sustainable development
- **Finalist at the Sustainability Food Award – 2019 (Amsterdam, Netherlands)**
  Only Finalist from Asia in the World Pioneer and Leadership categories.
- **Presidential Awards – 2018**
  Discovery of special enzyme in activator for green tea processing – second place in food technology.

The certifications and quality standards acquired over the years such as FairTrade, Demeter, USDA, JAS, Bio Suisse, UTZ, BRC, FSSC 22000, and many more, stand as proof of our ethical, organic, quality standards and innovation that we proudly present to our customers all around the world. As the "World's First" organic and FairTrade registered exporter of spices and coconut products, we have progressed over the years to be a leader in what we do, supported by 11 factories around the country, approximately 10,000 farmer base and warehousing capabilities in Germany and Canada.

As a longtime processor and exporter of high-quality products, Bio Foods plays a major role in the organic post-harvested food industry in Sri Lanka. While fulfilling the ever-growing needs of the international market, we take all the necessary steps and responsibility to assure the sustainability of all stakeholders of this essential supply chain; from producer to consumer. We provide a guaranteed minimum price at the farm-gate, transparent documentation for assured traceability and rigorously maintain local and international environmental regulations.

When talking about innovation, what sets us apart from our competitors – is our diverse product portfolio with truly organic practices.

Coconut

Bio Foods Makandura coconut processing unit predominantly produces organic coconut milk in a variety of canned and aseptically packed products. Our innovative and streamlined manufacturing process ensures that the final product complies with the highest quality and international food safety standards.

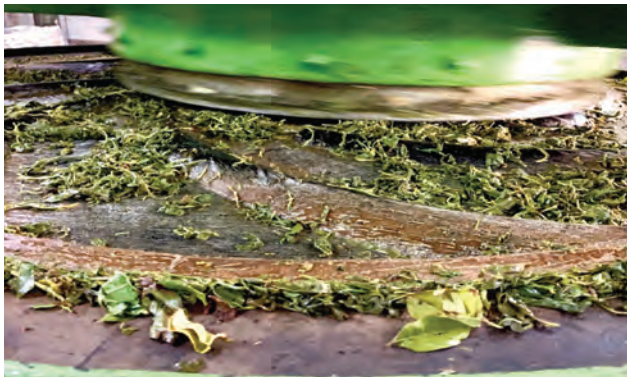
Displaying our innovativeness we have introduced a range of flavored coconut milk with ingredients such as ginger, lemon grass, turmeric, black pepper, and more. These recipes are developed in-house by our own competent research and development team. Attesting to its uniqueness, these flavored coconut milk products are in high demand and exported to many countries.

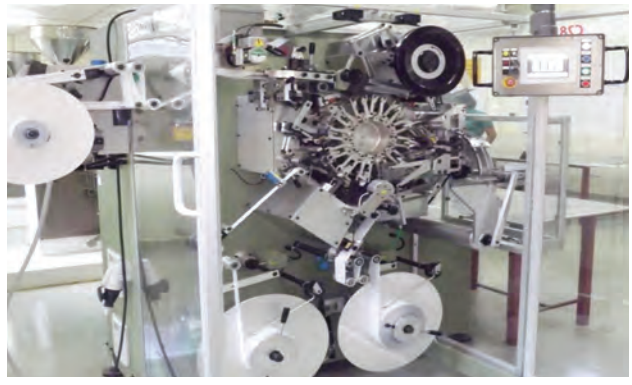
Spices

With our factory being situated in the central dry-zone of Sri Lanka, our organic, Fairtrade and biodynamic spice range includes black pepper (our major export crop) and white pepper, cinnamon, cardamom, clove, nutmeg, mace, turmeric, and ginger.

Keeping in line with our value of innovation, we are the first processor to use Liquid Nitrogen for milling. Cryogenic milling is a very advanced technology adopted by leading processors in EU which preserve all flavor compounds, other volatile oil, color and goodness. This has

Coconut is processed to produce flavored coconut milk products that are in high demand and exported to many countries.





With processing facilities in Gampola, Diyathalawa and Mahauva, Bio Foods offers a wide range of organic black tea, green tea and flavored tea.

allowed us to make powders with extra fine texture and free flowing qualities. Furthermore, we have adopted special sterilization techniques for various types of spices so that we can sell them at very competitive prices. These techniques were developed after very lengthy research and development trials and experiments.

Add to this, we have developed our own techniques for making white pepper without smell and prominent whitish color. The process of making nutmeg ensures that total aflatoxin and ochratoxin remain at very low levels. As a result, we have become the leading seller and our nutmeg de-shelling mechanism is developed in the in-house engineering division which results in zero damages to the nuts while de-shelling.

Frozen

Over the years quick freezing was established as a widespread commercial method for long term preservation of perishable food in the industrialized countries. One of the latest processing technologies in ensuring product quality, texture and the taste while providing two years plus shelf life is the Individual Quick Freezing (IQF) technology. With two processing lines in our frozen product factory located in Pannampitiya, we are the largest IQF food products processor in Sri Lanka at present. We have introduced a new IQF milling mechanism after discussions with one of the largest machine suppliers in USA. Our IQF products range from coconut milk cubes, green tea cubes, lemon grass, ginger, jalapeno, herbs and many more fruits and vegetables. Our high value added IQF green tea cubes and milled production is a one of its kind innovation in the frozen food products industry which was formulated according to a concept of the Chairman.

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Fertilizer

Located in the central dry zone of Sri Lanka, the Eco Planet fertilizer unit of Bio Foods was initiated to play the role of introducing new organic agriculture inputs, technology and knowledge to the Sri Lankan agriculture industry. Through continuous and extensive research under the guidance of Chairman, Dr Ranaweera, we were able to successfully introduce a unique organic certified fertilizer that is not merely compost. This is composed of a combination of organically

Bio Foods high value added IQF green tea cubes and milled production is truly a one of its kind innovation in the frozen food products industry.

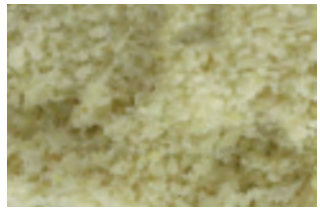
Mango chunks

Chillie - Jalepeno

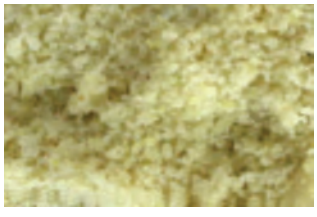
Lemongrass

Tea cubes

Cobra Chillie - red



Ginger - milled



Lemongrass - milled

Pineapple - tidbits

Curry Leaves

certified compost and beneficial soil microorganisms that no longer exist naturally in the soil. Through the use of our organic fertilizer, farmers have reported much higher yields than with the use of conventional fertilizer. Also attesting to this, studies have shown, on average with the use of Bio Foods organic fertilizer – a 30 percent higher yield has been harvested from crops such as tea, coconut, paddy, onion, vegetables and spices.

Tea

With processing facilities in Gampola, Diyathalawa and Mahauva, we offer a wide range of organic black tea, green tea and flavored tea. These tea range in dust, fanning, broken and leafy grades as well as in the form of extracts. As a proud initiative of Bio Foods with regards to our range of tea - Mahauva project takes prominence. The Mahauva project was initiated in 2016 to keep up with the international demand for organic and Fairtrade teas. Bio Foods rehabilitated a factory at this Mahauva plantation that had fallen into disrepair due to a long period of non-use. Through this project, Bio Foods began processing of a new range of green and black teas, provided by small-farmers affiliated with the project, according to the sustainable 'Farmer Outgrower' model. Prior to engaging with this project, these farmers were merely daily paid workers, but are now educated and trained to farm under a sustainable organic program. This contributes to over two decades of Bio Foods' history in sustainable, eco-friendly food production. Green tea is processed through special patented technology by which excellent and pleasant green tea characteristics are achieved and maintained.

Throughout our 27 years of history we have always believed in organic way of life. We take pride in feeding people all over the world a truly healthy product, contributing to preserve Mother Nature and providing a sustainable living to our farmers. BL

RESEARCH AND DEVELOPMENT

HDDES: Innovation in natural essences

Using methods of steam distillation and solvent extraction, HDDES is one of the few companies that specializes in organic and conventional spices, essential oils, oleoresins, herbal extracts, floral extracts, hydrolates, natural aromatic chemicals, coconut based products and instant tea.

The HDDES production facility in Horana.

Having started in the 1930's as a spice business primarily with Cinnamon as the key product, HDDES further expanded as an exporting business in 1982. After I joined the business in 1990, I decided to take the company in a different direction where we went beyond spices. We focused on value addition and once we moved our production facility to the BOI Zone in Horana we started to manufacture the main products such as essential oils and oleoresins in the conventional and organic forms by using the methods of steam distillation and solvent extraction. Our products are used in the flavor and fragrance industry, pharmaceutical, nutrition, food and beverages and aromatherapy industries. The Group diversified its portfolio and invested in the latest technology in order to introduce floral and herbal extracts to the export market.

HDDES provides high quality spices such as organic and conventional spices, ground spices either in bulk quantities or consumer value added packaging with the quality systems placed in the factory ensuring high quality standards throughout the vertical integration process. We use sophisticated nano-tech steam sterilizing mechanism to maintain the optimum quality of the spices.

Gehan De Silva, Managing Director, HDDES Group.

Above photographs: Research and Development by scientists in state-of-the-art laboratories. Below: Value addition is done at the production facility.

In terms of essential oils, HDDES utilizes a range of natural raw materials to produce these oils. An essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds from plants. At HDDES, essential oils are extracted by steam distillation, hydro distillation and supercritical extraction using carbon dioxide. The oils are used in perfumes, cosmetics, soaps and other products, as well as food and drink flavoring and fragrances of incense and household cleaning products.

In terms of coconut products, while the usual products are also manufactured, we have developed a process to produce organic extra virgin coconut oil, Medium Chain Triglycerides (MCT Oil) and MCT Oil powder from selected and certified organic farms. The MCT Oil powder is a value addition of the extra virgin coconut oil where we have fractioned the coconut oil. The process to produce MCT oil and powder was developed through research. In such a manner we are developing new methods to further extract different herbal materials that would provide health benefits to the consumer.

Hydrolates are produced through the steam distillation process. The main hydrolytes that are produced at HDDES are from the aromatic spices, wood and grass distillated with water. This combination is heated using steam that captures all the essential oils with trace amounts of aromatic compounds, which dissolve in the water. Once the essential oils separate through a sophisticated separation process, the hydrolates are stored in large stainless-steel vessels. Hydrolates are used in the aromatherapy and cosmetics industries.

We specialize in the production of oleoresins. Oleoresins are mixtures of volatile and non-volatile compounds of botanicals, which are extracted from

We are the only company in the world to produce the Blue Lotus extract, which is greatly used in the manufacture of high-end perfumes and cosmetics. HDDES holds a dominant place in the floral extract market in Sri Lanka.

Above: Solvent extraction in process.
Below: Many innovative products are manufactured at the HDDES factory.

spices available in Sri Lanka namely, Black Pepper, Cardamom, Nutmeg, Ginger, Cloves, Garcenia, Lemongrass, and Cinnamon. Oleoresins are used as a flavor enhancer in the food and beverage industry.

Research and development is a continuous process at HDDES and we have 15 scientists working with us. We have developed many innovative products for various industries. One such area is floral extracts, which are obtained from the flowers grown in the tropical climate of Sri Lanka. HDDES is the only company to add value to the Blue Lotus, which is the National Flower of the country. We are the only company in the world to produce the Blue Lotus extract, which is greatly used in the manufacture of high-end perfumes and cosmetics. HDDES holds a dominant place in the floral extract market in Sri Lanka. We are presently the only company in Sri Lanka who is able to manufacture any required fragrance tailor made to individual customer needs. With the expansion of the Companies portfolio, HDDES ventured into the medicinal plant extract segment as well. These products are mainly used in the pharmaceutical industry. The medicinal plant extracts are manufactured through solvent extraction with the use of approved solvents and are used to manufacture medicine to treat patients with various ailments.

In terms of flavors, we have partnered with two companies in

Above: Left, HDDES is the only company to extract essesnces from the Blue Lotus.
Right, manufacturing of incense sticks.
Below: Packaging of finished products.

France and Spain to produce the best flavor solutions for tea, food, bakery products, beverages, confectionary, candy and medicinal preparations. Many of our products are suitable for vegans, lacto vegetarians, ovo-lacto vegetarians and coeliac individuals. The flavors comply with the highest standards in the EU and follow EU specifications.

One of our latest products is the Smoke Liquid. We use 100 percent natural ingredients to produce the smoke liquid which can be used in the meat processing, sausage processing as well as to produce smoked goods such as smoked salmon and ham without actually using charcoal. No chemicals are added, it is a physical process that produces 100 percent pure and natural smoke flavor. We are happy to say that we are the only company to perform multiple value addition to a single product. For example; with Cinnamon, we do 500-600 times value addition at various stages so that nothing is wasted.

We have transformed the entire incense sticks industry in Sri Lanka, which was monopolized by overseas suppliers. With the assistance of our R&D team we utilized all natural waste produced from the various manufacturing processes and added value to create a different type of product. This is a CSR project with more than 300 women working with us on this project. The waste from all the spices are utilized as a base raw material to make the incense stick. We are happy with the entire project and we have created two important incense scents; one is to control mosquitos, which is highly effective and the other type of incense stick helps to prevent human-elephant conflict. The elephants do not like the fragrance of the incense sticks, thus once lit they would not approach villages or paddy fields. We have done research with the Wildlife Department and I believe it is a good solution to control the human-elephant conflict and save the humans as well as the elephants.

With the COVID-19 pandemic situation there is great demand for various spices especially Cinnamon. We wish to stress that it is the pure Ceylon Cinnamon that has the medicinal and healing benefits. We use only pure Ceylon Cinnamon in all our products. Our entire team is working on creating immune booster products specially to address the current situation. There are two pharmaceutical companies interested in our products, one in the US and the other in the UK. Much value addition can be done to pure Ceylon Cinnamon as it is only available in Sri Lanka.

We have developed our team so that we produce finished products for export instead of sending our raw materials overseas. We have developed more than 300 products and there will be more to come in the future as well. BL

Gehan De Silva
Managing Director, HDDES Group

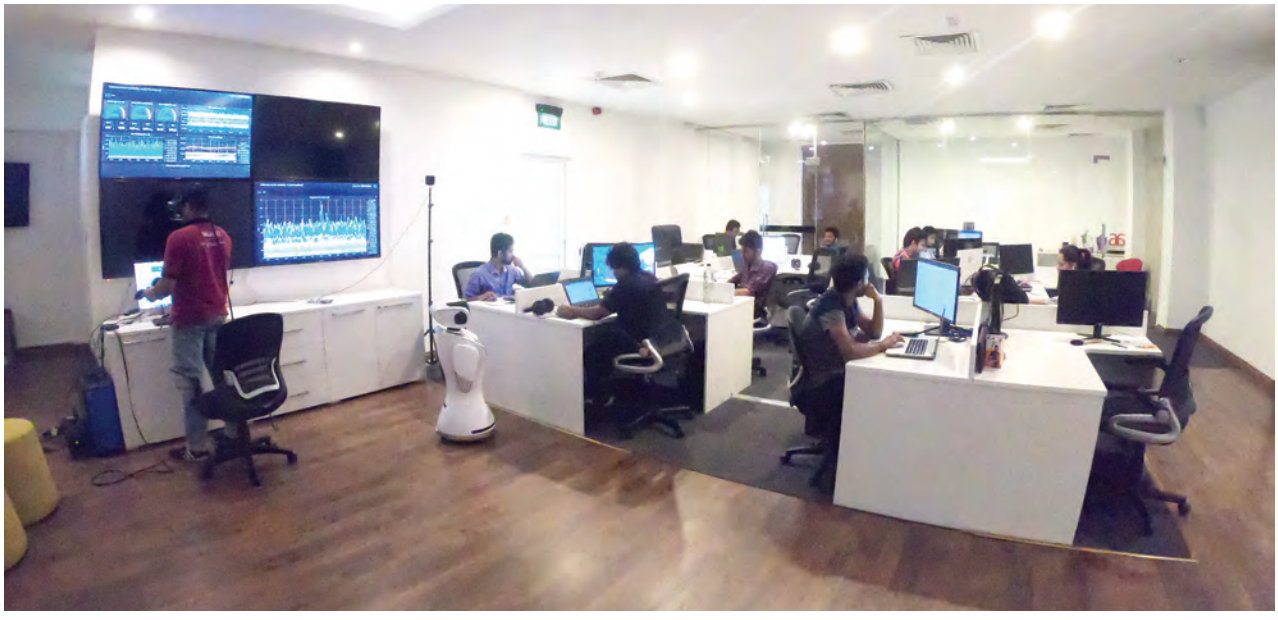
DIGITAL

Arimac: Blending creativity with technology

Diyazen, the pioneering humanoid robot in South Asia.

The Arimac family with our trademark digital disruption has revolutionized the corporate digital landscape of Asia through the transformational uplifting of the digital standards of many multinationals and blue chips for nearly a decade. Together we have reached remarkable milestones in Robotics that gave birth to Diyazen the pioneering humanoid robot in South Asia and other large scale international projects. Arimac's Innovations and disruptive strategies have been a game changer in the Sri Lankan Tech arena and the following are some insights into our key innovations and milestones.

Chamira Prasad Jayasinghe, Founder, Arimac.



The Arimac office inculcates an innovative environment.

Believing in and honing Sri Lankan talent

Arimac was launched in 2011 with the vision to blend creativity with technology and create groundbreaking innovations, when I identified that there was no platform for talented engineers to be creative and bring to life their futuristic ideas. Our key goal was to mitigate brain drain and halt the country's most talented tech minds from moving on to nourish the tech landscape of other countries. I was determined to give these individuals the ability to stay on in their motherland and shine bright by providing the right tools and infrastructure to fuel their dreams. Most importantly I wanted to break the barrier and myth that one must possess a degree and be fluent in English to gain entry to and excel in the field of IT. We opened the doors wide for pure talent, no longer were language and educational qualifications barriers to access this dynamic field. The Arimac philosophy is to empower young people to achieve their fullest potential and equip them with the knowledge and tools to do so.

Chamira Prasad Jayasinghe with Diyazen, the humanoid robot.

NERO one of the latest games by Arimac will be launched soon.

We opened the doors wide for pure talent, no longer were language and educational qualifications barriers to access this dynamic field.

At Arimac, we as a policy do not compete with other Sri Lankan technology companies as our wish is for all Sri Lankan tech entities to excel and place Sri Lanka on the map. We are happy to take on the onus to help any company that needs our guidance or wishes to engage in knowledge sharing with us.

Innovation that takes on the world

Our Innovation has reached global altitudes through the acquisition of high net worth clients and the completion of massive global campaigns. An example of these would be the Butterfly Effect - project done for the United Nations to showcase the UN's Sustainable Developmental Goals, which received millions of impressions from across the world. For VISA, the international aggregated Payment Company, we developed an e-Commerce platform that allowed an extended shopping experience, through (AR) Augmented Reality. We also designed and developed the biggest application ever done for an Airline – the world's first application to earn and redeem miles, real-time, done for Etihad Airlines. In yet another example, Arimac developed a platform for Dhiraagu a leading telecom provider in The Maldives – an island with a population of around 500,000. Dhiraagu attracted more than 300,000 users through Arimac's solution which became the most downloaded and active app in The Maldives – the only product of its nature in the world and a direct result of Arimac's Design Anthropology service.

Innovation in Gamification and Gaming

We also spread our wings of innovation across gaming and established this area of expertise in Sri Lanka with yet another twist of differentiation. We created an eco-system with multiple types of gaming, like hyper casual, mobile gaming and desktop gaming, with the biggest gaming milestone being Kanchayuda. Arimac also set the curriculum for gaming for students in Sri Lankan Universities. We are extremely pleased to have introduced cognitive computing where the player's complete cognizance is analyzed – which we call Hexagon of Cognition. This tracks the cognitive skills of the user, such as mathematics skills, memory and strategy. In collaboration with Neurosurgeon, Dr Kishara Guneratne who is affiliated with Harvard University, Arimac is opening up a different dimension for gaming to help children with cognitive disorders such as ADH or dyslexia.

The Arimac team.

Propelling the future of the Industry

With regard to the future of the tech industry in Sri Lanka, we strongly believe that the future in tech is strongly based on the success of startups. We are acquiring startups aggressively to nurture them. Many startups although rich in talent and innovation need a vision and focus.

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We take them under our wing and mentor them with our experience gained and ensure that they don't make the same mistakes we did in the past. Our aim is to acquire 50 startups by 2023 and to reach a USD one billion valuation by 2028. We want to be Sri Lanka's first unicorn in the IT sector. The accumulation of all these companies, can and will drive the GDP of Sri Lanka.

Using digitalization to raise the country's GDP

With our Industry leadership of nearly a decade, we believe that if Sri Lanka carefully nurtures its sharp young minds brimming with innovation which surpasses those in developed nations, Sri Lanka could create the next world-changing, groundbreaking app or innovation. To raise the country's GDP and to diminish debts, the route that the nation must take is through the revolutionizing of the digital sphere. What can be earned through manufacturing is far less when compared to the incredible contribution that effective digitalization has the potential of making to the nation and the world. The barriers to entry are limited in the tech industry. A singular idea or an imaginative game, can bring unprecedented success. In comparison, manufacturers have large barriers to entry, starting from the investment in infrastructure and massive overheads. Therefore, if this proactive and youth oriented Government together with private sector related to technology solutions focus on developing Sri Lanka's tech landscape, the country will definitely be geared to experience unprecedented growth and development.

Chamira Prasad Jayasinghe
Founder, Arimac

GO DEEPER

Quality

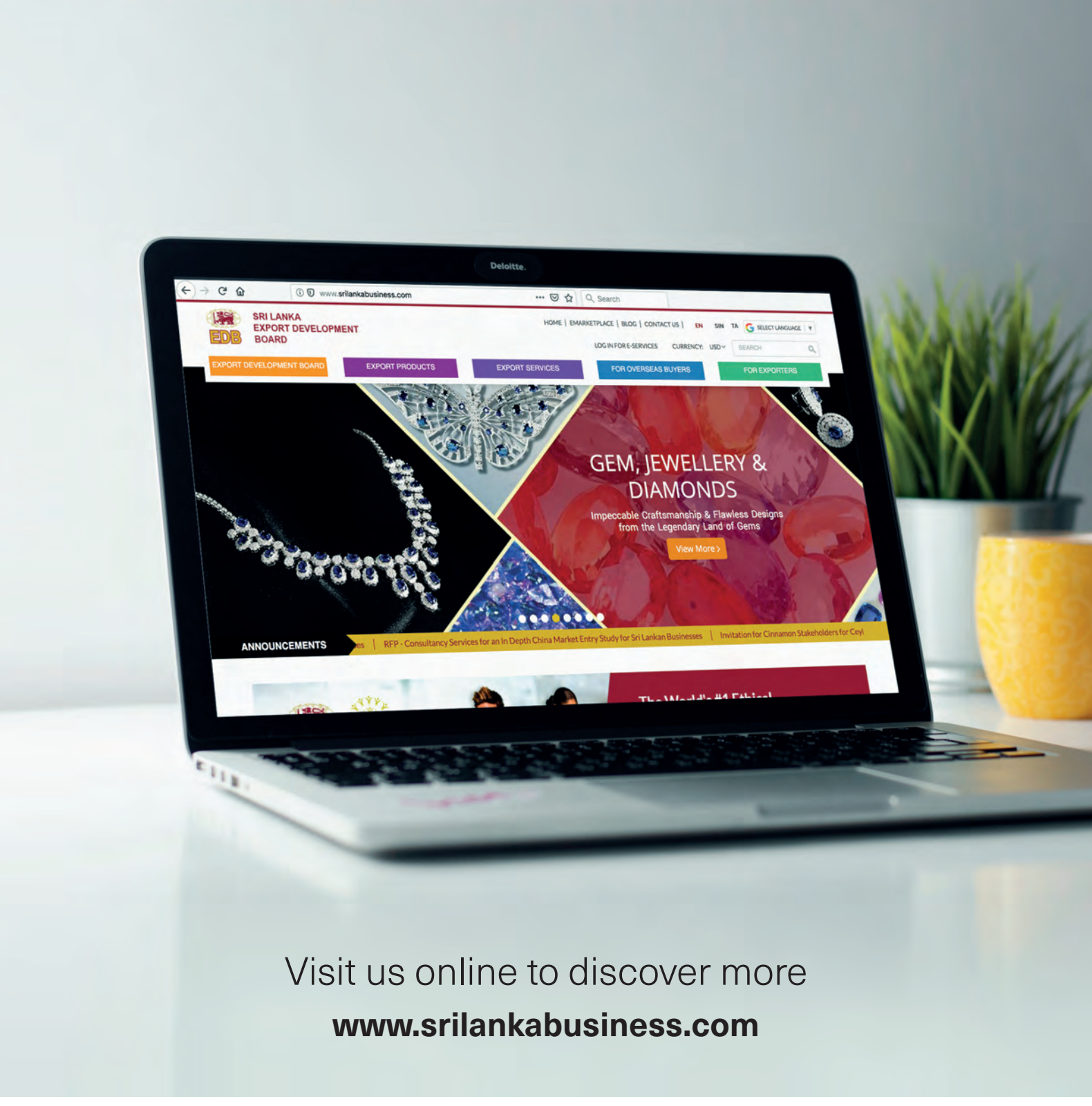
Quality is measured in many ways utilizing specific techniques. A product quality can be defined by its features, conformance to specifications and also that it is without any defects.

Quality is essential in any industry, whether it be agriculture, manufacturing or services. It is the measure in which a consumer/client determines whether to proceed with a certain product or not. Quality is based on the inherent properties of the product/services offered. Quality is measured in many ways utilizing specific techniques. A product quality can be defined by its features, conformance to specifications and also that it is without any defects. Quality may be interpreted differently according to the criteria and the respective environment/ country.

Quality standards are determined from the raw material stage to the production process and the final product stage as well. This can vary from industry to industry. Certifications are issued when quality standards are met and many organizations ensure that they obtain the required certifications to enable their product and organization to be of a high level in the consumer/customer's mind.

It is essential to maintain quality standards when engaging with the export market as each destination has its stipulated requirements. Furthermore, in this highly competitive global market it is important to be able to identify the best quality products that fulfill the required standards.

In the next issue of Business Lanka we will be focusing on quality and its importance focusing on the Sri Lankan context where goods and services would be on par with similar products internationally. BL



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