



LA TROBE
UNIVERSITY

CENTRE FOR TECHNOLOGY INFUSION 2009 ANNUAL REPORT



Professor Jugdutt (Jack) Singh

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DIRECTOR'S REPORT

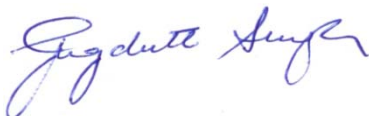
The Centre for Technology Infusion was legislated by the University in 2009 and is located at the La Trobe University's R&D Park. The Centre is very closely aligned with the Faculty of Science, Technology and Engineering. The mission of the Centre is to stimulate major opportunities for economic growth by pioneering future directions and innovations with focus on translational and commercially relevant research and development of Proof-of-Concepts through integration of complementary research expertise in Micro/Nanotechnologies and Information and Communication Technologies.

The Centre has established industry standard R&D facilities and infrastructure to deliver on its objectives. These include the Microsoft Centre, Home Automation facility, Micro/Nanotechnology design facility, VIC6 Test Bed for IPv6 and Software Development facilities. The Centre is a partner in the National Networked TeleTest Facility for Integrated Systems, the Melbourne Centre for Nanofabrication and in the Global Microsoft's Start-up Program, BizSpark, which is established to help accelerate the success of early stage start-ups by providing key resources, support and visibility.

The Centre has been very proactive in engaging in high impact and strategic research since its establishment. Some of these include *Intelligent Transport Systems to Improve Safety at Level Crossing*, *Mid-band Receiver for Australian Square Kilometer Array (SKA) Pathfinder Radio Telescope* and *Energy Management System for Australian Zero Emission House*, which attracted huge media (print, Radio and TV) interest. Since its establishment, the Centre has won number of international awards, including International EDN Award - 2007 and 2009, Innovic Next big Thing Award – 2008 and 2009, and was invited to showcase its research outcomes in energy management in Copenhagen.

The Centre has published its research outcomes extensively, filed three patents and spun a JV company, "EcoEnergy Innovations" in 2009. The Centre will capitalise on its outcomes to generate additional revenue from IP licensing, commercialisation, Venture Capitals, innovations Australia, Proof-of-Concept grants, etc.

In coming years, the Centre will see the growth of its R&D, research training, innovation and technology transfer activities fuelled by the establishment of industry standard R&D facilities, staff expertise and business development support.



Professor Jugdutt (Jack) Singh
Director/Research Professor

CENTRE OVERVIEW

The Centre for Technology Infusion, a Research and Development Centre (*legislated by the University in 2009*) is located at the La Trobe University's R&D Park and is very closely aligned with the Faculty of Science, Technology and Engineering and its research activities complement the research strengths of the University. It also has very close research collaboration with the Graeme Clark Research Centre for Bionic Ear & NeuroSensory and the Centre for Materials and Surface Science.

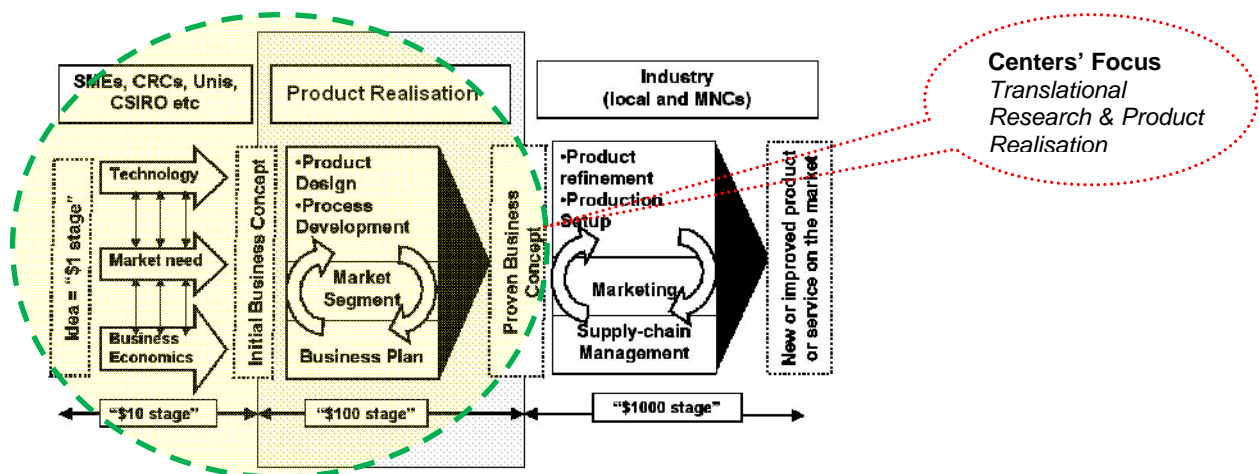
The mission of the Centre is to stimulate major opportunities for economic growth by pioneering future directions and innovations with focus on strategic and translational research and product realisation through integration of complementary research expertise in Micro/Nanotechnologies and Information & Communication Technologies. One of the strategic priorities of the Centre is to further develop collaborative relationships across faculties and with the stakeholders including universities, research institutes, governments and industry.

The objectives of the Centre are to:

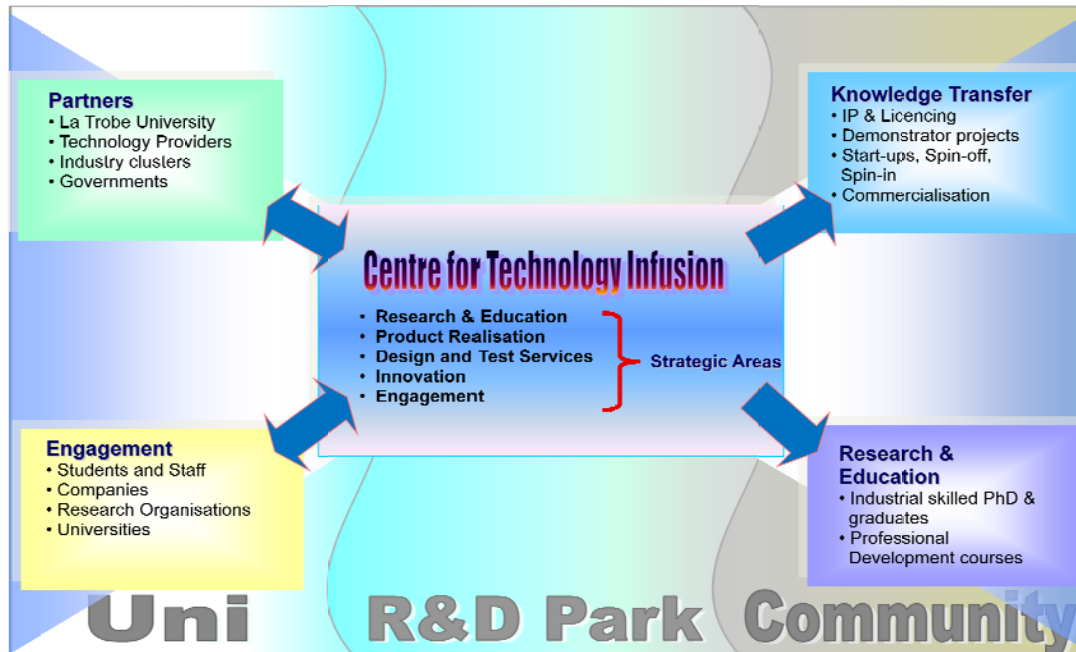
- Engage in strategic and translational research;
- Transition the outcomes of research & innovation into public & private sector;
- Foster student/staff engagement with industry;
- Provide access to technologies, design tools, infrastructure and methodologies for research, L&T, innovation and product development;
- Encourage/facilitate cross-faculty R&D engagement;
- Provide design and consultancy services;
- Encourage and support the formation of start-up companies; and
- Provide advice on project feasibility and qualification, infrastructure support and expertise to technology start-ups, industry and governments.

CENTRE MODEL

The Centre's focus is engaging in applied and commercially relevant research and product realisation (Proof-of-Concept), targeted towards high impact and strategic growth areas.



The Centre is based on partnership model (see below), where technology providers, government and industry clusters have collaborated to establish industry standard facilities/platforms to facilitate research, develop IP and commercially relevant, high impact proof-of-concept (PoC) solutions that can be licensed, commercialised and spun-off.



CENTRE FACILITIES

The Centre has established world-class industry standard design and test facilities to deliver on its' objectives. These include the Microsoft Centre, Home Automation facility, Micro/Nanotechnology design facility, VIC6 Test Bed for IPv6 and Software Development facilities. The Centre is partner in the National Networked TeleTest Facility for Integrated Systems, Melbourne Centre for Nanofabrication and in the Global Microsoft's Start-up Program, BizSpark, which is designed to help accelerate the success of early stage start-ups by providing key resources, support and visibility.

Microsoft Centre

The La Trobe University Microsoft Centre is a technology infusion initiative between Microsoft and La Trobe University and is supported by industry cluster. The Centre provides research and product development platform for cutting edge technology, contributing to economic growth through the development of world-class technology and new intellectual property. The facilities and activities in the Centre focus on strategic projects closely aligned to the Microsoft platform, encouraging the innovative abilities of our students, and furthering their entrepreneurial skills and career prospects. The benefits include the mentoring opportunities for start-ups and

researchers from Microsoft, as well as creating better student-to-business linkages, making our students more 'job ready'.

The Centre's objectives are to:

- Give Industry & Academia access to a cutting-edge technology and a stimulating environment for research, innovation and technology transfer;
- Give smaller companies, researchers and developers access to mentoring resource by larger companies (Microsoft, Intel, etc);
- Give students and researchers exposure to industry in a "soft" environment;
- Engage students and academics in Research and Development projects based on Microsoft platforms;
- Foster student enrichment and engagement with industry; and
- Encourage/facilitate cross-faculty R&D engagement.

Microsoft BizSpark™ Program

This program is specifically designed to provide early stage start-ups and researchers to bring their ideas to life and help ignite their success. The program provides eligible start-ups/researchers access to:

- **Software:** Fully featured development tools, including Visual Studio Team System, plus production licensing to develop and bring solutions to market.
- **Support:** BizSpark provides professional technical support (from Microsoft) and connects to a global community of business experts who can help guide through the hurdles of growing your business.
- **Visibility:** BizSpark provides global visibility to an audience of potential investors, clients and partners.

Micro/Nanotechnology Design Facility

This industry standard facility is set-up in partnership with technology companies, including Sun Microsystems, IBM, Cadence, Synopsys, Altera, Actel, Coventorware, AWR, Sapphicon, and other technology providers. The facility provides access to technologies, Electronic Design Automation tools, infrastructure and methodologies for research and product realisation in Micro/Nanotechnology, embedded and wireless systems.

Currently the Centre is negotiating with the Melbourne Centre for Nanofabrication for funding support to further enhance the Centre's nanotechnology design capability.

Home Automation Innovation Facility

The Home Automation Innovation facility is a technology infusion initiative between La Trobe University and number of technology providers in energy and intelligent platform sectors.

The main objective is to provide platforms for research and intelligent product development for:

- Smart Grid;
- Embedded Intelligence for Boosting Energy Efficiency & Micro-Generation;
- Smart energy monitoring and management systems;

- Zero Emission & Climate Change;
- AMR/AMI

National Networked Test Facility & Melbourne Centre for Nanofabrication

The Centre is a partner and has access to the National Networked TeleTest Facility which was created as a Major National Research Facility to provide vital equipment in micro/nanoelectronics research, development & commercialisation. The facility provides leading edge capabilities addressing the most complex testing, IP validation and characterisation challenge.

The Centre is also a partner in the multi-million dollar Melbourne Centre for Nanofabrication

Vic6 (Victorian Industry Collaborative IPv6) Core Node

Vic6 is an Industry Outreach program, funded and supported by the State Government of Victoria, La Trobe University, CISCO, AARNET, IPv6Now, Australian Industry Group (Ai Group) and other application providers.

The VIC6 core node is intended to be a reference point for research and innovation in network, industry products and processes. It will enable the participants to:

- experience a functional IPv6 network;
- test their own existing equipment for IPv6 capability;
- test how their software operates in an IPv6 network;
- experiment with hardware and software configurations; and
- engage in R&D and skill development.

The venue, equipment, software and services used in Vic6 Core Node will be seen and used by industry participants as they plan their own IPv6 strategies. It will bring industry participants directly into contact with La Trobe University, raising University's profile and strengthening university-industry engagement. There are only a few VIC6 core nodes, so there is an element of exclusivity involved as well. La Trobe University will be seen, from the outset, as part of a Centre of Excellence in IPv6, supplier of expertise, and will be strongly associated with a technology that will figure very large in ICT, education and health care strategies over years to come.

Kovair R&D Facility

Kovair is the innovation leader in application lifecycle management solutions supporting global software development and management. The software platforms will be used by undergraduate and postgraduate students for teaching and research. The platform will also be made available to the start-up companies based at the R&D Park.

PARTNERS

Industry Collaboration and Engagement

Strong collaborative relationships have been developed with a number of organisations to facilitate research and innovation in high-tech sector. The partners have invested well over \$3million in the establishment of industry standard facilities/platforms to support research, research training, IP generation, knowledge transfer and commercialisation. The list of current partners is listed at:

www.latrobe.edu.au/tech-infusion/partners

RESEARCH

The research focuses of the Centre are in:

- Micro/Nanotechnologies
- Wireless Systems and Sensors
- Embedded Systems and System-on-a-Chip
- Information and Communication Technologies
- Intelligent Platform Technologies

Current research projects include:

Intelligent Transport System to Improve Safety Level Crossing

This three year multi-million dollar project will develop an Intelligent Transport System (ITS) based on Dedicated Short Range Communications (DSRC) technology to improve safety at level crossings. This work includes:

- Development of Vehicle-to-Vehicle and Vehicle-to-Infrastructure simulation platform for level crossings with identification, development, and implementation of core technologies for Human Machine Interfaces.
- Development of a demonstrator system for lab-based testing using an industry-standard hardware platform.
- Field trials performed at several level crossings and consequent further refinement of the simulator system.

Funding

The current funding for the project is by cash and in-kind contributions to the value of **\$3.9million** which is expected to grow as additional participants join this project.

Participants Involved

- La Trobe University (Lead Partner)
- AutoCRC
- Department of Transport (Victoria)
- Queensland University of Technology
- Embedded Systems Technologies

- (Negotiations are in progress with VicRoads, VPAC, BlueScope Steel and State Governments of Queensland and NSW).

Single Chip Receiver for the Australian Square Kilometer Array Pathfinder

This research and development project involves the design and implementation of down-conversion stage of a Square Kilometer Array (SKA) mid-band receiver chipset for the focal-plane array based Australian Square Kilometer Array Pathfinder (ASKAP) radio telescope. The SKA project will require thousands of antennas, each with a focal-plane array of hundreds of receivers. This is a collaborative R&D project between CSIRO's Australia Telescope National Facility, Sapphicon Semiconductor and Centre for Technology Infusion at La Trobe University.

Funding

The project is funded by Sapphicon Semiconductor Pty Ltd, CSIRO and Peregrine Semiconductor. Total cash contribution for the project to-date has been **\$347,500**. The collaboration has also resulted in **\$347K** in-kind contribution by AWR for the design tools and **\$450K** in-kind contribution from Sapphicon/Peregrine for chip fabrication.

Participants Involved

- CSIRO-ATNF
- La Trobe University
- Sapphicon Semiconductor
- Peregrine Semiconductor
- AWR Corporation

Australian Zero Emission Homes (AusZEH)

The objective of this collaborative project is to create an integrated technology assessment and demonstration platform for reducing carbon emissions with the ultimate goal of developing next generation living solutions which have a zero carbon emissions footprint. La Trobe University Centre for Technology Infusion (CTI) is a key partner in this project and was responsible for designing and implementing a specially customised Home Energy Management System deployed in this house. The system is designed to provide an integrated solution for complete monitoring, control and management of energy consumption within the house and aims to create a behavioural change in home users towards energy conservation for long term sustainable living.

Funding

The project is co-operatively funded (cash and in-kind) by CSIRO, Henley and Delfin Lend Lease and La Trobe University. The La Trobe Home Energy Management System adaption and deployment was funded by CSIRO with cash contribution of **\$50K**. The project was developed at CTI's Home Automation Innovation Centre facility and includes licensed La Trobe IP which together provides a total indirect in-kind contribution of over **\$65K**.

Participants Involved

- CSIRO
- La Trobe University
- Delfin Lend Lease and Henley
- Other strategic partners included Sustainability Victoria, Telstra and SP AusNet

Multifunctional MEMS sensors for Autonomous Vehicle Avionics

This project involves the design and implementation of an array of multifunction sensors for the control system of UAVs. Each sensor consists of several nano structures on a single substrate that are sensitive to some or all of the followings; acceleration, angular velocity, temperature, pressure, IR intensity, magnetic flux and fluid flow. It also incorporates the mechanisms for deriving estimates, with an indication of their quality, of the required parameters. This quality indication may be used as a basis for robust estimate amalgamation.

Funding

The project is funded by DSTO (one research staff, infrastructure and fabrication costs)

Partners

- La Trobe University
- DSTO

DESIGN SERVICES AND CONSULTANCY

2.4GHz Transceiver Chip

This project involves design and implementation of a single-chip radio transceiver front-end working at 2.4GHz using 0.25micron Silicon-on-Sapphire (SOS) process. The transceiver chip includes all RF blocks from low noise amplifier (LNA) to Analogue-to-digital converter (ADC) in receiver section and all RF blocks from Digital-to-Analogue converter (DAC) to power amplifier in transmitter section. The chip is intended for use in the ISM (Industrial, Scientific and Medical) frequency band of 2.4 - 2.4835 GHz.

Funding

This project is funded by X'ian Swip, China.

RESEARCH TRAINING (2009)

The Centre has number of fully funded PhD students engaged in research degree. They are:

- **Name:** Kriyang Shah
Thesis Title: A low power low phase noise voltage controlled oscillator
Degree: PhD

- **Name:** Aniruddha Desai
Thesis Title: Micro-architectural Characterisation and Configurability of Embedded Java Virtual Machine
Degree: PhD
- **Name:** Dat Nguyen
Thesis Title: Wireless Technology for Reliable In-Vehicle Communication
Degree: PhD
- **Name:** Harsh Trivedi
Thesis Title: Reliable and Secure Wireless Ad-Hoc Network for Vehicle-to-Vehicle Communication
Degree: PhD
- **Name:** Nazuhusna Bintj Khalid
Thesis Title: Design and Implementation of Very High Quality Factor (Q) passive components for a RF Receiver based on MEMS Technology
Degree: PhD
- **Name:** Nurul Izza Mohd Nor
Thesis Title: Nano-Electro-Mechanical (NEM) based Resonator for RF Receiver
- **Name:** Qian Huang
Thesis Title: A High Performance Embedded System for Vehicles based on DSRC Standard
Degree: M.Eng.
- **Name:** Stephen Vander Velden
Thesis Title: An Array of Symmetric Multifunctional MEMS Sensors for Improved Autonomous Vehicle Avionics
Degree: PhD

The Centre is also meeting its research degree completion target with following student completing his PhD degree during 2009

- **Name:** Rohit Naik
Thesis Title: Reconfigurable Digital Filter Bank for Ultra Wideband Impulse Receiver
Degree: PhD

PROJECT STUDENTS

The Centre works very closely with the School of Engineering and Mathematical Sciences and over the years has engaged more than 30 postgraduate and undergraduate project students from the School on industry related major projects. The Centre provides full project supervision, space, infrastructure and assessment for the projects.

PROFESSIONAL DEVELOPMENT AND POSTGRADUATE COURSES

The Centre offered number of professional development and postgraduate courses targeted at companies and postgraduate students. Some of these courses include:

Postgraduate Courses (Department of Electronic Engineering)

- RF (Radio Frequency) design (postgraduate course)

Professional Development Courses (industry and overseas)

- Wireless design
- RF Design
- MEMS based RF design
- Low power analog & mixed signal design

PUBLICATIONS (2009)

Books/Chapters

R. Naik, J. Singh and H. P. Le, "Intelligent Communication Module for Wireless Biosensor Networks," *Intelligent and Biosensors*, ISBN 978-953-7619-X-X, Jun 2009.

Journal Papers

H. P. Le, K. Shah and J. Singh, "A Broadband Ultra Low Noise Amplifier for Square Kilometer Array Application," *IET Electronics Letters*, August 2009.

A. Desai and J. Singh, "Architecture Independent Characterization of Embedded Java Workloads," *IEEE Computer Architecture Letters*, vol. 8, pp. 29-32, April 2009.

Refereed Conference

A. Desai, H. Le, and J. Singh, "A Novel System for Smart Grid Monitoring and Management," *Nanotech Conference*, May 2009.

N. I. M. Nor, K. Shah, J. Singh, H. P Le, J. Devlin and Z. Sauli, "High Quality Factor RF MEMS/NEMS Resonators for Very High Frequency Wireless Systems," *Conference of Solid State Science and Technology 2009* Dec. 2009.

H. Trivedi, P. Veeraraghavan, S. Loke, H. P. Le and J. Singh, "A Survey of Lower Layer Technologies for Vehicle-to-Vehicle Communication," *IEEE Malaysia International Conference on Communications* December 2009.

D. Nguyen, J. Singh, H. P. Le and B. Soh, "A Hybrid TDMA Protocol Based Ultra-Wide Band for In-car Wireless Communication," *IEEE TENCON 2009 Conference*, November 2009.

N. Khalid, J. Singh, H. P. Le, and J. Devlin and Z. Sauli, "A Very High Q-factor Inductor using MEMS Technology," *Conference on Postgraduate Research in Microelectronics & Electronics (PrimeAsia)*, November 2009.

H. P. Le, K. Shah and J. Singh, "A Fully-On-Chip Wideband Low Noise Amplifier for Radio Telescope Applications," *IEEE International Symposium on Circuits and Systems (ISCAS 2009)*, ISBN: 978-1-4244-3827-3, May 2009.

K. Shah, J. Singh, H. P. Le and J. Devlin, "A 2mA-2.5V Low Phase Noise Multi-standard VCO," *IEEE International Symposium on Circuits and Systems (ISCAS 2009)*, ISBN: 978-1-4244-3827-3, 24-27 May 2009.

A. Desai, H. P. Le, J. Singh, "A Novel System for Smart Grid Monitoring and Management," *NSTI Nanotechnology Conference* May 2009.

K. Shah, N. Khalid, J. Singh and H. P. Le, "Fully On-Chip High Q Inductors Based On Microtechnologies," *NSTI Nanotechnology Conference*, ISBN 978-1-4398-1782-7, May 2009.

PATENTS (2009)

- A. Desai, J. Singh, et. al., "Method and System for Energy Management", Provisional Patent No. 2009904370
- R. Naik and J. Singh, "Method and Apparatus for Reducing Power Consumption in Electronic Device", Provisional Patent No 2008901299

AWARDS

The Centre won number of international awards. These include:

- International EDN Award - 2007/2009
- Innovic Next big Thing Award – 2008/2009

EVENTS (2009)

Company Spin Out

In 2009 the University launched a company "EcoEnergy Innovations", a joint venture between La Trobe University and Melbourne-based semiconductor developer Semitech Innovations Pty Ltd. The Company provides fully integrated solution for home and business on all aspects of Energy Monitoring & Management including:

- Automatic Meter Reading (AMR) and Automatic Metering Infrastructure (AMI)
- Smart Energy Management with Context Aware Persuasive Technology
- Load Management

- Energy Planning and Audit
- Home and Industry Automation
- Green ICT (Data Centre)
- Technology Integration - alternative energy

The new smart technology empowers householders, business and industry to monitor and manage their own power consumption from intelligent touch screens that deliver real-time meter readings, updated every half-hour.

The technology offers immediate cost and energy savings - at minimal cost to consumers – deploying powerline communication technologies that allow communication between appliances and electrical meters over existing powerlines, and the seamless integration of other technologies (wired and wireless) to facilitate remote control options from computers, mobile phones and other handheld devices.

Based on networked and bi-directional communication technologies, the centre piece of the system is a home or business-based intelligent touch-screen that keeps consumers constantly in the picture about their energy consumption - offering alternative options for reducing it.

With each screen invisibly networked to smart meters that read energy usage in real time, and 'system-on-a-chip' technology which will eventually be embedded in most household and business-based electrical appliances, the system delivers remote control options to switch appliances off, or re-program them to turn on at different times.

Weblinks

Smart Energy Management Pilot

<http://www.latrobe.edu.au/tech-infusion/activities/smart-energy-management.htm>

Centre for Technology Infusion

<http://www.latrobe.edu.au/tech-infusion/>

MARKETING AND PROMOTION

The Centre has been very proactive in engaging in high impact and strategic research and as such has attracted huge media (print, Radio and TV) interest in its activities. The full list of media coverage is available at:

<http://www.latrobe.edu.au/tech-infusion/news.htm>

INTERNATIONAL COLLABORATION

The Centre has developed active research collaboration with some of the leading Universities overseas. These include:

- Tsinghua University, Beijing, China
- Tongji University, Shanghai, China
- University Malaysia Perlis

Intelligent Transport System Research Collaboration with China

This project involves collaboration in research, training, and technology transfer activities in advanced automotive technology and transport engineering between La Trobe University, Tongji University (Shanghai, China), Tsinghua University (Beijing, China), and the Co-operative Research Centre for Advanced Automotive Technology Ltd (AutoCRC). The project also aims to attract involvement and support from both Australian and Chinese automotive companies.

The principal areas of collaborative research include but are not limited to:

- Intelligent Transport Systems:
 - Vehicle-to-Vehicle and Vehicle-to-Infrastructure communications.
 - Security of Vehicle Network Communications.
 - Human Machine Interface (HMI) – human factors issues.
- Advanced Automotive Technology.
- Transport and Traffic Engineering.

Funding

The initial funding for the project is by cash and in-kind contributions to the value of **\$566K** (\$260 cash) which is expected to grow with funding support from China. The current project is funded by AutoCRC.

Micro/Nanotechnology Research Collaboration with Malaysia

This project involves collaboration in research and research training in micro/nanotechnology between La Trobe University and University Malaysia Perlis (UniMAP). Currently two staff members from UniMAP are pursuing their PhD studies at the Centre. The research training is fully funded by UniMAP through the Ministry of Education, Malaysia.

CENTRE GOVERNANCE AND MANAGEMENT

Advisory Committee

- The Advisory Committee assists the Director, the Dean and Deputy Vice-Chancellor (Research) by:
 - advising on policy and strategy to meet the aims of the Centre;
 - participating in the appointment of the Director;
 - advising, and assisting in reporting, on the management of Centre resources;
 - identifying potential new sources of funding for the Centre;
 - receiving and endorsing the annual report of the Centre and submitting it to the Academic Board through the Dean to the Deputy Vice-Chancellor (Research).

- The Advisory Committee conducts its own proceedings and may hold meetings at two or more venues using any technology that allows all members of the Advisory Committee at the meeting an opportunity to participate therein.
- Membership of the Advisory Committee are as follows:

Professor Tim Brown – DVC(R) (or nominee)
 Professor Brian McGaw – Dean, FoSTE (or nominee)
 Professor Jugdutt (Jack) Singh – Director, Centre for Technology Infusion
 Professor Philip Broadbridge – Head of School – SEMS
 Associate Professor Wendy Macdonald - Biosciences
 Mr. David Sajfar – Industry Development Manager, Microsoft
 Mr. Brad Dunstan – CEO, VCAMM
 Dr. Gary White, Research Program Manager, AutoCRC
 Dr. Aniruddha Desai – Research Staff (Centre)
 Mr. Vincent Galea – PhD Student

Secretariat

Ms. Sammi Gregory-Tacey

- The term of membership for each Committee Member is two years. A Committee Member's term may be extended.
- The Advisory Committee will be accountable to and report to the Academic Board through the Deputy Vice-Chancellor (Research).
- The Deputy Vice-Chancellor (Research) shall have the power to terminate the appointment of a member of the Advisory Committee where the Deputy Vice-Chancellor (Research) considers it necessary and in the interests of the Centre.

Executive Committee

- The management of the Centre for Technology Infusion is assisted by an Executive Committee. The current Executive Committee comprises of following staff:

Professor Jugdutt (Jack) Singh – Director
 Dr. Aniruddha Desai – Research Staff - Embedded
 Dr. Kriyang Shah – Research Staff – Micro/Nanotechnology
 Mr. Vincent Galea – PhD Research Student
 Ms Sammi Gregory-Tacey – Administrative Officer/Secretariat

CENTRE STAFF AND ASSOCIATES

Director/Research Professor: Professor Jugdutt (Jack) Singh

PA/Administrative Officer: Ms Sammi Gregory-Tacey

Research Staff:

- Dr. Aniruddha Desai
- Dr. Felix Acker

- Dr. Kriyang Shah
- Dr. Stanley Ding
- Mr. Sriram Arul Prakasam

Research Associates:

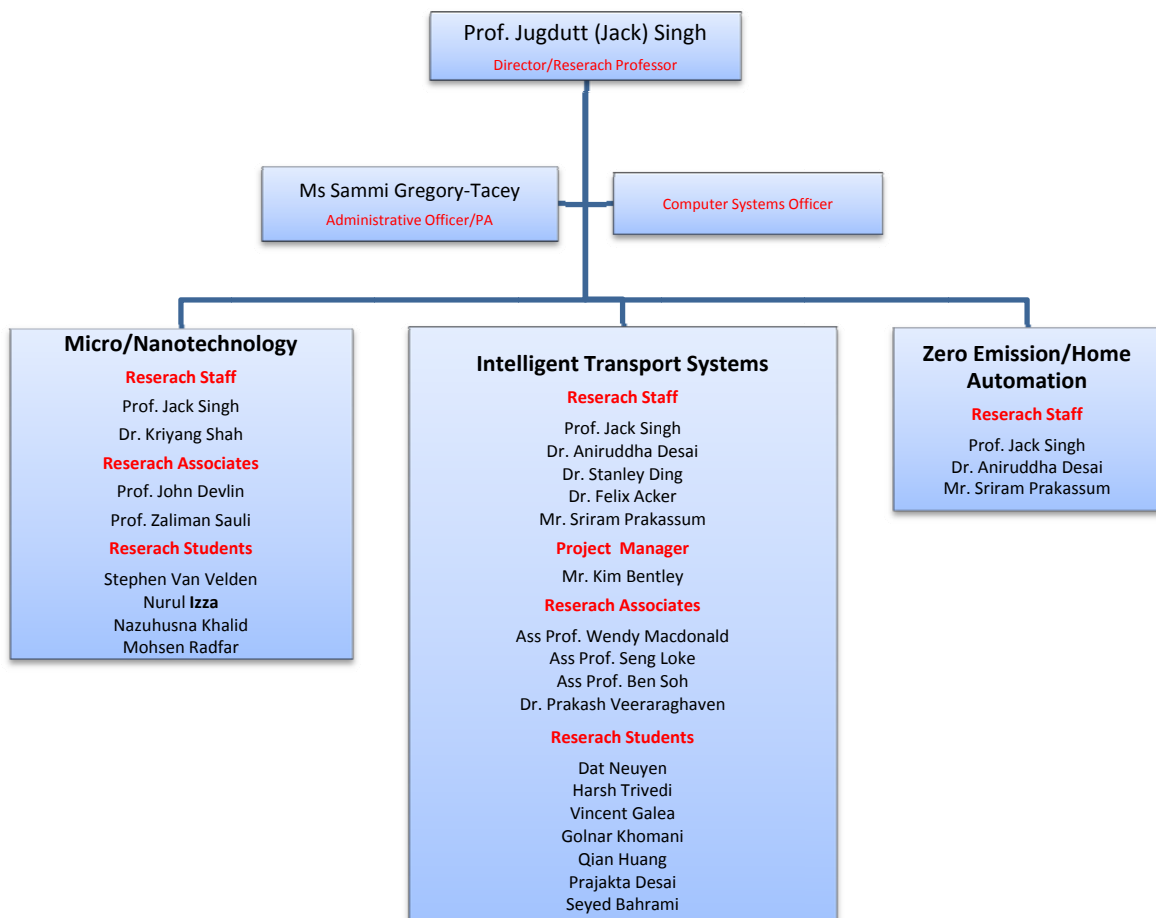
- Professor John Devlin - EE
- Associate Professor Wendy Macdonald - BioScience
- Associate Professor Seng Loke – CE&CS
- Associate Professor Ben Soh – CE&CS
- Associate Professor David Tay – EE
- Dr. Prakash Veeraraghavan – CE&CS
- Professor Lun Zhang – Tongji University
- Professor Keqiang Li – Tsinghua University
- Professor Zaliman Sauli – University Malaysia Perlis

Project Manager: Mr. Kim Bentley (ITS Project)

Computer Systems: vacant

Finance: (Research Division – Ms Raksha Ratilal)

CENTRE ORGANISATION



FUTURE DIRECTION

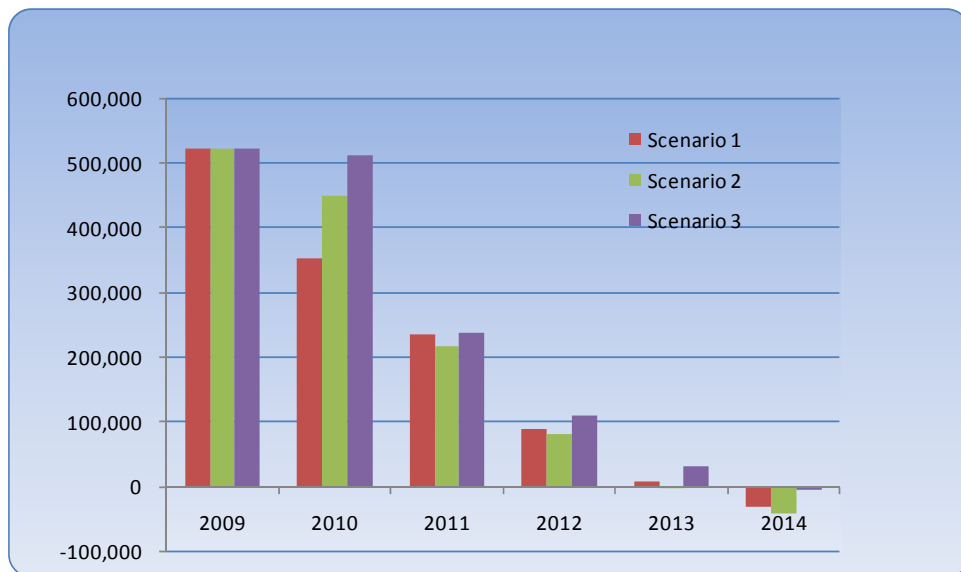
In coming years, the Centre will see the growth of its R&D, innovation and technology transfer activities fuelled by the establishment of major industry based R&D facilities. Some of the strategic priorities of the Centre will be to:

- Expand R&D income from industry, government, ARC, etc.
- Expand Higher Degree Research Students
 - One of the priorities of the Centre is to grow its research students.
- Expand high quality publications
- Further expand engagement with Faculties – research, research training, education and marketing/promotion
 - Over the years the Centre will see itself growing into a cross-faculty, university-based research, innovation and knowledge transfer Centre.
- Target strategic engagement with industry
 - One of the strategic priorities of the Centre is to further develop collaborative relationships with industry.
- Developing new IP/Patents, licensing, spin-off/in and commercialisation
The Centre will focus on developing high impact IP/patents for possible licensing and commercialisation.
- Expand international and regional R&D
 - External Standing
 - The Centre will engage in projects of national and international significance.
 - Develop R&D linkages with high profile international research institutes/universities
 - CTI@Bendigo and regional campuses
- Grow CTI as the Centre of Excellence (partnership with major technology providers, faculties, Governments, Research Institutes, etc)
- Attract presence of major Technology Company's R&D operation at R&D Park.

BUDGET

Currently the Centre's operations are funded through research grants, contracts and the University Central funds. There has been a dramatic increase in research income from 2009 to 2010 and the forecast is for at least 15% increase in research income for the coming years. This will enable the Centre to reduce its dependence on the University's Central funds. Five year financial forecast is presented in Appendix A.

Five Year Financial Plan for the Centre



ACKNOWLEDGEMENT

The Centre acknowledges the commitment and support provided by the University Senior Management, Office of the Deputy Vice-Chancellor (Research) and the Dean of the Faculty of Science, Technology and Engineering.

APPENDIX A: FIVE YEAR FINANCIAL FORECAST

Scenario 1: PGR related student expenditure reimbursed to FSTE

	2009	2010	2011	2012	2013	2014
Research Revenue	-241,451	-701,000	-805,150	-925,925	-995,370	-1,070,023
Other Revenue	0	-330,000	-365,000	-400,750	-447,288	-514,652
Student Revenue (non-AutoCRC)	0	-150,000	-210,000	-330,000	-540,000	-600,000
Total Revenue	-241,451	-1,181,000	-1,380,150	-1,656,675	-1,982,658	-2,184,675
Employee Benefits & OnCosts	504,384	789,448	828,090	911,171	1,090,462	1,201,571
Infrastructure Related	34,281	285,722	294,294	303,122	312,216	321,583
Professional Fees	0	45,000	46,350	47,741	49,173	50,648
Student Related	65	3,000	4,200	6,600	10,800	12,000
General Operating	24,090	33,000	33,990	35,010	36,060	37,142
Staff Related	21,632	48,500	49,685	54,670	65,428	72,094
Other Expenses	14,419	5,500	5,665	5,835	6,010	6,190
Central Cost Allocations	165,033	243,003	257,097	272,009	287,785	304,477
Central cost From FSTE	0	80,765	95,450	110,135	132,161	146,846
<i>Non-Salary Expenditure</i>	<i>259,520</i>	<i>744,490</i>	<i>786,731</i>	<i>835,121</i>	<i>899,633</i>	<i>950,980</i>
Total Expenses	763,908	1,533,938	1,614,821	1,746,292	1,990,095	2,152,551
Net (Surplus)/Deficit	522,456	352,938	234,671	89,617	7,437	-32,124

Scenario 2: Surplus from Student Income Allocated to CTI

	2009	2010	2011	2012	2013	2014
Research Revenue	-241,451	-701,000	-805,150	-925,925	-995,370	-1,070,023
Other Revenue	0	-330,000	-365,000	-400,750	-447,288	-514,652
Student Revenue (non-AutoCRC)	0	23,751	2,378	-83,195	-240,954	-267,726
Total Revenue	-241,451	-1,007,249	-1,167,772	-1,409,870	-1,683,611	-1,852,401
Employee Benefits & OnCosts	504,384	789,448	700,663	775,428	925,986	1,018,821
Infrastructure Related	34,281	285,722	294,294	303,122	312,216	321,583
Professional Fees	0	45,000	46,350	47,741	49,173	50,648
Student Related	65	6,000	4,200	6,600	10,800	12,000
General Operating	24,090	33,000	33,990	35,010	36,060	37,142
Staff Related	21,632	48,500	42,040	46,526	55,559	61,129
Other Expenses	14,419	5,500	5,665	5,835	6,010	6,190
Central Cost Allocations	165,033	243,003	257,097	272,009	287,785	304,477
Central cost From FSTE	0	0	0	0	0	0
<i>Non-Salary Expenditure</i>	<i>259,520</i>	<i>666,725</i>	<i>683,636</i>	<i>716,842</i>	<i>757,603</i>	<i>793,169</i>
Total Expenses	763,908	1,456,173	1,384,299	1,492,270	1,683,589	1,811,989
Net (Surplus)/Deficit	522,456	448,924	216,527	82,401	-22	-40,412

Scenario 3: PGR Student related expenditure reimbursed to CTI

	2009	2010	2011	2012	2013	2014
Research Revenue (less AutoCRC students)	-241,451	-521,000	-625,150	-805,925	-995,370	-1,070,023
Other Revenue	0	-330,000	-365,000	-400,750	-447,288	-514,652
Student Revenue - Exp Reimb from FSTE	0	-92,986	-116,928	-136,671	-166,885	-185,428
Total Revenue	-241,451	-943,986	-1,107,078	-1,343,346	-1,609,543	-1,770,103
Employee Benefits & OnCosts	504,384	789,448	664,247	738,840	885,248	973,556
Infrastructure Related	34,281	285,722	294,294	303,122	312,216	321,583
Professional Fees	0	45,000	46,350	47,741	49,173	50,648
Student Related	65	6,000	4,200	6,600	10,800	12,000
General Operating	24,090	33,000	33,990	35,010	36,060	37,142
Staff Related	21,632	48,500	39,855	44,330	53,115	58,413
Other Expenses	14,419	5,500	5,665	5,835	6,010	6,190
Central Cost Allocations	165,033	243,003	257,097	272,009	287,785	304,477
Central cost From FSTE	0	0	0	0	0	0
<i>Non-Salary Expenditure</i>	<i>259,520</i>	<i>666,725</i>	<i>681,451</i>	<i>714,647</i>	<i>755,159</i>	<i>790,453</i>
Total Expenses	763,908	1,456,173	1,345,697	1,453,487	1,640,407	1,764,009
Net (Surplus)/Deficit	522,456	512,187	238,619	110,141	30,865	-6,093