# Experiences in Implementing IT Service Oriented Academic Programmes

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***Abstract*—New demands for Computer Science education arise in response to changing models of computing provision, in which earlier models of computing 'as a product' are being superseded by models of computing 'as a service'. Typical names for this shift are service-oriented computing or services computing. Both academic and industry sectors of computing are reacting to this trend in differing ways. This article provides an insight into the development of an undergraduate major in service science and a masters programme in service-oriented computing at the AUT University in Auckland, New Zealand, and an overview of the service computing offerings in the New Zealand market. We also provide an insight into the considerations that take place in developing new university programmes, the unique dialog that is part of a university programme approval process in New Zealand and the arguments our proposal received from other universities. We will also compare how these programmes relate to the proposed curriculum reference models for Service Computing. This in turn has lead to the establishment of a specialist Service Science Innovation Research group.**

## I. Introduction

New demands for Computer Science education arise in response to changing models of computing provision, in which earlier models of computing 'as a product' are being superseded by models of computing 'as a service'. Typical names for this shift are service-oriented computing or services computing. Both academic and industry sectors of computing are reacting to this trend in differing ways. For instance in a recent *"ACM Tech Pack on Cloud Computing"*[1], the research committee report that:

*Cloud computing promises to radically change the way computer applications and services are constructed, delivered, and managed. Although the term means different things to different people, and includes a bit of marketing hype and technical redefinition, the potential benefits are clear. Large data centres permit resource sharing across hosted applications and lead to economies of scale at both the hardware and software level. Software services can obtain seemingly infinite scalability and incremental growth to meet customers' elastic demands. The pay-as-you-go model and rapid provisioning can result in more efficient resource utilization and reduced costs. Realizing these benefits requires new techniques for managing shared data in the cloud, fault-tolerant computation, service composition, scheduling, metering and billing, protecting privacy, communication, and, more generally, sharing resources among applications under the control of diverse organizations. The research community is stepping up to meet these challenges, as are a number of high-tech companies.*

Complementing these developments in the educational sphere and with significant industry support from IBM, a reference model for a masters programme in Services Computing has been proposed [2], [3].

Service science, cloud computing and service-oriented computing are growth sectors that are starting to demand experienced graduates. There is an acknowledged lack of IT professionals equipped with skills to work in the new environment where both applications and services are increasingly reliant on distributed computing in its contemporary forms - such as cloud computing [4]. While IT deployment has always brought changes to the way organisations and firms work, cloud computing and the related service computing often lead to a fundamental transformation which requires an ongoing and parallel development of new business processes and the technology methods needed to support them. How does academic programmes need to evolve to adapt to these changes?

In this article we reflect on the programme development we have undertaken in both undergraduate and postgraduate level in the School of Computing and Mathematical Sciences at AUT University in Auckland, New Zealand. The first step in formally recognising the need for graduates with Service Computing skills was taken in 2004 when we developed an undergraduate major in Information Services. This was to complement majors in Computer Science, Software Development, Networking and Security [5] and Information Systems Science. With a re-focus and renaming to IT Service Science in 2009, this major has been successfully running for the past 6 years in Auckland, in *VNU University of Science* in Ho Chi Minh City, Vietnam since 2009, and soon to be delivered at

*PSB Academy* in Singapore and in *China Jiliang University* in Hangzhou, China.

The second formal step was taken in 2010 when the decision was taken to develop a new postgraduate programme in service computing. This development work resulted in an application and subsequent approval of a one year professional programme titled Master of Service-Oriented Computing *(MSOC)*. We compare the programme goals and structure to the reference curriculum and review challenges posted by other New Zealand universities on the proposal.

Further in this article we discuss the undergraduate programme in IT Service Science (section II), followed by the postgraduate programme in service-oriented computing (section III). Section III-D reviews the approval process for academic qualifications in New Zealand including dialog during the approval process of the Master in Service-Oriented Computing. We also discuss some of our international collaboration in teaching and research in section IV.

## II. Under-graduate programme

The service science specialisation in the Bachelor of Computer and Information Sciences *(BCIS)* was designed to broaden the School's undergraduate computing programme and to provide a pathway for students aspiring to pursue careers in an area of computing which is less intensive in computer science and software development topics.

### A. Graduate Profile

While the aim was to broaden the choice students had for their studies, we wanted to maintain a technically focused graduate profile and to provide a course of study that would support;

- The sound analysis, design and implementation of Information Technology solutions
- The ability to relate the functions, services and best practices to information technology domains
- The ability to integrate and relate information security frameworks with technical and non-technical requirements
- A sound understanding of contemporary IT services, security and operations management practices

### B. Programme Structure

Students gain skills in key IT service delivery areas: understanding of the ITIL [6] and CobiT [7] frameworks, business analysis, information security, and network and system administration. Further, the compulsory papers in the BCIS programme include data and process modeling, project management, and the application of their learning in a final year capstone project [8]. In 2004, when the major was established no reference curricula existed. The major was established to cater for the Management part of the Service Science Management and Engineering (SSME) concept and has since focused on the aspects of IT Infrastructure management. The core papers of the major and key compulsory papers from the programme are listed in table I.

Table I
IT Service Science major and key BCIS compulsory courses

| **Course** (M=Major, P=Programme)<br>Description |
|---|
| **IT Service Provision** [M]<br>Identification, development and implementation of service-oriented skills, service techniques and standard procedures in providing IT related services. |
| **Network and System Administration** [M]<br>Issues, skills and strategies associated with providing core services over a network in a multi user environment, fine tuning of networked systems for optimum delivery in terms of security, cost and speed. |
| **Needs Analysis Acquisition and Training** [M]<br>Focuses on skills required to identify a users information technology solution requirements: to investigate and evaluate suitable solutions including software, platform and vendors, to plan the acquisition of a solution, to identify training requirements, and to plan a training programme. |
| **IT Services Management** [M]<br>Examines the practice and theory of IT Services Management with a focus on industry best practices in managing IT in an organisation, in context of an overall framework for aligning IT strategies with business strategies, monitoring, evaluating and improving IT operations performance, and auditing. |
| **IT Strategy and Governance** [M]<br>Explores the issues in and approaches to managing information systems in organisations, including information systems planning and architecture, governance and alignment with business strategy. |
| **Information Security Management** [M]<br>A holistic view into how information security is managed in an organisation, examining its relationship with laws, ethics, culture, standards. Includes the examination of the frameworks, processes, and measures as well as practical problems involved in building secure operational environments for businesses and individual users. |
| **Data and Process Modeling** [P]<br>Provides an insight into methods of data and process modelling, building on the broader context of Software, Information and Systems Engineering, contemporary methods. |
| **IT Project Management** [P]<br>Provides students with the core competencies of project management in an information technology context. A range of IT project management methodologies and approaches are compared. |
| **Research and Development Capstone Project** [P]<br>A typically original investigation into a selected area whether that be a specific problem domain, or an area of business opportunity. Projects are aligned with students focus of study, in this case IT Service Science focused projects. |

Elective papers for the major allow students to further develop technical skills in database, network and systems administration, software development, and network and information security.

### C. Graduate Statistics

AUT University computing graduates formed 17% of total New Zealand computing graduates in 2010. IT Service Graduates are 31% of total AUT computing graduates in 2010. This is slightly less than Networks and Security, which is a common combination for a double major with all the other majors.

The School's full time equivalent student growth in computing over the last 5 years is 29% with the closest rival at 3%. This phenomenal growth coincides with the introduction in 2004 of the additional majors including Information Services (later renamed IT Service Science). This indicates the attraction of Service Science as a desired graduate destination. At the same time many IT Schools in New Zealand have experience negative growth indicating that the traditional 'Computer Science'-based only choice is no longer desirable.

## III. Post-graduate programme

While the School has existing research-oriented masters programmes across the areas of Computing and Information Sciences, our new Master of Service-Oriented Computing programme aims to augment those with a more specialised masters programme focused on the interdisciplinary area of service-oriented computing. Call for the programme arose from two sources, first to address a local skills shortage and second to respond to demand from our South East Asian and China partners who requested a postgraduate opportunity in service-oriented computing. It is aimed at graduates who desire a taught masters programme, presenting some of the latest developments and trends in both practice and research in the area. This one-year masters by coursework builds on professional experience in the information technology (IT) sector and prepare graduates for the growing cloud computing, service science and service-oriented computing sectors.

The School's objective was to develop its postgraduate offerings in the emerging IT Service Science discipline, with an applied vocational and professional focus. This programme aligns with the University's strategic plan [9] objectives; ensuring programmes are at the leading edge of practice and enabling graduates to be knowledgeable and sought after. The Master of Service-Oriented Computing provides a means for promoting excellence in information technology and service science development and practice for information and communication technologies (ICT) professionals. This provides access to new subject areas in postgraduate university education for students from diverse communities within the region.

The provision of a specialised masters programme in Service-Oriented Computing is a new postgraduate development in New Zealand, although such programmes are starting to be seen internationally (viz. the services computing curriculum reference model [3], and the RMIT Master in Enterprise Architecture). The School already offers an undergraduate major in IT Service Science within the Bachelor of Computer and Information Sciences, and this is a logical extension at the postgraduate level. Within the New Zealand University sector aspects of services computing typically exist as discrete topics or emphases within broader postgraduate programmes (e.g. high performance computing at Lincoln; distributed and mobile computing at Victoria; service science at University of Auckland; E-science and grid computing across several universities). These tend to have less of an interdisciplinary and practitioner focus, and are less comprehensive in coverage of the services computing area than is proposed with this programme.

The objectives of the programme are: (i) to provide a training opportunity for those who have already been in employment in the IT sector; (ii) to enable students who have completed one year's postgraduate study in a computing discipline to offer a valuable mixture of applicable practical skills to prospective employers; (iii) to enable high quality graduates from other disciplines who meet the entry criteria to develop a similar set of practical skills; and (iv) to provide all students with advanced knowledge in the specialist area of service-oriented computing. Finally, the programme will also appeal to computing graduates completing a four-year bachelor's programme who wish to gain specialised knowledge in the area. This is particularly the case in South East Asia and China where many potential students have a four year undergraduate degree. For an interdisciplinary programme like this the combination of skills and experience students bring to the programme enables dynamic interaction within the cohort.

The emerging disciplines of service science and service-oriented computing aim to bring together computer science, software engineering and management science (SSME) in order to provide an opportunity to the contemporary IT professional to gain advanced knowledge in the specialist area of cloud computing technologies and management. The structure of the programme enables students to undertake, through full-time or part-time study, a coursework masters degree in these areas, providing flexibility and choice to suit the aspirations of information technology professionals. The core papers, Service Science for IT, Service-Oriented Architecture, Cloud Computing and Service Relationship Management expose students to the interdisciplinary and integrated nature of service science as well as current research results and challenges of the field.

### A. Graduate Profile

Graduates from the programme will be critically reflective professionals who demonstrate;

- Advanced knowledge and capabilities in service-oriented computing and the ability to apply this creatively and rigorously to new situations and problems
- Analysis, synthesis and problem solving skills, demonstrating awareness of the interdisciplinary and integrated nature of IT service science, and the relationships between technology, service design and provision and organisational processes and goals.
- The ability to research, model, critically reflect, evaluate and integrate findings with practice
- Capabilities enabling work as a professional in IT service design- or delivery-related roles or at intermediate to senior levels in industry
- Preparation for advanced practice particularly within a services computing context

Graduates will also have developed skills and/or be practised in;

Table II
MASTERS OF SERVICE-ORIENTED COMPUTING: CORE COURSES

| Course<br>Description |
|---|
| **Cloud Computing**<br>Critically evaluates advanced principles and layers of cloud computing and virtualisation. Reviews the technical integration of "Platform as a Service" (PaaS) and "Software as a Service" (SaaS) in an organisational context, and the disciplines required to provide a continuing, secure, reliable and highly scalable service. |
| **Service-Oriented Architecture**<br>Critically evaluates the design principles used during the phases of systems development and integration for implementing services that deliver a key portion of their benefit by communication over computer networks. Concepts covered include service discovery, inter-process communication, session management, persistence, and data and transaction management. |
| **Service Relationship Management**<br>Systematic study and analysis of the issues involved in managing the complex roles of client and service providers. Models for consulting, partnerships, contracts, alliance building and processes for managing client expectations and creating, assuring and sustaining effective relationships are analysed and evaluated. |
| **Service Science for IT**<br>Critically evaluates the fundamentals of services and service science and how service systems in organisations support customer-provider interactions thereby delivering value to stakeholders. Also covers service modelling, where traditional system modelling approaches are applied and extended to create new service systems and service activities, with an emphasis on service quality. |

- Communication: oral and written communication, including working virtually across organisational, country, time zone and cultural boundaries
- Teamwork: working effectively as a member of a team, whether local or virtual
- Leadership: undertaking leadership roles and advanced practice in the context of global services provision
- Critical reflection: reflecting critically on their own thinking and action, strengths and weaknesses.

### *B. Programme Structure*

The core papers of the major are listed in table II and the elective papers are listes in table III. The courses are designed to be free of prerequisites within the programme, relying on the entry criteria to ensure that all candidates are prepared to take the papers in any order. This was achieved for all courses except for Software Engineering for Services, which required the Service-Oriented Architecture course as a prerequisite.

As the students are selected individually based on their earlier academic record and work experience, we are able to recommend an individualised course of study, which can recommend the students to take preparation courses first. These are typically found from the set of elective papers.

### *C. Body of Knowledge Areas of Services Computing*

The taxonomy for the knowledge areas of Services Computing [2] and their application in [3] to suggests a reference model for a postgraduate programme in Services Computing

Table III
MASTERS OF SERVICE-ORIENTED COMPUTING: ELECTIVE COURSES

| Course<br>Description |
|---|
| **Contemporary Service Science Infrastructure**<br>Critically analyses component architectures and infrastructures for the construction of enterprise-scale software systems that operate and interact via the internet. Evaluates service science principles in developing and managing services and the motivations that led to the deployment and emergence of web services from middleware and enterprise architecture integration. |
| **Global IT Project Management**<br>Advanced treatment of the principles and pragmatics of IT project management with a focus on globally delivered projects and global virtual teams. Critically evaluates mechanisms for coordination, communication and collaboration in the context of distributed resourcing and service delivery. |
| **Information Security**<br>Discusses methods and techniques to identify, describe and recognize security threats, evaluates solutions related to securing the enterprise including networks, systems and applications, and reviews methodologies aimed at the prevention and detection of security breaches. |
| **Net-centric Computing**<br>Critically analyses a range of sub-specialties, including computer communication, network concepts and protocols, multimedia networking, web standards and technologies, network performance issues, wireless and mobile communication networks, and distributed systems. |
| **Research Methods**<br>An introduction to research in general and with specific reference to computer, information and service sciences. |
| **Software Engineering for Services**<br>Critically evaluates the technical aspects of developing software in the cloud computing paradigm. Reviews the platforms, tools and knowledge developed to meet the unique challenges that large-scale online services present. |
| **Ubiquitous Computing**<br>Investigates platform and location independent access, and context-aware systems, appraises issues related to ubiquitous applications development, wireless networking infrastructure, emerging W3C standards, next generation wireless, mobile agents, and auto- identification and analysis. |
| **Web Services Development Project**<br>Component architectures based development project for the construction of enterprise-scale cloud-based software systems. |
| **eSystems Design and Development**<br>Develops an advanced understanding of the technologies, issues and controversies in the field of contemporary Web-based information systems (eSystems). Critically discusses eSystems requirements analysis and the use of application modelling languages and Web development tools for the production of dynamic and database-driven Web applications. |
| **Special Topic**<br>A guided readings paper in which the student critically evaluates key theories, concepts and practices in the area of service-oriented computing. |

Table IV
MASTERS OF SERVICE-ORIENTED COMPUTING: COMPARISON WITH BODY OF KNOWLEDGE TAXONOMY

| Taxonomy Knowledge Areas | MSOC Courses: Cloud Computing | Service-Oriented Architecture | Service Relationship Management | Service Science for IT | Contemporary Service Science Infrastructure | Global IT Project Management | Information Security | Net-centric Computing | Research Methods | Software Engineering for Services | Ubiquitous Computing | Web Services Development Project |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Principle of Service | | | | x | x | | | | | | | |
| 2. Services Lifecycle | | | x | x | | | | | | | | |
| 3. Web Services | x | | | | | | | | | x | | x |
| 4. Service-Oriented Architecture | | x | | | | | | | | x | | x |
| 5. Services Relationships | | x | | x | x | | | | | | | |
| 6. Services Composition | | | | x | x | | | | | | | |
| 7. BPM and Integration | | | x | x | | | | | | | | |
| 8. Business Grid and Cloud comp. | x | | | | x | | | | | | | |
| 9. Enterprise Modeling and Mgnt. | | | | x | | x | | | | | | |
| 10. S-O Consulting Methodology | | | x | | | | | | | | | |
| 11. S-D Platform and Methodology | x | | | | x | | | | | x | | |
| 12. App. Services and Standards | | x | | | | | | | | x | | x |
| 13. Security, Privacy and Trust | x | | | | x | | x | | | x | | |
| 14. IT Services Management | | | | x | x | | | | | | | |

provides an suitable point of comparison with our programme. Table IV provides a mapping between the taxonomy and our course structure. The programme covers all of the identified knowledge areas and in fact provides a wider range of choices including research methods.

### *D. Programme approval process and programme peer-review*

The process of applying for an approval for a university programme in New Zealand requires all other universities in the country to agree with a proposal and to sign it off. Before signing off a proposal the approving universities can require the applying university to respond to their questions about the proposal. The questions can relate to any aspect of the qualification and must be answered in a way that satisfies the concerns of the querying university. This process ensures that all new qualifications are screened by not only the experts in university qualifications and pedagogy, but also peer-reviewed by the subject experts in competing universities.

Below we share the key points of the questions we received and our respective answers in order to share further insight of the MSOC programme and provides an interesting insight into the qualifications approval process:

Q: *We do not see any opportunity for a student to undertake any research or project work papers within the degree. We would like to see that students do have the opportunity to take such work within a masters degree.*

A: All of the core papers and other elective level 9 papers in the programme include a research component and a contribution of at least 30% but typically 50% assessment weighting for a research based assignment. The programme also includes a 30 point paper Web Services Development project which enables the students to apply their new theoretical knowledge and techniques in solving a problem, and a Reading Paper, which enables students to undertake a small research project.

Q: *Given the industry-relevant nature of this qualification (and the reported support of industry) we would like clarification of how the papers will be informed by and linked to best industry practice.*

A: We work with industry to source guest speakers, project and thesis co-supervisors, project and problem topics, and external reviewers of papers and assessments to maintain a connection with the current issues and expected demands of the industry as well as to maintain currency with industry best practice.

Q: *There is nothing in the proposal that indicates why the proposed new papers should be considered at level 9 and not at level 8.*

A: In developing the level 9 papers we have been strongly guided by the New Zealand Qualifications Authority (NZQA) standard [10] for level 9 learning with regard to the level of required knowledge, skills and application. We have also followed the CUAP (New Zealand Vice Chancellors' Committee (NZVCC) Committee on University Academic Programmes) definition for masters degrees that state: *"Master's degrees usually build on undergraduate degrees, bachelor with honours degrees or postgraduate diplomas. They may also build on extensive professional experience of an appropriate kind. Their outcomes are demonstrably in advance of undergraduate study, and require students to engage in scholarship and/or research"*. For example each of the level 9 papers includes a research component *(see the following question)*. The University's established quality assurance processes will continue to ensure that the papers are developed, delivered and assessed at the prescribed levels.

Q: *We do question whether it should be a Masters level course. As it is written, it could easily be submitted as a postgraduate diploma course for example.*

A: The programme development team considered the inclusion of a dissertation or project component, but decided not to follow that model and instead included research based activities in each of the level 9 papers. This model complies with the CUAP definition of masters degrees by coursework only. Further, the inclusion of a 30 or 45 point mandatory project component would limit the number of courses and the

breadth of topics could not be included.

The programme enables the students to apply theoretical knowledge, skills and techniques in solving a problem in a project setting, and a Readings Paper, which enables students to undertake a research project in a more theoretical context.

Considering the CUAP definition of masters degrees [11, p. 42], the graduates are expected to meet the following outcomes:

1) show evidence of advanced knowledge about a specialist field of enquiry or professional practice
2) demonstrate mastery of sophisticated theoretical subject matter
3) evaluate critically the findings and discussions in the literature
4) research, analyse and argue from evidence
5) work independently and apply knowledge to new situations
6) engage in rigorous intellectual analysis, criticism and problem-solving.

The Graduate Profile of our proposal meets these expectations, and the proposed programme structure and content are at the appropriate level to achieve this. Overall the proposal complies with the CUAP requirements for masters degrees.

Further, the entry criteria of the candidates are higher than that of postgraduate diplomas, expecting the candidates to have completed a year of postgraduate study or equivalent.

Q: *We have little concern with the content of the coursework for the proposed masters. The proposers have gone to some length to establish the contemporary appropriateness of the material, and the reasons for proposing this at graduate-level. Our concern is with the continued proliferation of uniquely titled degrees. A Master of Service-Oriented Computing?*

A: In relation to our undergraduate major in IT Service Science, the School sees the new programme as a logical extension from the point of view of using our existing staff resources and interests at the postgraduate level, from the point of view of needs of the industry, and finally from the point of view of the existing undergraduate students by showing that they can continue their studies with a more general research-based masters, or by returning to a specialised masters after gaining professional experience in the field. We may consider a more generic one-year coursework masters programme in the future.

Q: *We note that the document states: " The School already offers an undergraduate major in IT Service Science within the Bachelor of Computer and Information Sciences, and this is a logical extension at the postgraduate level. " If this is the case, then why is the Master of Computer and Information Sciences (MCIS) not an appropriate vehicle here, or a generic one-year coursework variant?*

A: During the development, the relationship between the new degree and the MCIS was carefully considered. As the two programmes target very distinct groups of candidates and have very different regulation structures, combining these two degrees was seen to result in confusion with the programme regulations for enrolled students, with providing prospective students clear information about the goals of the programme, and with the ongoing assessing and reporting of the achievements of the programme.

Q: *The objectives of this qualification are laudable, aimed as it is towards people with industry experience as well as students who enter with an honours degree or a PG Dip. The proposed content and regulations seem to be appropriate.*

*Although the word "services" in this context is well established, it is an unfortunate fact that the same word "services" also has a more traditional meaning in the context of "Information technology services". The title of this qualification may therefore cause some confusion for the uninitiated.*

A: We considered the name of the programme carefully within the School and with our Industry Advisory Committee members. While the components of the name have historical associations we considered "Service Oriented Computing" to be well established having been in use for the past 10 years. Considering the target audience of the programme, the candidates should be aware of the term and be able to distinguish it from earlier computing terminology. However, we will also ensure that the programme marketing material describe the nature and content of the course in a way that makes this difference clear to prospective candidates.

Q: *Thank you for the opportunity to review this proposal. Our reviewer supports the proposal in general but asks: Will the department have enough academic staff to offer eight new courses?*

A: In 2010 and 2011 the School has hired nine new permanent lecturers. Four of these newly hired lecturers will be directly linked in developing the new papers.

The above summary illustrates not only the rigour of the approval process, but the rigour of the process of development of both the IT Service Science major (which was subject to the same CUAP process) and the Master of Service-Oriented Computing programme. The result is a solid, sustainable and integrated Service Science/Service-Oriented Computing academic programme that clearly meets both industry and student needs.

## IV. Collaborative Partnerships

In 2009, AUT began delivering the IT Service Science papers at Vietnam National University's (VNU) University of Science in Ho Chi Minh City (HCMUS) [12]. Students will receive AUT's BCIS degree in IT Service Science, plus, depending upon the specific programme the student is enrolled in, the HCMUS Bachelor of Science in Computer Science. The programme at HCMUS is running successfully, with more than

100 students enrolled in the Service Science programme and with student numbers expected to keep steadily increasing. As a result of our success with this programme, we are partnering with Ho Chi Minh City's Department of Science and Technology (DoST) and "Project 500" in HCMC [13] to up-skill City personnel and associated partners in both generic qualifications to Masters and PhD levels, and to educate in IT Service Science concepts. To this end a series of IT Service Innovation workshops were run at HCMUS in September to educate Service Science concepts and brainstorm service innovation projects.

Apart from this collaborative partnership, AUT will soon begin delivering the IT Service Science major (as a double major with Networks and Security) at PSB Academy in Singapore, then in 2013 at China Jiliang University in Hangzhou, Zhejiang Province, China. The longer-term objective is to follow each of these undergraduate programmes with the MSOC, similarly delivered on-campus in flexible mode, once the demand for such is generated through IT Service Science graduates at these locations.

As well as these on-campus partnerships, students from generic articulation partners such as Binus University, Jakarta, and Georgian College, Canada can transfer directly to the IT Service Science major at AUT in Auckland, New Zealand after two years of study at their home University. Other similar partnerships from other countries such as Korea, Taiwan, and two countries in Latin America are in the negotiating stages.

## V. Conclusion

In our paper we have presented our reflection on the development, approval, and establishment of an integrated IT Service Science and Service-Oriented Computing academic programme. We have shared the highlights and processes of establishing such a programme to give insight into how one University introduced such a programme. However; teaching feeds research, and research feeds teaching. Therefore, we refer the reader again to the previously mentioned Service Science innovation initiative in Ho Chi Minh City, Vietnam. This in turn has spawned the newly formed AUT Service Science Innovation Research Group under whose banner this paper is presented, whose aims include;

- To work collaboratively with our international partners to develop solutions and concepts for information creation that helps in capturing value in todays service driven information centric world.
- To take interest in all areas of the service lifecycle; including identification, net-value-formation, modeling, implementation and commercialization.

Our group is interdisciplinary with interests spanning from intercultural competencies with focus on people, organizations, and communication across diverse cultures, to information and information technology theory with the focus on how to apply these in creating new service-oriented information. Together with our collaborative partners we aim to create new solutions for solving problems in different and diverse sectors of society, taking into consideration the variety of motivators that drive innovation, including financial, cultural and practical needs of our stakeholders.

We coordinate a virtual service innovation hub for students, researchers, and practitioners to enable everyone to benefit from the advances on the field, and support the University's Service Science and Service-Oriented Computing programmes by coordinating research students and research programs with our partners.

Clearly, the time for Service Science and Service-Oriented Computing academic programmes has come. AUTs School of Computing and Mathematical Sciences has positioned its IT degree programmes to provide timely and appropriate education to a growing education demand.

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