MAURITIUS RESEARCH
COUNCIL Unsolicited Research
Grant Scheme COVER SHEET

DATE RECEIVED	FOR MRC USE ONLY
	DATE ACKNOWLEDGED
MRC PROPOSAL NUMBER	**ASSIGNED TO**

PROJECT TITLE
Investigating the Factors Affecting Technology Acceptance in Mauritian SMEs

Priority Area: ICT and Emerging Markets

REQUESTED AMOUNT: Rs 201,400	PROPOSED DURATION : 6 Months
PRINCIPAL INVESTIGATOR NAME **B A Gobin**	TITLE: MR/MRS/DR/PROF/MISS **Dr**
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FORM 1010

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1 Project Summary

In Mauritius, Small and Medium Enterprises (SMEs) have the ability to significantly contribute to economic growth (SMEDA, 2014). SMEs are currently mushrooming in Mauritius for the sustainability of many households. However, these SMEs in Mauritius also face challenges from other emerging markets, for example, a highly competitive environment in which to conduct their business. Therefore, in order to improve their competitiveness, quality and productivity, SMEs in Mauritius have to adopt new technologies (SMEDA, 2014).

The SMEDA has observed that the technology usage of SMEs is low and in this respect, a Technology Centre has been set up to provide multiple services such as training, a technology incubator and research and development services. Despite providing training in the use of basic technologies such as MS Office tools and communication technologies such as email, the SMEDA has observed that a significant percentage of the concerned SMEs has not adopted these new technologies in their day-to-day activities. Therefore, it is clear that SMEs in Mauritius are facing challenges regarding technology acceptance and this proposed research aims to investigate the factors impacting on technology acceptance among Mauritian SMEs. The effective integration of technology in SMEs in Mauritius is a complex process, which may involve significant investment, and resources and thus, it is essential to have a good understanding of the SME sector and the factors that could be acting as barriers to technology acceptance.

No study has yet been carried out regarding the IT usage and the barriers for IT adoption by SMEs in Mauritius. This project aims at understanding the factors correlating with the adoption of technology acceptance in SMEs. In addition, there is no proper distinction and classification of SMEs; only a few figures on technology usage are available. Thus, to bridge this gap, after carrying out a thorough study, SMEs in Mauritius will be classified into clusters based on specific criteria. A questionnaire-based survey will be carried out on samples from these clusters to assess technology adoption and acceptance. This data will

then be statistically modelled and analysed to identify the factors pertaining to the adoption or disregard of technology by SMEs.

Appropriate methods will be applied to examine and interpret the results. Findings in Mauritius will be compared with other similar countries, for example, Small Islands Developing States (SIDS), in order to depict meaningful patterns on the use of technology from identified clusters. Recommendations will be made with respect to ways through which SMEs can be motivated about the acceptance and adoption of technology in their businesses. These recommendations will also help decision makers from SMEDA as well as from the Government on their policies and action plan.

2 Project Justification

Mauritius is undergoing major changes; its landscape is transforming into a service-oriented economy. At the ICT-BPO International Conference 2013, it was discussed that the services sector accounts for 67% of the country's GDP with the three leading poles, that is, tourism, financial sector and more recently Information and Communication Technologies (ICT). The country is being recognised as a safe investment destination because of its established tradition of socio-political stability, free market economy and good governance. Thus, recently the ICT sector has a new role as the third pillar of the Mauritian economy. At the ICT-BPO International Conference 2013, it was also stated that the vision of the Government of Mauritius is to position the country as a leading ICT destination in Africa.

In line with this statement, it is sine-qua-non for SMEs in Mauritius to keep pace with the application of technology. If not adopted rightly and positively, SMEs could position themselves far away from the Government's vision and policy. Without the adoption of technology, SMEs in Mauritius will have a low profile and capacity compared to foreign SMEs and in order to sustain their future needs, it is an undisputed fact that the SMEs in Mauritius should provide services that meet international norms.

Despite the existence of thorough literature on the benefits of IT and sensitization promoted by SMEDA, SMEs are still reluctant to adopt technology in their daily activities. Therefore, it is important for researchers to find out the factors related to the reluctance regarding the use of technology by SMEs. Hence, the aim of this project is to investigate these factors and provide recommendations for policy and decision makers. This study can help in transforming Mauritius by helping SMEs and eventually the economy of the country. Mauritius has the potential of being the leading ICT hub in the Indian Ocean and the ICT diffusion process requires the help of each and every one.

3 Project Description

3.1 Project Objectives

The main aim of the project is to investigate the factors affecting technology acceptance in Mauritian SMEs and provide recommendations based on the findings. To be able to achieve this goal the following objectives have be set:

1) **Thorough review of the work carried out on technology acceptance among SMEs.**

   Much work has been done with regards to technology acceptance in SMEs in other countries. There are also a lot of technology acceptance models that have been proposed. A thorough study of relevant works and models will be carried out to identify all the necessary components required for evaluating the status of Mauritian SMEs.

2) Identify the various Mauritian SMEs and cluster them based on specific criteria.

There are at present 10,000 SMEs, which can be grouped into various categories. An initial classification has been done by the SMEDA, which does not focus on technology usage. With the help of the SMEDA the SMEs will be grouped in various IT-related clusters. The different clustering criteria will be defined and the SMEs will be categorized accordingly.

3) Survey a representative sample from the various clusters of SMEs.

The purpose of the survey is to gather all the relevant data, which will be required to assess SMEs in terms of technology assessment. The survey will be designed based on various criteria used to assess technology acceptance. The questionnaire will be designed based on various factors proposed in existing technology acceptance models. At present there are no specific models, which focus on SMEs in Small Developing Island States (SIDS). Most of the related works focus on technology acceptance in large developed or developing countries. A representative number of SMEs will be considered and interviewed from each cluster so as to have a better overview of all segments.   A total of 250 SMEs will be involved for this survey.

4) Analyse the data of the survey.

A framework will be designed using statistically tools and techniques for the in-depth analysis and evaluation of the data obtained through the survey.

5) Provide recommendations based on the analysis done.

These recommendations will be the main outcome of this project. The evaluation done will provide a better overview of the current status on technology acceptance in existing SMEs and based on these recommendations, action plans can be prepared by the SMEDA and the Government.

3.2 Project Scope

The project shall be limited to assessing technology acceptance in SMEs. It shall not go into in-depth assessment of technical and legal issues. This study is a preliminary research, which will pave the way to other specific projects in the future. Since the aim of the project is to assess to what extent technology has been used, and analyse why technology is not an integral part of SMEs strategy, the focus will be on the evaluation of the SMEs in terms of variables defined in technology acceptance models.

3.3 Methodology

The proposed methodology is as follows:

1. **Segmentation of SMEs in collaboration with SMEDA.**

   Using existing research, different ways in which SMEs registered with the SMEDA could be segmented will be investigated. For example, according to sector of operations, turnover, formality etc.

2. **Study of technology acceptance among SMEs.**

   A thorough literature review in the area of technology acceptance among SMEs will be conducted with the following objectives:

   a. Identify factors that impact on technology acceptance among SMEs.
   b. Review existing models of technology acceptance.

3. **Formulate hypothesis in regards to technology acceptance for Mauritius SMEs.**

   The variables that affect technology acceptance for Mauritian SMEs will be specified and the hypothesis for the study will be established. The relationships between the specified variables will also be determined.

4. **Collect data on ICT usage by SMEs.**

   A survey based on the previously identified variables will be designed and piloted. After the pilot phase, the questionnaire will be refined and distributed among a

sample of SMEs in Mauritius. Following the survey, depending on the need, some SMEs could be interviewed for further insights.

5. **Propose framework to analyse technology acceptance among Mauritian SMEs.**
   Existing models of technology acceptance will be used or adapted in order to analyse collected data.

6. **Analyse collected data from SMEs.**
   Using the proposed framework, data from SMEs will be analysed. Both qualitative and quantitative analysis will be performed in order to obtain a complete picture on technology acceptance, adoption and use among Mauritian SMEs. Quantitative analysis will also include statistical models and tests. During this stage, the barriers to technology acceptance among Mauritian SMEs will also be identified and formulated.

7. **Make recommendations to SMEDA on technology acceptance for Mauritian SMEs.**
   Based on the results of the analysis, recommendations will be made to the SMEDA regarding technology adoption and the barriers to technology acceptance among SMEs. Further recommendations will be made regarding measures that could be undertaken to enhance technology adoption and use.

3.4 Relevance to National Objectives

This proposed research work is relevant to the national objectives of the Government of Mauritius, that is, making ICT one of the pillars of the economy. In the National ICT policy 2007‑11 report (Ministry of Information Technology and Telecommunications, 2007), it is stated "pressure faced by existing pillars is forcing our government to look for opportunities to take advantage of modern technology to transform the ICT sector into the fifth pillar of the economy and position Mauritius as a regional hub for ICT". It is mentioned in this report that the government wish to position Mauritius as a major destination in the region for investment. But currently, although investing massively on the ICT sector,   SMEs

are still lagging behind in exploiting and adopting technology in their daily business processes.

In (Government Information Service Newsletter, 2011), it is stated "The ICT-BPO sector and the holding of such a timely and promising event is one of the many initiatives undertaken by Government in its ambition to put Mauritius in the forefront of development and position the country in a leading role in the ICT sector in the region". To ensure that Mauritius becomes a preferred platform and solution providers, SMEs have to play a key role in providing just-in-time and quality service to customers. Without the use of IT, this objective is far from being realised.

In addition, policy makers in Mauritius have mentioned that "E-Governance must be seen not just as a tool for citizen National ICT Policy convenience but also as a spur to the domestic ICT industry in Mauritius and a compelling reason for communities to adopt ICT in their daily lives" (Ministry of Information Technology and Telecommunications, 2007). It is therefore essential to come up with a framework to depict on the unwillingness of SMEs upon the use of technology in their daily businesses.

3.5 Current State of Knowledge in this Field

Since the 1980s, when personal computers became popular, researchers have observed that the trend of technology adoption for smaller organisations was different from the bigger organisations (Iacovou, Benbasat & Dexter, 1995). There are several reasons for this including the highly uncertain environment in which SMEs operate (Yap, Soh & Raman, 1992), the limited resources available, the relatively short-term reactive decision-making (Fink, 1998) and the attitude of the owner and/or manager of the SME including his attitude to IT, innovation and knowledge (Thong and Yap, 1995). In order to obtain a better understanding of the reasons why SMEs are not accepting technology, in the following, we provide an overview of the four technology acceptance models from existing research.

3.5.1   Technology Acceptance

User acceptance has been defined as "the demonstrable willingness within a user group to employ technology for the tasks it is designed to support" (Dillon and Morris, 1996). For example, within the SME sector, user acceptance of technology will include the SMEs' willingness to use the available technologies to improve their business processes or for communication purposes. Over the years, researchers have demonstrated a strong interest to understand the reasons for which people accept or reject technology in order to improve the approaches used to evaluate and predict the way users will respond to new technologies (Dillon and Morris, 1996). In this respect, researchers have proposed many theoretical technology acceptance models based on research in information systems, psychology and sociology (Venkatesh et al., 2003). In the following, some of the most important models of technology acceptance are described.

3.5.2   Theories and Models of Technology Acceptance

- Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) is inspired from psychology and is one of the fundamental theories on human behaviour (Venkatesh et al., 2003). According to the TRA model, the two major factors that determine behavioral intentions are the person's attitude toward the behavior and subjective norms. Attitude towards the behaviour refers the person's judgement and perception about whether the target behaviour is good or bad (Ramayah and Jantan, 2004) whereas the subjective norms refers to the person's perception about whether the people who are important to him think he should or should not perform the behaviour in question (Fishbein and Ajzen, 1975). In the context of technology adoption and acceptance, a user's intention to accept or reject a particular technology is based in a trade-off between the system's perceived benefits and the complexity associated with learning or using the system (Ramayah and Jantan, 2004).
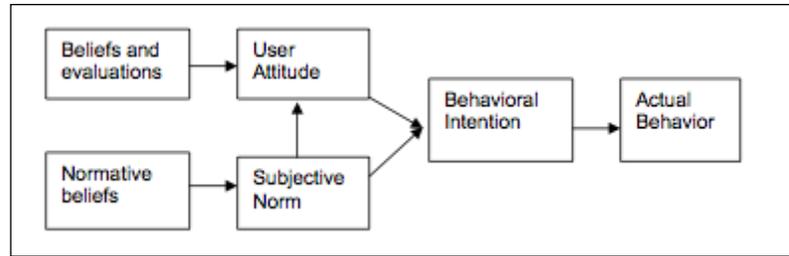
Figure 1: Theory Reasoned Action (Ramayah and Jantan, 2004).

- <u>Technology Acceptance Model (TAM)</u>

The Technology Acceptance Model (TAM) (Davis, 1989) differs from the TRA model by incorporating perceived usefulness and perceived ease of use as key components that determine whether a particular technology will be accepted and used (Ramayah and Jantan, 2004). Perceived usefulness is the "degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989) while perceived ease of use can be described as " the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). However, in order to provide a better understanding of the factors that determine perceived usefulness of a system, Venkatesh and Davis (2000) proposed an extended version of the Technology Acceptance Model, named TAM2. This enhanced model take into consideration variables that affect perceived usefulness such as subjective norm, experience and voluntariness etc. as shown in Figure 2. TAM has been widely used under different environments and researchers have often proposed modified versions of TAM to address acceptance of technologies. Some recent examples of the application of the TAM model include (Meng and Ambrose, 2013; Galadima, Akinyemi and Asani, 2014; Ernst, Wedel and Rothlauf, 2014).
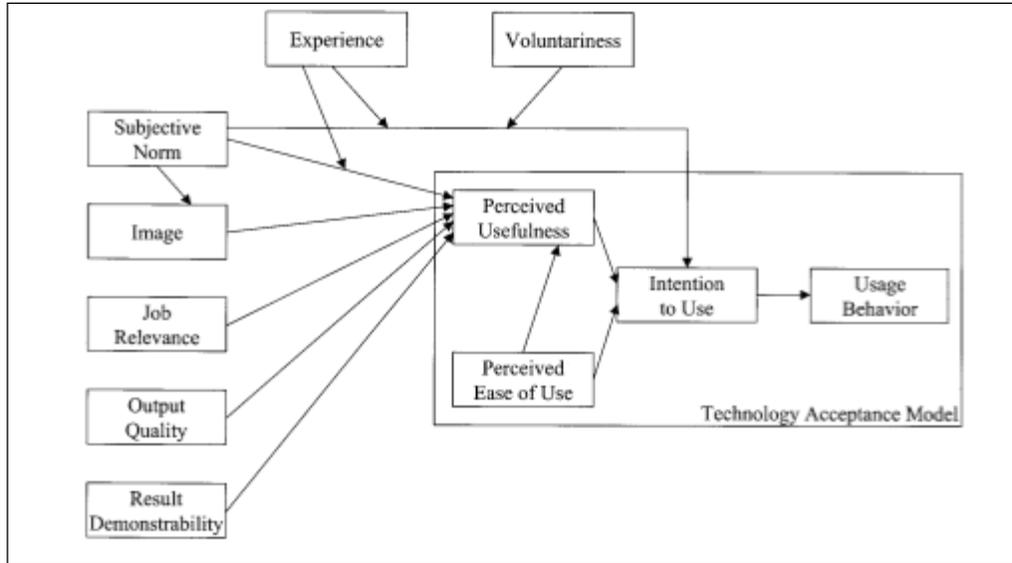
Figure 2: Enhanced Technology Acceptance Model (TAM2) (Venkatesh and Davis, 2000).

- Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) (Ajzen, 1985), an extended version of the TRA, account for perceived behavioural control as an additional determinant of intention and behaviour (Venkatesh, 2003). Perceived behavioural control measures the extent to which users have complete control over their behaviour or the extent to which a person believes he or she has control over factors that may impact on behavioural performance (Ramayah and Jantan, 2004). TPB has been successfully used to understand acceptance and usage of technologies on an individual level.
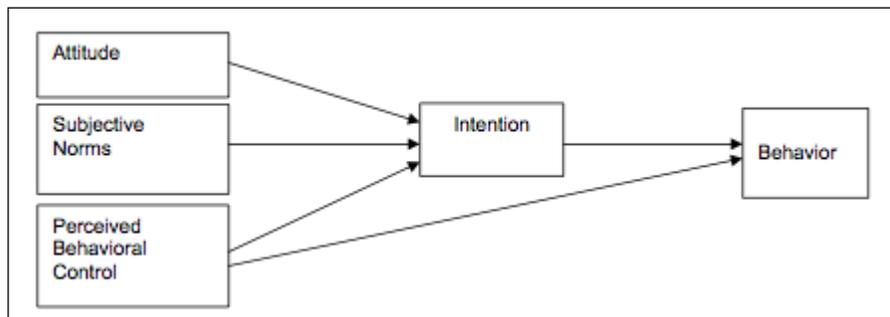

Figure 3: Theory of Planned Behaviour (Ramayah and Jantan, 2004).

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- Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al., (2003) formulated the Unified Theory of Acceptance and Use of Technology (UTAUT) model after empirically reviewing and comparing 8 original models and theories of acceptance including Theory of reasoned action (TRA), technology acceptance model (TAM), motivational model (MM), theory of planned behaviour (TPB), model combining technology acceptance model and theory of planned behaviour (C-TAM-TPB), model of PC utilization (MPCU), Innovation diffusion theory (IDT), and social cognitive theory (SCT). The authors argue that the existence of this many models put researchers in the dilemma of having to "pick and choose" constructs from the varying models or to choose a favourite model and thus ignoring the insights that the other models can bring (Venkatesh et al., 2003). As shown in Figure 4, the UTAUT model consists of four primary variables that influence the intention to use and the actual use of technology namely performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC). Additionally, the model includes four moderators: gender, age, experience and voluntariness.
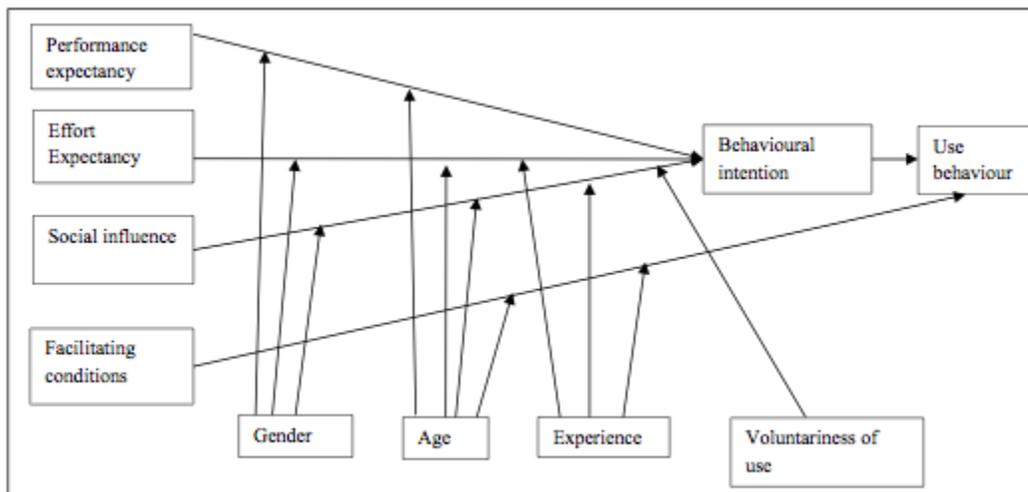

Figure 4: Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)

3.5.3 Factors Impacting Technology Acceptance from SMEs

There is a wealth of work that address acceptance of technologies among SMEs. Much of this research has focussed on the acceptance, adoption and use of Information Communication Technologies (ICTs) which include communication devices such as phone and fax machines etc. (Esselaar, Stork, Ndiwalana and Deen-Swarray (2007); X). In the Table 1, factors that impact on the adoption and use of technologies among SMEs are described. For the purpose of this proposal, only a few research papers are listed for their direct relevance to the proposed research. However, as discussed in the 'Methodology' section, factors that impact on technology acceptance among SMEs will be thoroughly researched.

Table 1: Factors, which impact on technology adoption and use among SMEs

Research Paper	Country under study	Factors Impacting Technology Adoption and Use
(Esselaar, Stork, Ndiwalana and Deen-Swarray, 2007)	13 African Countries including: Botswana, Cameroon, Ethiopia, Ghana, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zimbabwe.	• Cost • Lack of awareness and knowledge of ICT • Lack of financial resources
Wolf, S. (2001)	South Africa	• Uncertain environments • Training/Experience of the entrepreneur (owner) • Optimism/Pessimism of the entrepreneur (owner) • Education level of the workforce
(Harindranath, Dyerson and Barnes, 2008)	United Kingdom	• Cost • Lack of resources • Owner/managers not ICT trained or skilled • Lack of internal ICT expertise • Uncertainty over business benefits
(Hashim, 2007)	Malaysia	• ICT skills of SME owners

3.6 Expected Output

The expected outcomes of this project are defined in the following:

1. **Data on technology usage by Mauritian SMEs.**

   The data collected will be the first set of data collected on Mauritian SMEs with regards to technology acceptance. This data will be used for the purpose of our research and will also be made available through publications for future research also. It will include the various segments identified as well as the quantitative and qualitative analysis done on these segments.

2. **Factors influencing technology acceptance in Mauritian SMEs.**

   It cannot be denied that ICT definitely impacts positively on SMEs and helps to improve their competitiveness and productivity. Still it is also acknowledged that SMEs are not really ICT as should be. All the factors affection ICT adoption will be identified making it clear where the real problem lies. Based on this only can appropriate actions be taken. Also these factors will also contribute to design a technology acceptance model for Mauritian SMEs, which can then be used to assess the SMEs again after some time to see whether new initiatives from the SMEDA and the government are successful.

3. **Set of Recommendations provided SMEDA and the Ministry of Business, Enterprise and Cooperatives on how to improve technology acceptance.**

   This research will enable to have a better understanding on technology adoption and the barriers to technology acceptance among SMEs. Recommendations will be provided on measures that could be undertaken by the SMEDA and the Ministry to enhance technology adoption and use.

4. **Guidelines on how to go about integrating technology in Mauritian SMEs.**

   Attached to the set of recommendations, a set of guidelines will also be provided on how to go about the integration of technology. These guidelines will be prepared   in

consultation with the SMEDA.

4 Project Activities, Cost Components and Milestones

Forms 1020, and 1030 are attached at the end of the document. The cost breakdown and justifications are as follows:

Cost Components	Justifications	Cost(Rs)
Consumable --- Stationary	For questionnaire and reports (printing of questionnaire of 5 pages(Rs2 per page/1000 questionnaires) + printing of report and reading materials)	11,000
Salaries --- 1 Research Assistant (Salary per month is Rs23, 400 based on latest PRB report)	The research assistant will be involved in various activities – Refer to Form 1020	140,400 (23,400 x 6)
Local Transport	Visit to SMEDA and SMEs – Rs500 per day	20,000 (Rs500*2*20)
Documentation and Publications		30,000
	Total Cost	**201,400**

5 Validation and Dissemination of Results

The different hypotheses identified will be validated statistically based on the proposed evaluation framework. The validated of the results will be done with the help of the SMEDA. Dissemination of results will be carried out through:

- Publication of results in international refereed journals.
- Presentation of the work to different stakeholders

- Submission of project report with recommendations to the Mauritius Research Council, the SMEDA, the Ministry of Business, Enterprise and Cooperatives

6 Prior Research work undertaken by PI

Dr B A Gobin, the Principle Investigator of the project, has a PhD in Computer Science and Engineering with a specialization in AI. She is currently the Chairperson of the Information System for Society Research and Consultancy Group (ISS), which consist of lecturers of the Department of Computer Science and Engineering of the University of Mauritius. The main objectives of the research and consultancy group is to 1) identify areas of need at national level with respect to how IT can potentially contribute to improve efficiency 2) undergo research in various social fields and analyse how IT-based solutions can support sustainable development and 3) provide consultancy services to solve problems related to society for example social integration, education, health and many other sectors.

The PI in collaboration with Mrs Z.Cadersaib member of the ISS and investigator for the proposed research project, and Ms M.Antoo, have already started to investigate on the IT adoption in SMEs. The research focused on the adoption of cloud computing in 20 companies who make use of IT. The output of the research project was a 1) a PEST evaluation framework used to assess the readiness of cloud computing by Mauritian SMEs and 2) a framework for cloud computing adoption. The first output of the research has been published in an international reviewed journal[1] and a second publication is in progress to disseminate the work done with regards to the framework for cloud computing adoption.

The PI and her team are currently investigating on the need of having Information Systems at the National Empowerment Foundation, which is an organization working for social

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[1] M.Antoo, Z.Cadersaib and B.A.Gobin, 'PEST framework for Analysing Cloud Computing Adoption by Mauritian SMEs', Lecture Notes on Software Engineering 2015, Vol3(2), 107-112, ISASN:2301-3559, DOI:107763/LNSE:2015.v3.175

integration. Also the PI has worked on a methodology to capture tacit knowledge within the organization and map it onto computer-understandable format known as ontology modules, which can then be used to intelligent systems. The methodology has been proposed for the purpose of her PhD thesis. The methodology aims at being an agile methodology which will be very beneficial to inexperienced knowledge/ontology engineers, especially those of Small Island Developing States, who have very limited experience in knowledge engineering. It can be used to capture and codify knowledge, hence making sure that expert knowledge is not lost.

The PI has presented papers in various conferences and has also be been part of the organizing committee of AFRICON2013. She has also organized two research seminars at the University of Mauritius.

Papers published by the PI are as follows:

Research Papers in International Refereed Conferences:

1. Gobin B.A., 'Assessing the suitability of existing Agile Ontology Engineering Methodologies for ontology module development, In the proceedings the International Conference on Web and Information Systems (ISWIS 2014),March 22-24 2014, Hammammet, Tunisia.

2. Gobin B.A., 'Using the 4-DAT tool to evaluate Agile Ontology Engineering Methodologies', In the proceedings the International Conference on Web and Information Systems (ISWIS 2014), March 22-24 2014, Hammammet, Tunisia.

3. Gobin B.A., 'A Quantitative Framework for assessing Agile Ontology Engineering Methodology', In the proceedings the International Conference on Web and Information Systems (ISWIS 2014),March 22-24 2014, Hammammet, Tunisia.

4. Gobin B.A, 'An Agile Methodology for developing Ontology Modules which can be used to build modular ontologies. In the Proceedings of 2013 IEEE International Conference on Computer Science and Automation Engineering (CSAE 2013), November 01-03, 2013, Guangzhou, China

5. Gobin B.A , "A domain ontology for capturing knowledge for social integration", In the proceedings of the 10th IEEE International Conference on ICT and Knowledge Engineering, November 21 --- 23, 2012, Bangkok, Thailand

6. Gobin B.A., "Reusing OWL--S to model knowledge intensive tasks performed by Knowledge Based Systems", In the Proceedings of the 9th IEEE International Conference on ICT and Knowledge Engineering January 12 --- 13, 2011, Bangkok, Thailand

7. Gobin B.A. and Subramanian R.K, "An Owl Ontology for CommonKads Template Knowledge Model", In the Proceedings of the International Conference on Knowledge Systems Engineering (ICKSE 2009), April 28--30,2009, Rome Italy

8. Gobin B.A and Subramanian R.K, "Knowledge Modelling for a Hotel Recommendation System", In the Proceedings of the XIX International Conference of   Computer Information and Systems Sciences and Engineering, January 29--31,2007, Bangkok, Thailand

Research Papers in International Refereed Journals:

1   M.Antoo, Z.Cadersaib and B.A.Gobin, 'PEST framework for Analysing Cloud Computing Adoption by Mauritian SMEs', Lecture Notes on Software Engineering 2015, Vol3(2), 107--112, ISASN:2301--3559, DOI:107763/LNSE:2015.v3.175

2   S.Ramkhelawon, Z.Cadersaib and B.A.Gobin, 'Cloud Computing as an alternative for on--premise software for Mauritian Hotels', Lecture Notes on Software Engineering 2015, Vol3(2), 113--119, ISASN:2301--3559, DOI:107763/LNSE:2015.v3.176

3   M. Heenaye, B. Gobin and N. Mamode Khan, 'Analysis of Felder--Solomon Index of Learning Styles of Students from Management and Engineering at the University of Mauritius', Journal of Education and Vocational Research, 2012 Vol. 3, No. 8, pp. 244--249, (ISSN 2221--2590)

4   B.A. Gobin,V. Teeroovengadum,N. Becceea,V. Teeroovengadum, 'Investigating into the Relationship between the Present Level of Tertiary Students' Needs Relative

to Maslow's Hierarchy', International Journal of Learning 2012. Vol. 18 Issue 11, p203--219,

5.   B.A. Gobin, R.K.Subramanian.'Mapping Knowledge Models onto Java Codes', World Academy of Science, Engineering and Technology, Vol.4 Issue1, p106--111

Internationally Refereed Book Chapters

1. B.A. Gobin, 'An Agile and Modular Approach for Developing Ontologies' , In K.J. BWALYA ed. Technology Development and Platform Enhancements for Successful E--Government Design, IGIGlobal, Chapter 7, December 2013

7   Result of previous work financed by MRC, if   any

None

8   Referees

9 Has this project proposal or a similar one, been submitted to any other organisation for either full or partial funding?

No.   The project proposal has been sent only to MRC for full funding.

10 Facilities, equipment and other resources

None

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