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Impact of ICT-Usage on SME Innovations in Western Province, Sri Lanka: Effect of entrepreneurial orientation

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Abstract
Small and medium-sized businesses are important sources of employment and value generation; hence they are essential to Sri Lankans' way of life. It shows that SME sector is not providing the expected results and lack in innovation. Thus, there is a burning need to identify drivers to galvanize sector's innovation capacity and business performance. Through a literature survey researcher defined the concepts ICT-usage, Innovation, EO and possible relationships. Questionnaire was devised based on literature and expert advice to find the relationship between ICT-usage and Innovations moderated by EO. Further research measures the level of ICT-usage among SMEs in Western province, Sri Lanka. This study used quantitative techniques. The population of the study was the SMEs with less than 500 employees in the Western Province. Sample frame was derived from the three main listings of organizations: Ceylon Chamber of Commerce and Ministry of Industries and Industrial Development Board. Accordingly, 350 respondents were selected by using simple random sampling method. Data was analyzed using SPSS and SMART-PLS using SEM modeling. Empirical findings proved the relationships between ICT-usage to SMEs innovations and EOs moderation effect.
This study identified four main innovations namely: product, process, market and organizational and found that there is a significant effect of ICT-usage on SMEs innovations positively moderated by Entrepreneurial Orientation. Future research could be undertaken to examine the mediating effect of ICT-based innovations on ICT-usage to business performance.

Keywords: Entrepreneur, innovation, small and medium size enterprises, information & communication technology, entrepreneurial orientation

1. Introduction
The main sources of employment and food production in Sri Lanka are small and medium-sized businesses. Because the sector plays a significant role in the creation of employment opportunities, the mobilization of domestic savings, the reduction of poverty, the distribution of income and regional development, the training of workers and entrepreneurs, and the creation of an economic environment in which large industries thrive and generate export revenues. As successive governments in Sri Lanka have recognized the importance of SME development for the country's economy, they have implemented a variety of initiatives to advance the industry. However, when compared to other developing nations, the figures suggest that sector is not delivering the anticipated benefits. According to the international situations that there is a huge potential and opportunity for further development to the sector and make it a massive contributor to the national economic development and social wellbeing. Considering the statistics in various researches conducted SME's contribution for the economic development & social wellbeing of a country has played a significant role.

Pushpakumari & Wantanae (2006) [55] found that in country of Japan SME accounted for 99.7% of all firms comparing to the 0.3% of large firms and SMEs employed 42 million people, which is 78% of total employment. It shows the significance of SME sector even in such a developed country. In 1996, small and medium scale industries (SMEs) made up 85.4% of all firms and employed 36.3% of all workers, according to Pushpakumari & Wantanae (2006) [55]. In 2008, 91.6% of small businesses generated 20.3% of value-added and 29.6% of all jobs (Department of Census and Statistics, 2009; Wickremasinghe, 2011; Vijayakumar, 2013) [63] However, 93.9% of SMEs accounted for 32.4% of employment in 2018 and 93.9% in 2017, respectively (ADB Data Library, 2021), which indicated an improvement. Except for 2017 and 2018, the figures show a decline in the performance of SMEs in Sri Lanka.

Even with such massive contribution potential to the economy of the country SMEs face significant survival challenge. So, researchers need to focus reasons behind this failure and the possible solutions for the long-time survival of the SMEs.

Suggested some strategies of SME development Premaratne (2008) [54] studied the effect of entrepreneurial networks on SME development but there is a lack of discussion on impact of ICT-usage for innovation performance. Gamage (1989) [13] examines entrepreneurial characteristics and the growth of small business ventures. Gamage (2003) [14] explained how Sri Lankan entrepreneurs use socio-cultural values to manage risk. Most of the researches conducted studies on entrepreneurship, but have not tried to find the causality between SMEs' ICT-usage and ICT-based innovations. Thus, this paper tries to examine the impact of ICT usage on SMEs' innovations to find solutions for SMEs' success.

There are best practices in global scenario related to the topic and this study examines the impact of ICT usage on SME innovations related to the Sri Lankan context.

This study is evidence that there is lack of ICT-usage in SMEs in Sri Lanka which has an impact on their innovation capability. Research conducted in other countries shows ICT as a salient facilitator for innovations and entrepreneurial orientation as a moderator enhancing the impact of ICT-usage for innovations. Thus, this study tries to investigate the impact of ICT-usage on SME innovations moderated by entrepreneurial orientation.

Objectives of the study are

1. To identify the existing level of ICT-usage among SMEs in Western Province, Sri Lanka.
2. To investigate the impact of ICT-usage on SMEs innovations in Western Province, Sri Lanka.
3. To look into how entrepreneurship orientation affects the relationship between ICT usage and SME innovation.

This study is very significant for the government in finding the way forward to bring success to the SME sector. Entrepreneurs in the SME sector and corporate entrepreneurs could benefit by understanding the importance of ICT usage and entrepreneurial orientation for increasing innovations and consequently, business performance.

Literature Review

An extensive literature evaluation on ICT usage, innovation, entrepreneurial orientation, and SMEs is provided in this section. In order to determine how much the occurrence is being explained by theoretical advancements in the field, this part studies the literature. The backdrop of the study, definitions of keywords and constructs, and an explanation of the conceptual framework based on the theories and empirical findings of prior research will be presented next.

ICT Usage

Usage of ICT is defined by Blurton (2002) [3] as the "diverse set of technological tools and resources used to communicate and to create, disseminate, store, and manage information". By collecting, storing, aggregating, and transmitting quantitative data, ICTs are a significant notion in attaining and facilitating the formation of explicit knowledge. (Phang & Foong 2010) [50].

Hector, Salvador, and Emigdio (2016) [19] came to the conclusion that ICTs are a key innovation facilitator that helps businesses significantly improve all administrative activity, resulting in significant efficiency gains, assisting businesses in keeping up with consumer trends, tracking competitors' actions, and quickly gather user feedback. These factors enable businesses to take advantage of opportunities for all types of innovation.

The fast advancements in information and communication technologies (ICT) that are taking place in the age of globalization and digitization serve as a catalyst for innovation (Pilat and Wölfl, 2004) [51]. Today's business environment has become really dynamic, ICT has been a driver of innovation-based activities for better efficiency and higher performance in such a dynamic company environment (Igun, 2014) [22]. ICT maintains competitiveness as well as improves profitability.

ICT could support innovation by assisting a business with the introduction of new goods and services, a greater focus on the needs of the customer, and improved market response (Koellinger, 2008; Tran *et al*., 2014) [24, 62]. ICT boosts efficiency and creativity as a result of the company's dynamic capacities (Melville *et al*., 2004) [38]. ICT is helpful in advancing the performance of the organization, It's crucial to emphasize, however, that this contribution is greatly increased by ensuring that ICT is used creatively inside the business and that opportunities presented by ICT and ICT-based innovations are immediately recognized and taken. (Manal, Abdul & Abbas, 2017) [35].

Ndubisi & Kahraman (2005) [43] categorized varieties of ICT systems used in organizations; according to the job tasks where systems are used, there are three categories: those for planning purposes (e.g., analysing trends, planning/forecasting, analysing problems/alternatives, and making decisions), those for administrative purposes (e.g., producing reports, letters and memos, data storage/retrieval, and communication with others), and those for both. Control objectives (e.g. budgeting and controlling and guiding activities). Bigliardi, Dormio, & Galati, (2010) [2] categorized ICT according to the knowledge creation process. The authors' creation refers to computer-aided design, virtual reality, investment workstations,

etc. including the applications supporting for creation of artificial realities, simulation, or modelling. Searching and acquisition: browser, data warehouses, database index system, etc. supporting information search related to a specific subject of business. Protection: virtual protection network, firewall, etc. is to secure generated information, Use: e-meetings, group decision support systems, collaboration suite, e-mail message broadcast software, etc. used for making the use of developed and stored information. Sharing: groupware, computer-supported cooperative work, intranet, portals, etc. to share required information with clients, suppliers, and distributors. Distribution: word processing, imaging and web publishing, electronic calendars, personal information management, etc. for managing and scheduling the work. Capture and codification: expert systems, neural nets, fuzzy logic, genetic algorithms, intelligent agents, etc. supporting decision-making and analysis of information for unseen patterns and opportunities.

Carbonara (2005) [5] created a classification system for ICTs based on (a) coordination technologies (e.g. LAN, WAN, database, shared elaboration systems, data modelling support systems, the group working support systems, groupware, Internet) which support communication and coordination, (b) process technologies (e.g. CNC, FMS, CAM) helping for different business functions and KM technologies (e.g. software agents, groupware, Internet) supporting to manage information and knowledge.

The following are the distinctions made by Papastathopoulos and Beneki (2010) [49]: (a) enterprise systems (such as enterprise resource planning, customer relationship management, and supply chain management); (b) information systems (such as management information systems, decision support systems, and executive support systems); (c) digital technologies (such as e-commerce, e-business, and e-management); (d) telecommunication systems (such as the Internet, e-mail, and local area networks); and (e) identification (e.g. portable data collection, handheld readers, magnetic and smart card readers).

Entrepreneurs must realize that ICT usage is no longer merely a choice, but a must in today's globalized world. A few decades back ICT usage was a leading factor, now it is an essential factor to avoid competitive disadvantage. But effective strategic utilization of ICT-based innovations will generate a competitive advantage for enterprises. If SMEs adopt ICT, the speed at which technology is developing has clearly created enormous opportunities for SMEs to access international markets and take part in global supply chains. The owners and/or managers must arm themselves with adequate ICT expertise in order to be able to do this (Fillis *et al*., 2004) [12].

Innovation

Innovation was defined as "the process that leads from an invention, discovery, or understanding into a new product, processor system, to its first successful commercial application" by Nightingale (2015) [44]. It can therefore be used to new goods, processes, and services, as well as to new markets, supply sources, and organizational structures (Nightingale 2015) [44]. Schumpeter has explained this few decades before mentioning invention or any new concept needs to be implemented and commercialized by an entrepreneur to call it an innovation. The Oslo Manual (OECD/Eurostat 2005) defines innovation as the introduction of a new or significantly improved product (good or service), method, new marketing strategy, or new organisational approach in company operations, the workplace, an organisation, or external interactions (OECD 2015).

A proposed theory or design concept that integrates existing information and methods to create a theoretical foundation for a novel idea is called innovation (Sundbo, 1998; Bright, 1969) [60, 4]. There can be a possibility to convert this concept to products or services or may not. Again, this innovation can be a tangible one or may not. According to Cooper (1998) [6] innovation has many facets and is multi-dimensional. He explains that the three main categories of innovation—radical vs gradual; product versus process; and administrative versus technological, are characterized as dualisms. According to these views' innovation is mainly related to originality and change in the existing state.

Radical innovations are path-breaking, unconventional, revolutionary, unique, ground-breaking, fundamental, or significant innovations (Green *et al*., 1995) [15]. These radical innovations are riskier. Radical innovations require huge knowledge capital and financial capital to be invested. That will put the entrepreneur at a greater risk. Smaller enhancements are known as incremental innovations, and they are designed to improve and expand current procedures, goods, and services. It is less risky and entrepreneurs are supposed to deal with more certainty. When the risk is higher on innovation, it makes higher returns or losses. According to a similar perspective stressed by March (1991) [36], the twin notions of exploitation and exploration have taken centre stage in analyses of technical innovation, organisational adaptation, competitive advantage, organisational survival, and advancement (Gupta, Smith, & Shalley, 2006) [16]. According to March (1991) [36], exploitation is defined as "such things as refinement, choice, production, efficiency, selection, implementation, and execution" whereas exploration is "things captured by terms such as search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation". Exploitation, from a resource-based perspective, refers to improvements made to already-existing resources, while exploration entails the production of whole new resource bundles (Lumpkin & Dess, 2001) [32].

In his taxonomy of innovation types based on the aim of change, Schumpeter (1934) [68] also made a similar suggestion, using organisational, market, product, and process innovations as examples. Zhao (2005) [68] attempted to define innovation broadly by including the aforementioned arguments to cover new markets, new organizational structures, new goods, new processes, new services, and the development of new human resources and skills. He has been able to summarize all the above arguments. This will be instrumental in understanding innovation in a more sensible manner. Innovations are supporting reducing costs and gaining profits and growth. The knowledge-based innovation challenges Schumpeter's (1934) [57] theory of the congenital "innovative individual". With reference to the literature, it is getting clear that congenital entrepreneurship can be further optimized by knowledge-based innovation.

According to Otero-Neira *et al*. (2009) [48] and Lan and Wu (2010) [27] "product innovation" was defined as the introduction of new products, the technological novelty of those products, and product differentiation.

Process innovation includes reengineering the business process, which entails bettering internal capabilities and operations (Cumming, 1998) [8]. Three components of process innovation were R&D focus, the use of new technologies, and novel material combinations in manufacturing Lan and Wu (2010) [27] and Otero-Neira *et al*. (2009) [48].

Market innovation focuses on the company's mix of markets and how selected markets can be effectively served while accurately reading customer preferences (Johne, 1999) [23]. This has recently had a direct impact on the company's results and sales. Three factors made up market innovation: the use of online transactions, creative marketing and promotion, and the capacity to identify new markets. Otero-Neira *et al* (2009) [48] and Lan and Wu, (2010) [27].

Organizational innovation, as defined by Mafabi, Munene, and Ntayi (2012) [33], is the process through which new innovations are introduced and implemented in structures, processes, and skills.

As an essence, the innovation emanates in two different intensities radical or explorative innovation & incremental or exploitive innovation where both types explain a change. This change can happen related to four domains as per the literature, product, process, market & organization.

Entrepreneurial Orientation

Entrepreneurship Orientation is the construct developed to observe the entrepreneurial behavior of the organization which shows the way of thoughts & decision-making patterns of the owners or senior management. EO is defined as the "willingness of a firm to engage in entrepreneurial behaviour" (Wiklund, 1998) [66] as referred to by Kollmann and Stöckmann (2012) [25] and "the policies and practices that provide a basis for entrepreneurial decisions and actions" (Rauch *et al*. 2009) [56]. Wiklund and Shepherd (2003) [67] defined EO as capturing "a firm's organization toward entrepreneurship". This is all about that how an organization has taken its stream of thoughts to facilitate entrepreneurship behaviour within its business and it's a part of the organization' culture.

EO establishes the decision-making process and style in a company, influences the formation of the firm's strategy, and affects the attitudes and conduct of each employee (Covin & Slevin, 1989) [7]. EO is supposed to produce better results since it is based on the notion that businesses gain from being innovative and responsive (Rauch *et al*. 2009) [56]. This newness is much related to the originality in other means innovativeness of the firm, this passion for newness keeps even older firms young and innovative.

Wiklund and Shepherd (2003) [67] explained that "EO represents how a firm is organized in order to discover and exploit opportunities" entrepreneurially oriented firms are proactively reacting to opportunities and will always take an innovative approach to exploit those opportunities. Researchers generally agreed on three EO dimensions: innovativeness, risk-taking, and proactiveness, which were based on Miller's (1983) conception (Rauch *et al*. 2009) [56].

Risk-taking is defined as a company's predisposition for high-risk ventures with chances of high returns or high losses and denotes a readiness to act bravely even without knowing all of the possible outcomes (Wiklund & Shepherd, 2003) [67]. Innovativeness refers to a company's readiness and capacity to accept and engage in unique concepts, experimentation, and creative processes (Lumpkin & Dess, 1996) [31]. That innovativeness keeps the firm brimming with newness and they become always young and innovative. A proactive attitude is one that foresees and responds to future needs and trends, giving one an advantage over rivals by being the first to do so (Lumpkin & Dess 1996) [31].

Therefore, EO establishes the method and style of decision-making in an organisation, influences the design of the company strategy, and affects the attitudes and conduct of each employee (Covin & Slevin, 1989) [7]. This suggests that strategic leaders and an entrepreneurial firm's culture work together to produce a strong tendency to embrace risks, proactively innovate, and outperform competition (Miller 1983). Researchers frequently agreed that the EO is a multidimensional construct with three components innovativeness, risk-taking, and proactiveness (Rauch *et al*. 2009) [56].

Conceptual model

The conceptual model employed in the study is mainly based on four theories. In conceptualizing the relationship of ICT usage to innovation, the study utilized Dynamic Capability View and ANT innovation translation. Subjectivist Entrepreneurship theory and Schumpeter's 1st Entrepreneurship theory support understanding the effect of Entrepreneurship Orientation on ICT-Usage to ICT-based innovation relationship. Based on this understanding conceptual model has been drawn below as in figure 1.

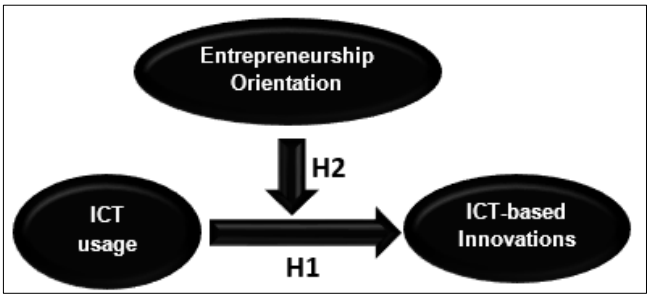

Fig 1: Conceptual model (Weeramanthri, 2022)

Hypotheses development

Impact of ICT usage on SME innovations

Japanese SMEs were discovered by Morikawa (2004) to be more likely to engage in creative activities than businesses without computer applications. Koellinger (2008) [24] discovered that e-business technologies are significant enablers of innovation, either by improving procedures or by allowing the firm to provide new products or services. This was based on a sample of European enterprises.

On the other hand, Hempell and Zwick (2008) [20] looked into the extent to which the use of ICT encourages innovation activities by enabling more adaptable organisational structures in businesses. Markides & Anderson (2006) [37] suggested ICT as one prominent enabler to the successful

implementation of radical new strategies. ICT support for the identification of new "who" the unidentified or ignored customer segment, new "what" products or new value propositions they expect, and new "how" innovative and economic ways to produce that product or service.

Hector, Salvador, and Emigdio (2016) [19] came to the conclusion that ICTs are a key innovation facilitator that helps businesses significantly improve all administrative activity, resulting in significant efficiency gains, assisting businesses in keeping up with consumer trends, tracking competitors' actions, and quickly gather user feedback. These factors enable businesses to take advantage of opportunities for all types of innovation. Manal, Abdul, and Abbas (2017) [35] found that innovation plays a significant part in an organization's ability to benefit from ICT since innovative ICT use is what separates competitive businesses from non-competitive ones. This has been demonstrated by the numerous innovation potentials that ICT has made feasible. Manal, Abdul, and Abbas (2017) [35] recommended highlighting the significance of having a few complementary aspects in a company in order to enable better use of ICT and subsequently reap its benefits towards developing creative business prospects and gaining competitive advantage.

Malone and Laubacher (1998) [34] discuss how the new economy, in which knowledge is the most crucial strategic resource, is compelling an increasing number of businesses to reexamine their current procedures and utilize potent information tools capable of handling commercial transactions on a much larger scale, dealing with new partnerships and networks with clients and suppliers, and operating techno-watch systems to aid in the discovery of new business opportunities and innovations. This concept shed the light on the significance of Information and Communication Technology to promote Innovation.

ICT facilitates the creation, integration, growth, and improvement of important resources over time. ICT demonstrates its dynamic abilities in a number of contexts, such as e-business, e-commerce, new manufacturing methods, new services, new business models, and effective ways to enhance supply chain management, customer relationship management, and decision-making (Manal, Abdul and Abbas, 2017) [35]. This is in line with Schumpeter's (1934) theory that gaining a competitive edge requires enhancing, reshaping, or improving current resources and competencies through innovative methods and complex procedures involving knowledge integration from various sources (Prahalad and Hamel, 1990) [18], learning processes (Pisano, 1994), seizing new opportunities, and managing risk and uncertainty. ICT could assist a business in innovating by assisting it to launch new goods and services, become more customer-focused, and react to market developments more effectively (Koellinger, 2008; Tran *et al*., 2014) [24, 62]. ICT increases efficiency and creativity as a result of the company's dynamic capacities (Melville *et al*., 2004) [38].

The theory of innovation translation sees technology advancements as socio-technical initiatives with both human and non-human elements acting as the major actors (Law, 1987). According to Latour (1996), innovation translation is the passage of invention over space and time into the hands of individuals who handle it in various ways. The innovation might be adopted, modified, or abandoned depending on how people respond to it. As a result, the players' responses to and shaping of the innovation are what lead to its adoption. ICT-based innovations are always evolving, and decision-makers in the business accept them when they can evaluate the opportunities they create. This is in accordance with the innovation translation theory (Latour, 1992). ICT act as an effective non-human actor which immensely supports for shaping innovation by specialized capabilities to simulate, version, and forecast the future of innovation.

ICT can be regarded as a very helpful tool in the innovation processes, according to the literature. ICT facilitates the creation and maintenance of cooperative and communication ties both inside and outside the business, and it streamlines, simplifies, and lowers the risk of New Product Development (NPD) procedures. ICT is also in charge of gathering market information and applying it during the innovation process, allowing for the creation of new goods that are completely tailored to market demand (Vilaseca-Requena, Torrent-Sellens, & Jime'nez-Zarco 2007).

According to the above literature, we posit the below hypothesis;

H1. Higher usage of ICT results in a higher level of innovation in SMEs.

4.2 Moderating effect of EO on the ICT-Innovation relationship

To promote exceptional innovation, management people must be receptive to fresh perspectives, aggressive in seizing new chances, and willing to take calculated risks. If companies wish to promote excellent innovation performance, having an entrepreneurial orientation is a critical strategy (Ha, Lo, Mohamad, & Ramayah 2018) [17].

Wiklund and Shepherd (2003) [67] decide that "EO represents how a firm is organized in order to discover and exploit opportunities" entrepreneurially oriented firms proactively react to opportunities and will always take an innovative approach to exploit those opportunities. EO functions as a capability that might connect other resources, allowing a business to employ them profitably (Zhou, Yim, & Tse 2005).

Firms with a strong entrepreneurial orientation (EO), according to Dess and Lumpkin (2005) [10], have an edge when pursuing innovation through both exploration and exploitation activities. According to Lumpkin and Dess (1996) [31], EO is a strategy used by businesses to seize new possibilities. It exhibits significant overlap and a merging of incremental and radical innovation. Below three dimensions of EO's effect on exploitive and explorative innovations are discussed in detail. A corporation may be able to implement novel product-market combinations and introduce cutting-edge technology, processes, and procedures for the production of goods and services with the help of first-dimension innovativeness. The innovativeness of decision-makers in an organization makes them bring advanced ICT systems and use them to generate innovations. Dess and Lumpkin believe that innovation may help both exploratory and exploitative innovations, similar to Kollmann and Stöckmann (2012) [25].

The capacity for taking risks is the second feature in EO literature. The decision to take on a high level of risk or not is heavily influenced by one's tolerance for the possibility of failing or missing an opportunity (Dickson & Giglierano, 1986) [11]. Therefore, taking risks speeds up decision-making and empowers businesses to capture chances with a narrow window of opportunity.

Proactiveness is EO's third component. Businesses that are proactive not only foresee change but also implement it since being proactive encourages inventive behaviour (Morgan &

Strong, 2003) [41]. Proactivity directs the business toward taking the initiative, chasing the opportunity, and influencing future demand by anticipating and acting on future requirements and demands (Lumpkin & Dess, 1996) [31]. Lumpkin and Dess (2001) [32], who are talking about how to use EO to obtain sustainable benefits, connect investigation and proactiveness to the development of whole new resource packages. Companies may use exploratory innovation to accomplish the goals connected to proactiveness. Proactive businesses constantly strive to adopt ground-breaking innovations while maintaining their innovative leadership. They lead the industry and even create brand-new markets which were never imagined by competitors before.

Being proactive also makes it easier to engage in exploitation. A proactive corporation is more likely to be attentive to changes and progression in the competitive environment, enabling it to meet the need for adjustment ahead of the competition, as proactiveness boosts the company's understanding of consumers' demands and its receptivity to market signals (Hamel & Prahalad, 1991; Hughes & Morgan, 2007) [18].

An entrepreneurial mindset that manifests itself in a workplace that supports and leverages proactiveness, creativity, and risk-taking may have a substantial impact on how well an organisation performs. Abbas T., Manal Y., and Abdul N. El K. (2017) [35]. To invest in ICT-based innovations and leverage them to provide new products, services, and business models, an organization's culture must support transformational leadership, proactiveness, creativity, and risk-taking (Todd and Javalgi, 2007).

Literature makes clear that EO and EO dimensions have a profound effect on the explorative and exploitive innovations at organizations. As per the literature, there should be a definite moderation effect from EO and its dimensions in elevating the innovation performance in ICT-usage to innovation relationship. Therefore, we posit the hypothesis as in below;

H2. Entrepreneurship Orientation moderates the relationship between ICT usage and Innovations in SMEs

Research Methodology

The study was conducted under the positivist philosophy. The research follows a hypothetical deductive approach therefore; research will take the shape of quantitative. The research strategy has been concluded as the questionnaire survey method. A questionnaire will be used as the main research instrument for the study. The questionnaire has been derived following a scientific method after an intensive review of the literature related to variables in the study.

After an investigation of various similar studies, the mono method was selected as the research choice. Research may follow a cross-sectional study in which data were gathered only once but over a period of time.

The population for the study was selected as the SMEs in Western Province. Databases of Ceylon Chamber of Commerce, Ministry of Industries and Industrial Development Board were used to create the sample frame. The sample frame included 1098 companies. Respondents were screened at the data gathering stage to maintain less than 500 employees to maintain SME level. The questionnaire was created with main 2 parts including the demographic characteristics of the respondents to be captured in the first part, and the second part dedicated to each variable to be captured in sequence ICT usage, innovation and entrepreneurial orientation. Data gathered by the survey was analyzed by SPSS and SMART PLS with Structured Equation Modelling.

Data Analysis & Discussion

To achieve the goals of the research, the statistical data analysis results are presented in this part. The data pertaining to the sample, the current level of variables in the conceptual model, the screening data, factor analysis multivariate assumptions, and hypothesis testing were done in sequence. Subsequently, the evaluation of the measurement model with indicator reliability, measurement model reliability, and validity are presented.

Readiness and fit for data analysis

According to Krejcie, Morgan, and 1970 [41], a sample size of 285 was determined with a confidence level of 95 and a margin of error of 5. But with the covid impact considering 77.71 % response rate questionnaire was distributed to 350 respondents. 272 responses were collected. The main variables in the study are the ICT-usage, ICT-based innovations and entrepreneurial orientation showed lower to moderate levels based on descriptive statistics.

Three of the data points were outside the acceptable range of values. Thus, the paper copy of the questionnaire was double-checked and fixed. Boxplots were used to identify outliers, but there were no outliers found in the data set. The percentages of missing values were less than 10%.

Then, the researcher ran the EFA with an absolute value of 0.5 and all items with factor loadings larger than 0.5. As a result, the researcher identified constructs as latent variables. Except for normality, all multivariate assumptions were satisfied. The variance-based SEM (VB-SEM) used in the current investigation was deemed reliable even though the data did not adhere to a number of multivariate assumptions, such as normality and the absence of outliers.

All items' outer loadings were greater than 0.7, indicating that the indicators' dependability was satisfactory. All Cronbach's alpha values of constructs were greater than 0.90. Then researcher could state that all constructs were reliable at an exceptional level. Composite reliability greater than 0.7, and the AVE values were greater than 0.5. So, researcher can be verified that the convergent validity of constructs was acceptable. The validity of this research's Fornell–Larcker discriminant validity criterion was satisfied. For each group-specific model estimation, discriminant validity has been established since all the $HTMT_{.9}$ criteria were below the critical value of 0.9. Therefore, measurement model requirements were fulfilled.

There were no multicollinearity problems because all inner VIF values were below the threshold of 10.

According to the Q2 values, the model of innovation has a high degree of predictive relevance concerning the endogenous factor. The q^2 values of ICT-Usage (ICTU) in the innovation model were greater than 0.15; noted ICTU medium level affects innovation. The effect size ICTU on innovation, f^2 values were greater than 0.35. It indicates that ICTU high levels affect innovation. Structural model analysis was found that higher ICT usage results in a higher level of innovations for SMEs, at 95% confidence level.

Existing level of ICT usage in SMEs Western Province, Sri Lanka

Table 1 shows the ICT-Usage level under eight categories. There is a lower-level usage of planning and analyzing

related ICT systems. Mean values show that all the categories are used at a moderate level. The highest usage among the categories is visible at ICT usage for Budgeting and Controlling and ICT usage for enterprise solutions. ICT usage for E-commerce also has a fairly higher value. The ICT-Usage latent variable also shows a moderate ICT-usage level.

Table 1: Existing level of ICT usage of SMEs, Western Province (Survey Data 2022)

ICT usage	Mean	Std. Deviation
ICT Usage for Planning and Analyzing	1.9939	1.25319
ICT Usage for budgeting and controlling	2.9816	1.04671
ICT Usage for creation	2.3732	1.35814
ICT Usage for searching and acquisition	2.5110	1.27834
ICT Usage for Sharing and collaboration systems	2.4774	1.27350
ICT Usage for enterprise solutions	2.9504	1.43825
ICT Usage for Identification and data capture	2.5790	1.20355
ICT Usage for E-Commerce	2.8520	.93390
ICTU	2.4990	1.15396

***Source*:** Survey Data, (2022)

Existing level of innovation in SMEs in Western Province, Sri Lanka

This research identified comparatively higher innovation levels in the process and organizational innovations. Product and market innovations are slightly lower compared to process and organizational innovations. This research found that SMEs are having moderate to low levels of innovations related to the product, process, market, and organizational levels.

This shows that there is a much longer way to go for these organizations to achieve innovation. This answered the research question of the poor performance of organizations because of their poor level of innovation. Specially, a lower level of innovation at product and market levels results in lower revenues and profits for the organizations.

Table 2: Existing level of Innovations of SMEs, Western Province

ICT-based innovation	Mean	Std. Deviation
Product Innovation	2.9208	1.03819
Process Innovation	3.0118	1.08431
Market Innovation	2.9681	1.11964
Organizational Innovation	3.0000	1.06275
Innovation	2.9775	1.04345

***Source*:** Survey Data, (2022)

Discussion of hypotheses

The literature in this study explains ICT's ability to act as an innovation facilitator. Research results highlight EO's ability to positively moderate ICT usage to innovation relationship. The study is in full conformity with previous theoretical assumptions and empirical findings.

Table 3: Path Coefficient with Mean, Standard deviation, T-Statistic, P – Values, and confidence intervals bias-corrected of direct effect (Survey data 2022)

		Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	2.5%	97.5%	Decision
H1	ICTU -> Innovation	0.471	0.474	0.054	8.747	0.000	0.374	0.584	Supported
H2	Moderating Effect ICTU * EO -> Innovation	0.131	0.129	0.037	3.496	0.000	0.057	0.201	Supported

H1. Higher usage of ICT results in a higher level of innovation in SMEs.

The rapid improvements in information and communication technology (ICT) serve as a catalyst for innovation (Pilat and Wölfl, 2004) [51]. ICT has acted as a catalyst for innovation-based efforts that aim to increase performance and efficiency (Igun, 2014) [22]. A company may benefit from ICT by introducing new goods and services, being more customer-focused, adapting more quickly to market changes, and innovating (Koellinger, 2008; Tran *et al*., 2014) [24, 62]. The above statements are summaries of the findings of authors of similar studies in different countries.

Many of the theoretical discussions in this paper explain ICT's ability to act as an innovation facilitator. The study results in this paper is in full conformity with those theoretical suggestions and empirical findings. In Table 3, the p-value is 0.000, and the t Statistic is 8.747. P-value is less than 0.05, and t Statistics is greater than 1.96, indicating that the coefficient is significant. In Table 3, the confidence intervals are 0.374 and 0.584. "0" is not within the confidence limits; the coefficient is significant. In Table 3, the Coefficient value is 0.471. All statistical tests prove that higher ICT usage results in a higher level of innovation in SMEs. In conformity with the previous theoretical and empirical findings, SMEs of Western Province, Sri Lanka also show higher innovation with a higher level of ICT usage. But the ICT-usage level and the innovation levels of SMEs reside at a moderate level. Therefore, it is very important to increase the ICT usage and innovation levels of SMEs in Sri Lanka.

H2. Entrepreneurship Orientation moderates the relationship between ICT-usage and Innovations in SMEs

Though ICT usage suggests many opportunities for innovations without the presence of entrepreneurial orientation in the organization and its management ICT and related innovations will not become a reality.

Dess and Lumpkin (2005) [10] found that firms with a strong entrepreneurial orientation (EO) had an advantage when pursuing innovation through both exploitation and exploration activities. Organizational performance may be significantly impacted by the creative application of ICT resources and the presence of an entrepreneurial attitude that shows itself in a setting that promotes and utilises initiative,

innovation, and risk-taking. Abdul, Manal, and Abbas (2017) [35].

The prospects made possible by the use of ICT and the adoption of innovations in the organisation are shown by ICT and ICT-based innovations. In order to foster the growth and competitive advantage of the company, managers with an entrepreneurial attitude are able to manage resources, take calculated risks, and successfully use these innovations.

The study identified the EO's profound effect on the explorative and exploitive innovations at organizations. Justifying literature, this research brings empirical proof of the moderation effect of EO in elevating the innovation performance in ICT-usage to innovation relationship.

In Table 3, the p-value is 0.000, and the t Statistic is 3.496. P-value is less than 0.05, and t Statistics is greater than 1.96, indicating that the coefficient is significant. In Table 3, the confidence intervals are 0.057 and 0.201. "0" is not within the confidence limits; the coefficient is significant. In Table 3, the Coefficient value is 0.131. All statistical tests prove that entrepreneurship orientation moderates the relationship between ICT usage and innovations in SMEs. Finding the structured model provided results in conformity with the literature and previous empirical findings. This highlights the fact that ICT usage itself can't innovate unless the organization's top management is entrepreneurial-orientated.

Conclusion and Recommendations

Conclusion

The study examined the impact of ICT usage on innovations of SMEs in Sri Lanka and the moderating effect of EO on the relationship. The study focused on the SMEs operating in Western Province, Sri Lanka, and their levels of constructs during the period from 2017 to 2022.

The research was commenced with the intention of achieving three main objectives, namely; (1) To identify the existing level of ICT usage among SMEs in Western Province, Sri Lanka, (2) To investigate the impact of ICT usage on SMEs' innovations in Sri Lanka and (3) To investigate the moderating effect of entrepreneurship orientation on ICT-usage to SME innovations relationship.

Empirical findings suggest overall ICT-Usage level at a lower boarder of moderate level in SMEs in Western Province, Sri Lanka. The highest usage among the categories is visible at ICT usage for Budgeting & Controlling & ICT usage for enterprise solutions. ICT usage for E-commerce also has a fairly higher value. ICTU latent variable also shows an overall moderate ICT-usage level. Compared to developed countries' ICT-usage level, in Western Province, Sri Lanka SMEs is not satisfactory.

There is a significant impact of ICT usage on SMEs' innovations. The current study empirically proved the suggestions of literature on a positive relationship between ICT usage to innovation. Findings prove the moderating effect of EO on ICT-Usage to SMEs' innovation relationship as well. ICT usage opens myriad opportunities to innovate in the product, process, markets and organizational level.

Research achieved its objectives very successfully reflecting with main theories of relevance Dynamic capability, Innovation translation and Schumpeter's innovation theory. Showing its success hypothetical proposition postulated have accepted in line with theory and literature.

Recommendations

As a result of the research's successful conclusion, suggestions can be made for a variety of topics that are relevant to and advantageous for this kind of investigation.

The survey discovered that SMEs used ICT at a low to moderate level, which is insufficient for enterprises to thrive and compete in the contemporary technology-based economy. It is advised that SMEs use ICT more frequently because this will offer up a wide range of creative opportunities for their development and performance. The highest usage among the categories is visible at ICT usage for Budgeting and Controlling and ICT usage for enterprise solutions. ICT usage for E-commerce also has a fairly higher value. But ICT usage for planning and analyzing, ICT usage for creation and sharing and collaboration has lower-level usage. To support the innovation process planning and analyzing systems like expert systems, neural networks, intelligent agents, data mining and fuzzy logic have to be more utilized by SMEs. Systems under the category of creation computer-aided design and virtual reality are very useful systems for organizations thriving to become more innovative. As per the findings of this research, ICT needs to be utilized by SMEs in an effective manner to increase innovation.

The research found lower to moderate levels of innovations in SMEs and out of four innovations related to products and markets, innovations were lacking. Product innovations are very important for boosting the economy and market innovations are important in the process of taking those commodities to international markets effectively. Under product innovation it is recommended for organizations to introduce new products to the market which could be technologically new, differentiated from competitors and value-added unique designs. The whole product development and design process to be proactive. Usage of ICT in this innovation process making the organization more agile and effective. Therefore, its highly recommended that SMEs need to take steps in boosting their innovation performance related to products.

Second factor is that how effective are the SMEs taking these innovative products in to the potential markets. This is where market innovations to be involved. With modern ICT based strategies innovative firms could find fast and effective roots to take their products to the market before competitors even think above it. Organizations striving to be innovative in markets may heavily engage in online transactions from product marketing, online payments to delivery. The companies to utilize top design techniques in their promotions and advertisements to be unique out of the competition. Organizations need to be research oriented and have to actively look for potential markets which can be local or international. Innovative companies have to always look at unseen potential markets and have to arrive those markets before anyone realize it. Analytics store the behaviors of every individual internet user globally with their likes and dislikes. Organizations with good ICT background knows how to utilize this information in marketing.

The management team must be open to new ideas, aggressive in seeking out new opportunities, and willing to take risks that will advance innovation if it is to nurture exceptional innovation. A key technique for organizations looking to develop exceptional innovation performance is entrepreneurial orientation. A corporation may be able to use new product-market combinations and introduce cutting-edge technology, processes, and procedures for the production of goods and services thanks to the first dimension

of EO innovativeness. Decision-makers in an organization that is innovative will bring cutting-edge ICT systems and use them to create innovations. Second, taking risks helps businesses make decisions faster and grasp possibilities with a narrow window of opportunity. Third, being proactive encourages businesses to think ahead and develop to meet future demands. This goes beyond simply responding to market realities.

To create innovations in relation to product, process, market, and organizational innovations, organizations should use ICT effectively. A key element in igniting the process is the organization's entrepreneurial orientation.

The findings of this research are applicable to the SME sector and the country as a whole to come out from the current economic crisis and to innovate for sustenance.

Limitations and Future Research

With the current scope of the study and with the time span study was not been able to overcome some limitations but highlighting them may provide more avenues to consider in future research.

One of the main limitations identified in the research was that the research was conducted through a questionnaire survey method. Conducting this kind of complex research through a questionnaire is not easy. This study recommends future research to address this limitation by keeping time to conduct a structured interview type of research strategy beyond merely a survey method.

The sample size is a very important factor to generate generalizable results. The current research received responses from 272 respondents. If there was a possibility to reach at least 500 respondents, it would have been better. Further, the sampling method utilized was a simple random sampling method. To increase generalizability its worth following stratified sampling methods.

There were limitations in this study as it was conducted in Western Province, Sri Lanka only. To bring more comparative results cross-sectional study would have been conducted covering different clusters in the country.

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