



**7<sup>th</sup> ANNUAL RESEARCH SESSION**

**SABARAGAMUWA UNIVERSITY OF SRI LANKA**

**13<sup>th</sup> DECEMBER 2017**



***Strengthening Research, Technological Development and Innovation  
for the Future***

**Abstracts of the 7<sup>th</sup> Annual Research Session, Sabaragamuwa University of Sri Lanka**

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**7<sup>th</sup> ANNUAL RESEARCH SESSION  
SABARAGAMUWA UNIVERSITY OF SRI LANKA**

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## **Message from the Vice-Chancellor**

### **Sabaragamuwa University of Sri Lanka**

It is a great pleasure and a privilege to welcome you to the 7<sup>th</sup> Annual Research Session 2017 of the Sabaragamuwa University of Sri Lanka. The annual research session is a major event of the University Calendar. Annual Research Session has been providing an ideal platform for university academics, postgraduate and undergraduate students to share their research findings and I am confident that the young academia of Sabaragamuwa University of Sri Lanka will immensely be benefited from the ARS – 2017.

I take this opportunity to congratulate the organizing committee for taking the challenge and organizing the 7<sup>th</sup> Annual Research Session in a very professional manner. I have no doubt that ARS – 2017 will offer our university academia to share their national and international experiences, latest research findings and insights with their colleagues in the different fields of interest.

Finally I hope that all of you would enjoy with the ARS 2017 and would experience a very stimulating and interesting session.

**Prof. M. Sunil Shantha**

Vice-Chancellor

Sabaragamuwa University of Sri Lanka

## **Message from the Director**

### **Centre for Research and Knowledge Dissemination**

#### **Sabaragamuwa University of Sri Lanka**

In marking the significance of the Annual Research Session (ARS), as the Director of Centre for Research and Knowledge Dissemination (CRKD) it is a great pleasure for me to forward this message on the 7<sup>th</sup> ARS of Sabaragamuwa University of Sri Lanka (SUSL). Universities are committed to encourage research and knowledge dissemination to determine the sustainability. ARS provides a platform annually for academic and students to disseminate their new research findings on predominantly specializing areas of interest. Here, the university shows consistent encouragement and leadership through the ARS towards its vision. Since the CRKD is the body purposefully established for the research and knowledge dissemination of SUSL holding the 7<sup>th</sup> ARS marks the milestones in the successful journey. Besides, the ARS is becoming a well-recognized institutional stimuli to build the confidence and research culture. Hence a number of enthusiastic and energetic young researchers from diverse disciplines in the university proliferate the magnitude of the 7<sup>th</sup> ARS remarkably. Enabling the intra and interdisciplinary networking and dialogue among the growing researchers to widen the knowledge on research and sharpen critical thinking of research. Eventually this enables the university to expand the horizon research and publication reaching national and global standards. This also will be an opportunity for the CRKD to expand its resource base to serve for the stakeholders and wider community. The presence and keynote speech of the well-known scientist and eminent scholar in Sri Lanka help the upcoming scholars and researchers to mold them to suite the future world. As the Director of the CRKD I really appreciate and acknowledge the leadership and guidance of the Vice-Chancellor, Prof. M. Sunil Shantha, and the support of Registrar and Bursar in holding the 7<sup>th</sup> ARS. I am also obliged to acknowledge the 7<sup>th</sup> ARS organizing committee specially the Chairman, Dr. R. M. K. T. Rathnayaka and Secretary, Dr. G. R. S. R. C. Samaraweera, for their untiring efforts to hold it through many challenges.

I extend my best wishes for the success of the 7<sup>th</sup> ARS while extending my gratitude for contributors and presenters.

**Dr. M. S. M. Aslam**

Director

Centre for Research and Knowledge Dissemination

Sabaragamuwa University of Sri Lanka

## **Message from the Chairman of the 7<sup>th</sup> Annual Research Session 2017**

### **Sabaragamuwa University of Sri Lanka**

It is with immense pleasure that I write this message as the chairman, on behalf of the ARS 2017 Organizing Committee to welcome you all to the 7<sup>th</sup> Annual Research Session of the Sabaragamuwa University of Sri Lanka. I have no doubt that ARS-2017 will offer our university academia to share their international and national experiences, latest research findings and insights with their colleagues in the different fields of interest. Our main aim of organizing this event is to inculcate a productive research culture and promote scholarly discussion among the academics of our university, emphasizing on the applied research that can contribute to the nations' development and sustainability. ARS 2017 is apart from this, a platform given to the undergraduates who identified by respective departments well in their undergraduate studies can be seen as right motivation for them to step further into their academic carrier and become accredited among the scientific community.

On behalf of the ARS organizing committee, we are much delighted to organize ARS 2017 and obliged to convey our sincere thanks to the Vice Chancellor of Sabaragamuwa University of Sri Lanka, Professor M. Sunil Shantha, for providing us with right guidance throughout this event and encouragements.

Furthermore, we are indebted to our Chief Guest, Senior Professor Hemanthi Ranasinghe, Dean, Faculty of Graduate Studies, University of Sri Jayewardenpura and the Technical Speaker, Mr. Pubudu Liyanage, Director / Human Resources and Process Development at IFS R&D Ltd., for gracing this occasion with their intellectual speeches. We would also like to make this an opportunity to express our gratitude to the Director, Centre for Research and Knowledge Dissemination Center, Dr. M. S. M. Aslam for the invaluable support that he extended to make this event a success.

There were over 60 abstracts submissions for the 7<sup>th</sup> ARS and it was a real challenge for the editorial board to select abstracts for the presentations because almost all the abstracts submitted were in high quality. I sincerely thank the members of the editorial board and the reviewers for their diligent work.

Finally, we wish all the researchers who had submitted abstracts for ARS 2017 as well as non-presenting researchers of SUSL all the success in your research endeavors, making 2018 a promising year to our research portfolio as a whole.

**Dr. R. M. Kapila Tharanga Rathnayaka**

Chairman - 7<sup>th</sup> Annual Research Session 2017

Sabaragamuwa University of Sri Lanka

**ABSTRACTS**  
**OF THE**  
**7<sup>th</sup> ANNUAL RESEARCH SESSION,**  
**SABARAGAMUWA UNIVERSITY OF SRI LANKA**

**Abstracts of technical sessions of the 7<sup>th</sup> ARS 2017 are organized as follows;**

- Summary of the **Keynote Speech** by Prof. Hemanthi Ranasinghe, Senior Professor in Forestry and Environment Science and Dean, Faculty of Graduate Studies, University of Sri Jayewardenepura- (pp.01-03)
  
- Summary of the **Technical Speech** by Mr. Pubudu Liyanage, Director Human Resources and Process Development at IFS R & D Limited- (pp.04-05)
  
- Abstracts of the **Oral Presentation Sessions**
  - **Session 1: Agricultural Sciences** - (pp.06-08)  
**Chairman – Prof. A. A. Y. Amarasinghe**  
**Rapporteur – Dr. P. K. Dissanayake**
  
  - **Session 2: Management Studies**- (pp.09-13)  
**Chairman – Prof. D. A. I. Dayaratne**  
**Rapporteur – Dr. R. S. S. W. Arachchi**
  
  - **Session 3: Applied Sciences (Food Science and Chemistry)** - (pp.14-17)  
**Chairman – Prof. R. M. U. S. K. Rathnayake**  
**Rapporteur – Dr. E. P. N. Udayakumara**
  
  - **Session 4: Applied Sciences (Computer Sciences & Information Technology)** - (pp.18-22)  
**Chairman – Dr. E. M. U. W. J. B. Ekanayake**  
**Rapporteur – Mr. R. K. A. R. Kariapper**

- **Session 5: Applied Sciences (Physics & Geomatics )**– (pp.23–26)  
**Chairman – Dr. Thilantha Dammalage**  
**Rapporteur – Dr. Duminda R. Welikanna**
  
- **Session 6: Social Sciences and Languages** – (pp.27–30)  
**Chairman – Dr. W. Manoj Ariyaratne**  
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- **Abstracts of the Students’ Poster Presentation Session** – (pp.32–57)

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## ***Summary of the Keynote Speech***

### **Research, Technology Transfer and Innovation: the Role of Universities**

**Hemanthi Ranasinghe**

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Research is a systematic inquiry that investigates hypotheses, suggests new interpretations of data or texts, and poses new questions for future research to explore. It consists of asking a question that nobody has asked before, doing the necessary work to find the answer and communicating the knowledge thus acquired to a larger audience. There are fundamentally two kinds of research; a pure pursuit of knowledge for its own sake and research linked to problem solving. The former is usually more appropriate for countries and situations which are able to allocate large amount of funds for research while the developing countries who are struggling with finances especially towards research and development needs to focus more on the latter in which research leads to problem solving. The research thus needs to be more focused taking on board the global and local issues and priorities. In 2015, the United Nations announced the Sustainable Development Goals (SDG) which are a collection of 17 interrelated global goals. They cover a broad range of social development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, environment and social justice. The SDGs are also known as "Transforming our World: the 2030 Agenda for Sustainable Development" or Agenda 2030 in short. The goals were developed to replace the Millennium Development Goals (MDGs) which ended in 2015. Unlike the MDGs, the SDG framework does not distinguish between "developed" and "developing" nations. Instead, the goals apply to all countries. More locally, the Ministry of Science, Technology and Research in our country, having identified the focus areas that need immediate research and development interventions came up with a comprehensive National Research and Development Framework (NRDF) having ten focus areas and ten interventions to direct research with the objectives of enhancing the quality of life of the people of the country, enhancing the economic development and laying the foundation for the country to become scientifically and technologically advanced nation while preserving its environment. The ten focus areas identified were water; food, agriculture and nutrition; health, shelter, environment, energy, mineral resources, apparel industry, ICT and knowledge services and basic sciences, emerging technologies and indigenous knowledge. This further endorses the Sustainable Vision for 2030 for Sri Lanka which is to become a sustainable, upper middle income Indian Ocean hub that is economically prosperous, competitive and advanced, environmentally green and flourishing and socially inclusive, harmonious, peaceful and just based on balanced inclusive growth. However, in order achieve these targets we need to use research, technology and innovation and positive mindsets.

Innovation is considered as an essential component or the engine of modern economies to survive within the global competition through introduction of new products, services and processes. In this approach, the importance of the interrelationship among the major actors to create and diffuse new knowledge and technology for the commercial benefits is stressed. Among the major actors, the universities are now moving to play an essential role that contrasting from traditional teaching roles to more complex and active engagements with industry and other S&T institutions (public and private), in terms of research works, sharing infrastructure, technology transfer through skilled technical personnel etcetera. The attention on the role of universities in the national innovation system of a country has been continuously increased. This is a result popularization of findings of university research activities in the processes of development of new products, services and technologies introduced by the industry. This has led to increase the importance of multi- and inter-disciplinary research and development. Further, it has strengthened interrelations for the purpose of industrial applications of basic research activities. In the university system, the traditional role in teaching and research is considered as first priority. Transferring the knowledge to industries and society began to be considered as the next priority. The third priority was the stream combination of first and second priorities. These three modes of streams require specific policies and resources to ensure the effective functioning for a strong innovation climate. As a part university role, it needs to develop models, marketable ideas and also transfer those effectively to the industry for commercialization. This Triple – Helix concept emphasized the necessity of university-industry-government interactions for these fruitful modes of streams. This can be effected in the engagement in joint research activities together with industry firms, transferring new products to industry, sharing infrastructure, mobility of high trained research and development personnel and visiting lecturing for industry etc. Universities distribute knowledge via teaching and improve the stock of human capital. Apart from that university broaden the knowledge via researching. Without satisfying from above, they need to transfer the generated knowledge to society by collaborating with industry. This category of activities is the results of the first two functions that are education and research. Third stream has not yet been a core function in the same way as the first two streams but it seems increasing attention on this. Today, universities have to play an active role in transferring knowledge, science and technology development to useful innovations all the time. In the global context, all national, regional and local levels are motivating the “third stream” which is describing the collaborative role of universities industries. Currently, university involvement for the innovation based development is greatly appreciated than earlier. Eminent universities in the world have shown three missions to be accomplished. They are trying to excel as well as to exploit and create strong connection among those missions that are teaching, conducting research and technology transfers. Role of modern universities have been recognized as create and introduce potential innovations for the requests of the societies. In contrast, industrial innovation in many developing countries is highly informal and unsystematic. Innovations in those countries are not the results of formally articulated through conscious

engagements in research and development activities. The studies in innovation should be interconnected with the country's economic and institutional development and growth. Newly industrialized countries such as South Korea, Taiwan have paid attention on strengthening their national innovation systems and were able to acquire a great economic growth. The developing countries need to pay considerable attention on enhancing their strategic capacity for innovation in the government level, institutional level, educational level etc. Comparing major inputs of the innovations in developing countries with those of developed countries, it is noted that capital accumulation which facilitates knowledge creation and learning is significantly higher in developed context resulting strong innovations. It can be concluded that innovation is the results of the collaboration between societal activities and findings of the science and technology initiatives. However, innovation does not count only as a result of technology creativeness. Most of the specific regional, social, economic factors affect to the effective innovations to be developed within countries. The developing countries need to learn from developed and newly industrialized countries and thereby try to grasp the benefits of increased economic performances.

## ***Summary of the Technical Speech***

### **The importance of close collaboration between academia and industry**

#### **Pubudu Liyanage**

Director, Human Resources and Process Development, IFS R&D Limited

Industry-Academic relationship and partnerships are becoming more and more collaborative as a result of economic volatility, competition, resource scarcity, high industry demands and rapidly changing technology. Industry interests to fund academic research have increased over last years as government funding is somewhat limited. Collaborations are not limited to academic research, but are expanding to different activities like industry funded laboratories, hybrid degree programs jointly carried out by industry and academia, student centric learning and development activities, student internships etc.

Research interests of universities and industry are traditionally at different ends – universities focusing on more knowledge driven academic research and industry focusing on profit driven applied research. But in the current setup universities have become more entrepreneurial and industry has realized the potential of academic expertise to foster their corporate objective.

Industry are having different challenges in terms acquiring the right talent with an industry ready skill set from academic institutes. This has become a fierce competition during last few years. Innovation and Creativity have become key terms in the IT industry. Technological improvements sustain short term product cycles and the need of technological advancement and readiness to go ahead with changing technologies has become essential.

If we are to look at opportunities we have there are many models in terms of collaboration:

1. Hybrid Degree Programs jointly carried out by Industry and Academia
2. Industry funded academic and student research (short term to long term partnerships) to strengthen Research and Development activities
3. Academic Institute facilitating Industry Professionals to embed with research with both academics and students
4. Industry funded incubators to promote Innovation and Entrepreneurship mindset in universities
5. Create a collaborative knowledge network of Academics, Students and Industry Professionals that will be beneficial for all the parties
6. Industry funded and maintained research laboratories inside universities

7. Industry funded programs (both mid-term and long-term programs to support universities to develop and deliver sustainable industry oriented degree programs)
8. Learning and Development activities for students – sharing industry knowledge, best practices etc. with students to make them industry ready
9. Help students to develop both interpersonal and intrapersonal skills – which has a high industry focus (this need to include both student mentoring and coaching)
10. Student Internships that gives the right level of exposure to students
11. Staff exchange programs (transfer staff from Industry to University and also from University to Industry)
12. Curriculum development activities

Key goals or outcomes of an industry academic collaboration are People (transfer graduates with right skill set to the industry), Resources and Ideas (ideas with actionable outcomes, new research directions, IP).

A right strategy is needed to have a prosperous Industry Academia collaboration that will be beneficial to both parties and also the government from an economical perspective.