

A Strategic Framework for Successful Adoption of Cloud-Based Services in Indian SMEs

Nitirajsingh Sandu and Ergun Gide

Abstract—The aim of this research paper is to suggest key strategies for the successful adoption of Cloud based services in Indian SMEs. In India, SMEs confront issues because of lack of information on Cloud services. So far, when compared with large firms, SMEs possess less capital, and employees are hired with lower pay packages. Hence, with this drawback, SMEs will not have enough human resources to support basic requirements. SMEs, when compared to large organisations, have infrequent full-time IT staff or are unable to afford formal IT departments. Equally, as SMEs are the backbone of the Indian economy, they generate considerable employment opportunities and utilize technology to improve competitiveness by reducing cost and improving productivity using innovative technology, which includes Cloud Computing. This paper has listed the key recommendation that will help Indian SMEs understand the importance of organisational and technological factors for Cloud-centric service adoption. By discerning the importance of Cloud-based services among business organisations, this study will then be contributing to society. It could also act as a basis for future researchers, decision-makers and others to improve competitive advantage in developing countries using Cloud-based services.¹

Index Terms—Cloud Computing (CC), framework, Indian SMEs, technology adoption.

I. INTRODUCTION

The majority of individual and business consumers are significant users of Cloud-based services such as email, social media, online gaming and mobile applications. The business community has begun to embrace Cloud-based services as a viable option in reducing costs and improving IT and business agility [1]. With the advent of Cloud-based services, organisations can achieve success by outsourcing their core IT activities or entire technology infrastructure that supports the organization processes [2]. The Cloud-based services adopted by many organisations worldwide have resulted in low operational costs without losing any focus on the needs of customers [3]. Computing services are readily available on demand, just like other utilities such as electricity and water [4]. Although SMEs have few resources, the integration of Cloud-based computing services has resulted in increased convenience and improved operational reliability in these organizations. Further, Cloud computing is seen to reduce costs, given that user firms can only use the required hardware and software platforms for their operations.

India is proceeding at a rapid pace towards the

development of IT industry with a high level of Cloud-based services [5], and with the steady growth of Cloud-based service adoption over the past few years [6]. The primary motive for the present research is that, despite the steady growth of adoption of Cloud-based services, there is a lack of specific research on adoption of the Cloud-based services by Indian SMEs. They play an essential role in economic development and employment generation in a developing country like India. Further, Cloud-based services provide new opportunities to Indian SMEs to compete globally by reducing their IT infrastructural and operational costs, and it is likely that the efficacy of Cloud-based services will be improved through IT capability.

Cruz notes that the Indian SME sector is considered the backbone of the economy, contributing 50 per cent of industrial output and 40 per cent of India's exports, and employing 60 million people [7]. It follows that failure to adopt Cloud-based services can significantly affect the global competitiveness of Indian SMEs, and might even have an impact on the very survival of many small and medium-sized enterprises. According to Google CEO Sundar Pichai, out of 51 million SMEs in India, only 32% have online presence [8]. Many SMEs are resource poor and Cloud based service can help them to provide online presence without worry about infrastructure and the resources required. This research paper will provide recommendation to SMEs to improve their efficiency and effectiveness using Cloud based services.

II. LITERATURE REVIEW

SMEs adopt Cloud-based services for several reasons. The main benefits are accessibility; reliability; security; cost savings; and ease of use[9]. However in the last few years there has been growing interest in emerging Cloud-based services from a range of stakeholders, including business organisations, various social institutions, the general public and the government [10]. The portability of end-user data to another Cloud provider in Cloud computing is seen to be extremely crucial since it enhances the reliability of the system and thus ensures that the SMEs operate continuously even when there are inconsistencies in the system [10]. This interest has led to the development of new models in economics driven by Cloud-based services [11]. There has been a paradigm shift away from heavy investment in physical IT infrastructure and IT resources that are owned and managed internally by firms, towards a pay-per-use for IT infrastructure and services supplied by a Cloud-based services supplier [12].

With the increase of globalization, most organisations face the necessity of reducing costs and increasing productivity and profitability in order to achieve success and retain their

Manuscript received May 3, 2019; revised September 9, 2019.

Nitirajsingh Sandu and Ergun Gide are with the School of Engineering and Technology, CQUniversity, Sydney, Australia (e-mail: r.sandu@cqu.edu.au, e.gide@cqu.edu.au).

competitive position [12]. Cloud computing has the potential to transform the way businesses and consumers use and store data, and with this new model organisations can save money, time and effort. To offset the high cost of infrastructure, Cloud service providers need enterprises and consumers to adopt Cloud computing [13]. This is where the evolution of information technology gives several positive advantages and effectiveness to various businesses.

Due to their advantages, Cloud-based services can be adopted effectively in all businesses, especially in SMEs, which in general act as a significant driver to the growth of the economy of any nation. SMEs provide different opportunities to society, including the reduction of poverty, development of rural areas, generation of job opportunities, entrepreneurship, and national exports [9]. However, SMEs face issues in society that are due to the lack of adequate resources available to increase their business performance. Thus, it is essential to adopt the new technologies to enhance their performance and compete on local and global market.

III. RESEARCH METHODOLOGY

Quantitative research methodology was selected to evaluate the data collected for this research. The reason for this selection, the questionnaire surveys including reliability, validity and the pilot study, as well as the limitations faced by the sampling methods are discussed. Quantitative information is evaluated using data analysis through Structural Equation Modelling (SEM).

This research theorizes that the innovation characteristics (DOI), and Technologies, Environment and Organisation (TOE) issues are primary drivers for SMEs in adopting Cloud-based services. The research will endeavour to examine the characteristic innovation factors holistically alongside technology, organization and environmental contextual factors that impact the adoption of Cloud-based services by Indian SMEs. The integrated structure of this report makes hypotheses depending on the use of two well-established theories of technology adoption: (a) Diffusion of Innovation theory framework and (b) Technology Organisation and Environment. A brief explanation of these theories is set out below.

Eleven variables were formulated based on the literature review obtained from the Conceptual framework derived from DOI and TOE. The critical drivers for Cloud-based service adoption by SMEs are relative advantage; top management support; competitive pressure; global scope; compatibility; and cost reductions. Factors that negatively affect the adoption of Cloud-based services range from firm size, technological readiness, regulatory support, and security issues to complexity. India also faces challenges such as blackouts, power outages and poor development of IT infrastructure, especially in rural areas.

The sample size of the study was 305 participants who were top management personnel in Indian SMEs; the sample participants were recruited from all zones of the nation (north, east, west, and south). The sample size is determined according to the size of the population [14]. It is imperative to establish the appropriate sample size before the collection and approximation of the characteristics of a large population. Fabrigar specifies that the investigator is approximating the

value of the whole population when statistics are functions of a sample; consequently, a few errors will remain, the overall error being dependent on the scope of the sample [15].

Hypothesis testing was done through correlation analysis. The association between two variables was analysed using correlation analysis. The correlation coefficient (r value), measures this relationship [16], the r value ranging from -1 to 1. Based on the correlation coefficient, the researcher makes the following deductions:

1. The correlation coefficient is positive ($0 < r_{uv} < 1$): the variables ‘U’ and ‘V’ have a positive relationship with each other.

2. Correlation coefficient is negative ($-1 < r_{uv} < 0$): the variables ‘U’ and ‘V’ have negative relationship with each other.

3. The correlation coefficient is 0: this means that the two variables are not correlated [16].

TABLE I: CORRELATION ANALYSIS BETWEEN THE FACTORS INFLUENCING ADOPTION OF CLOUD-BASED SERVICES

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
V1	1	.314**	.377**	.581**	.669**	.328**	.027	.377**	.014	.534**
V2		1	.729**	.476**	.272**	.658**	-.005	.199**	.445**	.152
V3			1	.469**	.316**	.670**	-.072	.200**	.444**	.219**
V4				1	.640**	.486**	.061	.315**	.199**	.403**
V5					1	.360**	.162**	.426**	.125*	.464**
V6						1	-.016	.238**	.523**	.096
V7							1	.371**	.201**	.125
V8								1	.294**	.428**
V9									1	-.006
V10										1

** $p < .01$, * $p < .05$

where V1 = relative advantage, V2 = top management support, V3 = compatibility, V4 = competitive pressure, V5 = cost, V6 = technology readiness, V7 = complexity, V8 = security and privacy, V9 = regulatory support and V10 = Cloud-based service adoption.

Correlation between the factors influencing adoption of Cloud-based services is depicted in Table I. The outcome of the analysis is that relative advantage has a positive relationship with all other variables except complexity ($p > .05$) and regulatory support ($p > .05$). It follows that, as relative advantage increases, then other variables—top management support, competitive pressure, cost, technology readiness, compatibility, security, privacy and Cloud-based service adoption—also increase.

Similarly, top management support is positively correlated with all other variables except complexity ($p > .05$) and Cloud-based service adoption ($p > .05$). Furthermore, the findings indicate that most of the variables are associated with one another. However, Cloud-based service adoption has a relationship with only five variables: relative advantage, compatibility, competitive pressure, cost, security and privacy. The adoption of Cloud-based services does not have

a relationship with the four variables of top management support, technology readiness, complexity and regulatory support.

Reliability analysis was carried out using Cronbach’s alpha statistic, which measures the internal consistency between the set of items/questions. With regard to the value of the statistic, if Cronbach’s alpha (α) is above 0.8, then the data consistency is good [17], if the alpha value lies between 0.6 and 0.8, then data consistency is acceptable, but if the alpha value is below 0.6, then data consistency is poor.

Reliability measures along with descriptive statistics are presented in Table II from the analysis, the innovation dimension and technological factors indicated acceptable factors.

TABLE II: RELIABILITY ANALYSIS WITH DESCRIPTIVE STATISTICAL MEASURES OF INNOVATION, TECHNOLOGICAL, ORGANISATIONAL AND ENVIRONMENTAL FACTORS

Factors	No. of items	Mean	SD	Cronbach’s Alpha
Relative advantage	12	5.69	0.89	0.948
Top management support	4	4.84	1.61	0.953
Compatibility	4	5.05	1.53	0.946
Competitive pressure	8	5.50	1.07	0.937
Cost	9	5.78	0.88	0.947
Technology readiness	3	4.99	1.48	0.914
Complexity	3	4.46	1.67	0.959
Security and privacy	9	5.41	1.00	0.948
Regulatory support	5	4.35	1.55	0.946

Organisational and environmental dimensions showed Cronbach’s alpha values above 0.6. This indicates that the data for the respective dimensions were adequately consistent. Hence, the data were valid for further analysis. In addition, the mean values (mean > 4.00) revealed that the majority of the respondents were in agreement with regard to all the dimensions.

IV. RECOMMENDED STRATEGIES BASED ON RESEARCH FINDINGS

The present research findings provide an understanding of the association between innovation and technological, organisational and environmental factors on one hand and Cloud-based service adoption within SMEs on the other. The study demonstrates that Cloud-based services are useful and important technology tools for SMEs. Based on this, recommendations have been framed for both practical use and future research.

Recommendations were derived from the analysis of survey data and from analysis of the literature review. The comparison and crosscheck between the data gathered from the literature review and the data collected from the survey helped to validate and enrich the research findings. As SMEs continue to grow aggressively, they will build their Cloud architectures. Successful SMEs will adopt Cloud services across all layers of Cloud based deployment models, such as

software as a service (SaaS), infrastructure as a service (IaaS) and platform as a service (PaaS) [18].

SMEs will maintain a traditional on-premises hosting environment while rapidly adopting Cloud based services. According to the research, a key for success will be to manage proper integration with the management task while brokering Cloud services. Considering most Indian SMEs are resource poor, a public Cloud will be essential to reduce the cost and develop next generation applications and initiatives like the Internet of Things (IoT) [19]. The public Cloud also provides viable alternatives to host applications compared to traditional on-premises hosting for SMEs. They also need scalable architecture to support on-demand capacity and the requirement of ever-increasing amounts of data, in order to be competitive in the Cloud environment [20]. SMEs will increasingly look at the public Cloud to address these scalability requirements. According to the Gartner report, organisations that do not leverage the public Cloud but take a wait and see approach will risk being distrusted by others in the industry. Furthermore, it has been predicted in the Gartner report that by 2020, 24 per cent of the total addressable Information Technology market will be with Cloud [21].

Cloud computing is not the only technical innovation that SMEs should focus upon, but Cloud based services are the most pervasive, broadly impacting other technical advancements, such as Internet of Things (IoT), Big data, data analytics and software developments. Business strategy without Cloud adoption strategy in today’s environment is risky and can be compared with building while deliberately ignoring the importance of foundation [22].

SMEs can move beyond initial deployments and making investments that will enable CC to deploy in proper governance and became mainstream in SMEs as shown in Fig. 1.

SMEs that leverage CC will be able to deliver business differentiation and will provide competitive advantage over their competitors. On the other hand, SMEs that do not adopt CC will run the risk of being disrupted in their core business, resulting in catastrophic outcomes [23].

The Gartner report stated that by 2018, 50 per cent of the applications hosted on the public Cloud would be considered mission-critical by the organisations that use them [21]. SMEs embracing the CC implemented-Cloud based service would need to implement a framework to enable efficient use of consistent architectural designs and Cloud service. Such a research framework will provide a governing process for selecting Cloud service providers, identifying application and managing day-to-day operation associated with public Cloud-based services.

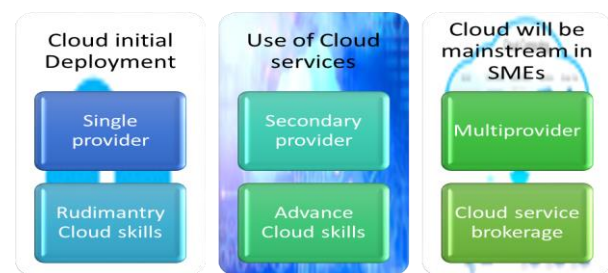


Fig. 1. SMEs approach to adopt cloud based services.

SMEs need to define and implement governance

procedures for each Cloud platform. SMEs need to develop and implement Cloud based strategies that define governance procedure within each Cloud platform as well as across platforms. Indian SMEs can use a Cloud adoption framework for building skill, accessing applications, selecting Cloud providers and services, developing architecture, establishing cost and governance, providing automation, and scalability of Cloud based services. The functions of such a framework are summarised in five stages below:

- Building skill and accessing applications would be the first step in order to access Cloud computing. Government departments such as the Ministry of Skill Development & Entrepreneurship (MSDE) are working with IBM to launch an advanced technical diploma program to train people in networking and CC.
- SMEs also need to select Cloud providers and services based on a model required for their businesses and develop criteria based on business requirements.
- Research also places emphasis on security requirements as one of the key factors necessary for Cloud adoption. Cloud vendors need to develop architecture based on robust design, security and back-up services for business continuity in case of man-made or natural disasters.
- Another key factor accepted for Cloud adoption is the cost. Both the tangible and intangible cost need to be calculated for Cloud adoption, along with developing governance mechanisms.
- Finally, once Cloud is integrated with current infrastructure for Indian SMEs, provisions need to be made for automation and scalability needs to be provided for future requirements. This includes an approach for managing public Cloud services as shown in Fig. 2.

The significant players in every market are SMEs as SMEs contribute in their way to each economy’s GDP and labour force. Overall, the SMEs have a great effect though they are not strong enough to affect the economy individually. To suggest new technologies and strategies that will help SMEs to become more effective and efficient will have a positive influence on the economy as a whole. Investing in ICT is one strategy that will help the SMEs to compete against larger companies. In several cases, these projects have been extremely expensive, and this is a major issue with investing in ICT, along with the considerable risk.

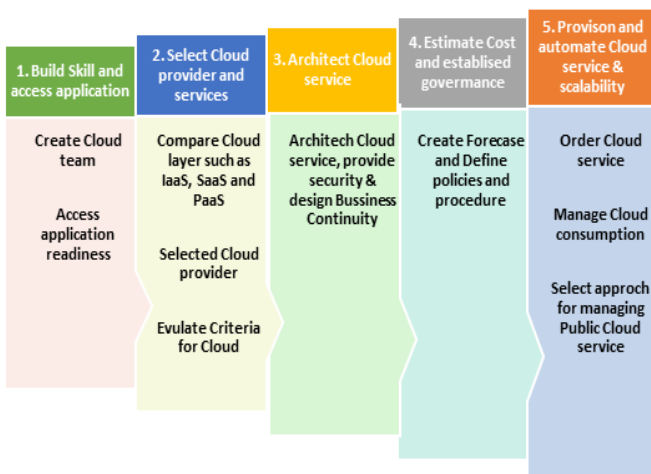


Fig. 2. Cloud based service adoption framework.

SMEs are restricted by their structure, size and limited budget from having access to IT services. IT services include but are not restricted to secure and reliable systems and to expert IT staff. SMEs can overcome this restriction as mentioned earlier by adopting Cloud computing. From the extensive adoption of Cloud computing additionally to the SMEs, the economy also benefits. Virtualization is one of the major underlying computing paradigms on which Cloud computing is based. The amount of power, which is being utilized by data centres, is significantly lowered by virtualization. Extensive use of Cloud computing, however, restricts the number of private data centres which are functional. Cloud computing also has its own disadvantages, debated by some practitioners and researchers.

Other issues which are mentioned by opponents of Cloud computing include data lock-in, bandwidth, availability of the systems and legal outcomes.

From a vendor perspective, however, there is a need for awareness programmes that will help in alleviating general misconceptions and, for instance, specify the level of time investment needed for common service/process transitions. Regarding savings made, this could provide cost benefit analysis findings in comparison to any financial outlay related with Cloud transitioning, and by the outsourcing of more complex services/processes to a Cloud provider, and it could outline how the scarcity of in-house skills may be addressed. Establishment of an expertise centre is the possible strategy to support such awareness and education with the objective of providing SMEs with independent advice on the management of the Cloud lifecycle.

Cloud computing is not simply the purchase of a specific product or service; rather, it is a partnership between Cloud service provider and Cloud user (the SME). The service provider should be considered a trusted partner, as it will become the extension of an organisation.

Trust plays a vital role in the adoption of CC. Cloud providers and SMEs need to learn to thrive on a symbiotic relationship and devise mutually beneficial and dynamic agreements and contracts, where both parties can create a relationship based on risk sharing and mutual economic success by embracing contractual obligations in order to manage risk legislation and to regulate how personal information is handled, stored and secured in CC.

This present research contributes to both business practitioners and academics. The model suggested in this study is unique and has not been employed in the earlier studies mentioned. Cloud providers can use the results of this study in order to increase the rate of adoption. Cloud knowledge is the principal factor in the diffusion of this study. Several mass media like LinkedIn, Twitter and Facebook can be used by Cloud providers in order to increase awareness of Cloud computing.

SMEs are essential players in any country as they contribute appreciably to every economic system’s GDP and labour force. Even though SMEs are not effective enough to provide independent direction to the economy, they possess a significant influence overall. Consequently, providing new techniques and technologies that assist SMEs in emerging more capable and effective will have a positive influence upon the entire financial system.

Outcomes of the present research include both practical and academic implications and contribute to both trade and academia, business practitioners and researchers. Cloud consumers use the services based only on demand and pay only for the resources used. Fig. 3 shows strengthening Cloud based adoption for Indian SMEs based on this research.

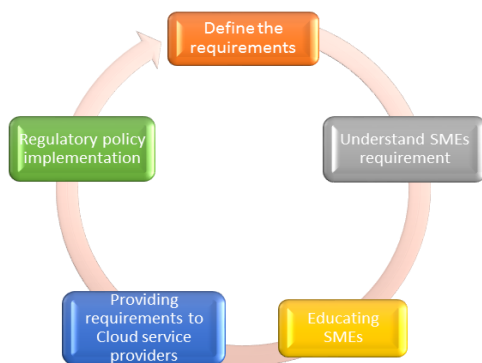


Fig. 3. Strengthening cloud based adoption.

Once the requirements are defined, vendors need to understand the SMEs' requirements based on type and size. As this research has pointed out, educating SMEs about the advantage of Cloud adoption is a major task, along with providing requirements to Cloud service providers. Finally, governments need to be proactive in designing regulatory policies for Cloud computing implementation.

This research will produce awareness about the application of Cloud-based services among SMEs in India. Further, it has proposed the concept of factors, which impact the adoption of Cloud-based services. This research had shown that there is need for more effort led by Government and state bodies to support SMEs who plan to adopt Cloud based services. Based on this, a framework has been created which will increase the awareness of preparatory steps for Indian SMEs to ensure effective and efficient migration to the Cloud environment.

There is a need for greater focus by the academic community on developing a literature specific to Cloud-based service adoption for Indian SMEs. There is also a need to further test and update existing models, and develop newer models, to support Cloud based application migration. This research has also shown that Indian SMEs do not follow an in-depth set of steps while migrating services to the Cloud.

Cloud models should be reflective of, and aligned with, the operational nature of many SMEs, which as research shows have limited resources to invest in new technology, have a simple command structure, and a lower level of formality compared to large organisations. This research also shows that there are also a variety of reasons for Cloud based adoption. There is a lack of awareness of the benefit of Cloud based services among Indian SMEs. The survey respondents also mentioned time and insufficient financial resources as the key deterrents to adoption; and many SMEs did not have the necessary IT skills to support Cloud migration.

SMEs also have greater agility and more rapid decision-making processes, so that developing a Cloud based adoption model should focus on a small number of steps that are easy to understand and implement, and they are more relevant for SMEs. Similarly, a model should also take into account SMEs' requirement of fewer levels of hierarchy,

simple procedure and less documentation. The provision of such Cloud models and guidance provided by Government and service providers may support better Cloud based adoption among Indian SMEs.

V. CONCLUSIONS

The research suggests that Indian Government and states need to provide support to aid SMEs that are planning CC adoption. A model/framework is proposed that shows preparatory steps in ensuring efficient migration to the Cloud environment. Research communities also need an additional focus on a growing literature base that is precisely tailored to Cloud computing adoption within the SME context. The model will assist SMEs through developing easy steps that may inspire them to be more planned and organized in their Cloud adoption efforts. Correspondingly, availability of this sort of model and related assistance might also inspire greater tiers of Cloud computing adoption among SMEs, as some respondents on the present research have not implemented it. This model can be an essential incentive in improving financial competitiveness and it can provide many benefits to SMEs in embracing Cloud environment.

REFERENCES

- [1] S. Ostermann, K. Plankensteiner, and R. Prodan, "Using a new event-based simulation framework for investigating resource provisioning in clouds," *Scientific Programming*, vol. 19, no. 2, 3, pp. 161-178, 2011.
- [2] L. Wang *et al.*, "Cloud computing: A perspective study," *New Generation Computing*, vol. 28, no. 2, pp. 137-146, 2010.
- [3] R. Buyya, J. Broberg, and A. Gościński, *Cloud Computing: Principles and Paradigms*, Hoboken, N. J.: Wiley, 2011, p. 637.
- [4] B. Tomlinson, M. S. Silberman, and J. White, "Can more efficient IT be worse for the environment?" *Computer*, vol. 44, pp. 87-89, 2011.
- [5] T. Pham, "Cloud computing and disaster recovery statistics – Company sizes in the cloud," *Online Tech*, 2011.
- [6] E. Gide and R. Sandu, "A study to explore the key factors impacting on cloud based service adoption in Indian SMEs," in *Proc. 2015 IEEE 12th International Conference on e-Business Engineering (ICEBE)*, 2015.
- [7] X. Cruz, "The state of cloud computing around the world: India," *CloudTimes*, 2013.
- [8] S. Joshi, "Google aims to get India's 51 million small businesses online with its new digital unlocked program," *Huffingtonpost*, 2017.
- [9] R. Sandu *et al.*, "The impact of innovative strategies to influence the adoption of cloud based service success," *Indian Small and Medium Enterprises (SMES)*, vol. 10, no. 2, pp. 403-413, 2017.
- [10] N. Sandu and E. Gide, "Analysis of the main factors affecting the adoption of cloud based interactive mobile learning," *The Australian Higher Education Sector*, vol. 12, no. 4, pp. 43-58, 2018.
- [11] E. Gide and R. Sandu, "A study of the current situation of adoption of Cloud based services," *Indian SMEs, Global Journal of Technology, Cyprus: Academic World Center*, vol. 5, no. 1, pp. 18-24, 2015.
- [12] Y. Alshamaila, S. Papagiannidis, and F. Li, "Cloud computing adoption by sme's in the north east of England: A multi-perspective framework," *Journal of Enterprise Information Management*, vol. 26, no. 3, p. 4, 2013.
- [13] D. Assante, *et al.*, "The use of cloud computing in SMEs," *Procedia Computer Science*, vol. 83, pp. 1207-1212, 2016.
- [14] H. Robbins and J. Van Ryzin, *Introduction to Statistics*, Chicago: Science Research Associates, 1975.
- [15] L. Fabrigar and D. Wegener, "Structural equation modeling," *Applied Multivariate Statistics for the Social Sciences*, pp. 537-582, 2009.
- [16] G. James *et al.*, *An Introduction to Statistical Learning*, Springer, vol. 112, 2013.
- [17] M. Tavakol and R. Dennick, "Making sense of Cronbach's alpha," *Int. J. Med. Educ.*, vol. 2, pp. 53-55, 2011.
- [18] S. R. Tehrani and F. Shirazi, "Factors influencing the adoption of cloud computing by small and medium size enterprises (SMEs)," in *Proc. International Conf. on Human Interface and the Management of Information, Springer*, 2014.

- [19] R. Sandu, E. Gide, and S. J. A. J. O. S. Karim, *An Analysis of SMEs Customer Behavior in Cloud-Based e-Commerce Environment*, vol. 7, no. 2, pp. 281-292, 2017.
- [20] R. Sandu and E. Gide, "Technological, Organisational and Environmental (TOE) factors that influence the adoption of Cloud based service SMEs in India," in *Proc. 2018 IEEE 11th International Conf. on Cloud Computing (CLOUD)*, 2018.
- [21] H. N. Saha, A. Mandal, and A. Sinha, "Recent trends in the internet of things," in *Proc. 2017 IEEE 7th Annual Computing and Communication Workshop and Conference (CCWC)*, 2017.
- [22] I. Khan. "Why Businesses (SMEs) should adopt cloud computing," *Online Oulu University of Applied Sciences*. [Online]. Available: https://www.theseus.fi/bitstream/handle/10024/101464/Khan_Imran.pdf?sequence=1&isAllowed=y
- [23] S. C. Misra and A. Mondal, "Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment," *Mathematical and Computer Modelling*, vol. 53, no. 3, pp. 504-521, 2011.



Nitirajsingh Sandu is a PhD student in cloud computing adoption issues for Indian SMEs under the supervision of A/Prof Ergun Gide at CQUniversity, Australia. He has published many research papers in journals and at conferences in the field of cloud computing, big data and IoT. He teaches ICT courses at CQUniversity.



Ergun Gide is a senior academic and researcher at CQUniversity, Australia. He has supervised more than 30 research theses, and published many book chapters, journal articles and conference papers in e-business/ICT and quality of higher education. He won the prestigious Australian national teaching citation award in 2009. He was previously the deputy dean research in the school. He is currently the campus leader in Sydney.