



UNIVERSITI
TEKNOLOGI
MARA

Cawangan Melaka

ICECOT 2021

International Conference on Emerging Computational Technologies

"Future Trends of Emerging Computational Technologies in the 21st Century"

"Strategizing IR4.0 in Conquering Covid-19 and Beyond"

In Partnership With



MAHASARAKHAM
UNIVERSITY



UNNES
UNIVERSITAS NEGERI SEMARANG



جامعة حائل
University of Ha'il

Vol. 1, 2021

International Conference on Emerging Computational Technologies



UNIVERSITI
TEKNOLOGI
MARA

Cawangan Melaka

INTERNATIONAL CONFERENCE ON EMERGING COMPUTATIONAL TECHNOLOGIES (ICECoT 2021)

24 - 25 August 2021

First Edition 2021

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission in writing from Rektor, Universiti Teknologi MARA Cawangan Melaka Kampus Jasin, 77300, Merlimau, Melaka Bandaraya Bersejarah, Malaysia. Negotiation is subject to royalty or honorarium estimation.

Hak cipta terpelihara. Tiada dibenarkan mengeluarkan ulang mana-mana bahagian artikel, ilustrasi, dan isi kandungan buku ini dalam apa juga bentuk dan cara apa jua sama ada dengan cara elektronik, fotokopi, mekanik, atau cara lain sebelum mendapat izin bertulis daripada Rektor, Universiti Teknologi MARA Cawangan Melaka Kampus Jasin, 77300, Merlimau, Melaka Bandaraya Bersejarah, Malaysia. Perundingan tertakluk kepada perkiraan royalti atau honorarium.

Published by:

Universiti Teknologi MARA Melaka Kampus Jasin

Preface

This e-book describes the research papers presented at the International Conference on Emerging Computational Technologies (ICECoT 2021), organised by Faculty of Computer and Mathematical Sciences (FSKM), UiTM Cawangan Melaka. The main discussions of the conference is on the technological advances that help shape the skills that are required to cope with the Fourth Industrial Revolution (IR 4.0). Considering that this is our first attempt at organising a conference, we are therefore greatly honoured that the Universitas Negeri Semarang (UNNES), Indonesia, Mahasarakham University (MSU), Thailand and University of Hail (UoH), Saudi Arabia have all agreed to become our partners by contributing several reseach papers as well as providing reviewers to assess the quality of the papers.

Out of the numerous research works that had been submitted and reviewed, the Editorial Board have selected 22 papers to be published in the e-book. The discussions of these papers pertain to the use of technologies within the broad spectrum of Computer Science, Computer Networking, Multimedia, Information Systems Engineering, Mathematical Sciences and Educational Technology. It is hoped that the research findings that are shared in this e-book can benefit those who are interested in the various areas of computational technologies; such as graduate students, researchers, academicians and the industrial players, to name a few.

As the Project Manager, I would like to thank all of the committee members from the bottom of my heart for their tireless efforts in ensuring the success of ICECoT 2021. Without their continual support and excellent teamwork, this conference would not have come to fruition. In fact, holding this major event has been a good learning experience for us all, and I sincerely believe that our future conferences will become more outstanding if the same spirit is maintained.

Dr. Noor Aishikin Adam

Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA Cawangan Melaka Kampus Jasin

**INTERNATIONAL CONFERENCE ON EMERGING
COMPUTATIONAL TECHNOLOGIES (ICECoT 2021)
COMMITTEE**

GENERAL CHAIR

NOR FADILAH TAHAR @ YUSOFF

PROJECT MANAGER

DR. NOOR AISHIKIN ADAM

DEPUTY PROJECT MANAGER

ZAINAL FIKRI ZAMZURI

SECRETARY

FADHLINA IZZAH SAMAN

DR. RAIHAH AMINUDDIN

TREASURER

UMMU MARDHIAH ABDUL JALIL

ANIS AFIQAH SHARIP

MOHD AZRIL SHAH ABDULLAH

NURUL AIMI MD NOR

INTERNATIONAL RELATION

DR. ELIN ELIANA ABDUL RAHIM (*Leader*)

NORBAHIYAH AWANG

NURULHUDA ZAINUDDIN

ZUHRI ARAFAH ZULKIFLI

SITI FATIMAH MOHD RUM

NOOR WAHIDA JAMIL

MOHAMMAD BAKRI CHE HARON

MUHAMMAD HAMIZ MOHD RADZI

DESIGN /MULTIMEDIA/MONTAGE/E-CERTIFICATE

DR. AHMAD FIRDAUS AHMAD FADZIL (*Leader*)

NORSHAHIDATUL HASANA ISHAK

MOHD NABIL ZULHEMAY

NUR FARAHAH MOHD JOHARI

NURAZIAN MIOR DAHALAN
NOR INTAN SHAFINI NASIRUDDIN
HAZRATI ZAINI
ZAINAB OTHMAN
FAIQA HAFIDZAH HALIM

SPONSORSHIP

DR. NURUL HUDA NIK ZULKIPLI (*Leader*)
Ts. DR. SITI RAHAYU ABDUL AZIZ
MOHD RAHMAT MOHD NORDIN
NORZATUL BAZAMAH AZMAN SHAH
NOR AIMUNI MD RASHID

SECRETARIAT & REGISTRATION

DR AZLAN ABDUL AZIZ (*Leader*)
DR. SITI FEIRUSZ AHMAD FESOL
FADZLIN AHMADON
MARIATHY KARIM
NUR ASYIRA NAZIRON
HAJAR IZZATI MOHD GHAZALLI
MASWATI SUFFIAN
MASTURA MANSOR
NURULHUDA GHAZALI
WANNORAINI ABDUL LATIF

REVIEWER

Ts. DR. SHAFAT IBRAHIM (*Leader*)
DR. NOOR HASIMAH IBRAHIM TEO
Ts. DR. ALYA GEOGIANA BUJA
NUR NABILAH ABU MANGSHOR
Ts. DR. CHEW CHIOU SHENG
HAMIDAH MUHD IRPAN
BUSHRA ABDUL HALIM
NUR SYUHADA MUHAMMAT PAZIL
YUZAIMI YUNUS
NOOR SURIANA ABU BAKAR
NOORAZILAH IBRAHIM
ANIS AMILAH SHARI

NORDIANAH JUSOH @ HUSSAIN
SALEHAH HAMZAH
DR SURYAEFIZA KARJANTO
ASSOC. PROF. DR. PHANG YOON NGOR
AZLIN DAHLAN

EDITORIAL

Ts. DR. KHYRINA AIRIN FARIZA ABU SAMAH (*Leader*)
Ts. DR. NURUL HIDAYAH MAT ZAIN
Ts. DR. EDZREENA EDZA ODZALY
ASSOC. PROF. AISHAH AHMAD @ ABDUL MUTALIB
SITI NURAMALINA JOHARI
NOOR AFNI DERAMAN
DR. NOR AIZA MOKETAR
ANITA MOHD YASIN
FARAH NADZIRAH JAMRUS
NURUL ZAHIRAH ABD RAHIM
NOR AZYLIA AHMAD AZAM
NOR ADORA ENDUT

PROTOCOL & INVITATION

RAIHANA MD SAIDI (*Leader*)
Ts. DR. JAMALUDDIN JASMIS
IZNI SYAMSINA SAARI
AINON SYAZANA AB HAMID
ANWAR FARHAN ZOLKEPLAY
ANIS SHOBIRIN ABDULLAH SANI
MOHD HAFIFI MOHD SUPIR
ADI HAKIM TALIB
ZURAH ABU
NOR ADILA KEDIN
SHAHITUL BADARIAH SULAIMAN
YUSARIMA MUHAMAD

TECHNICAL / WEBSITE / VIDEO SUBMISSION / Q&A SESSION

SHAHADAN SAAD (*Leader*)
DR. AZMI AMINORDIN
MOHD ALI MOHD ISA

ALBIN LEMUEL KUSHAN
MOHAMMAD HAFIDZ RAHMAT
SULAIMAN MAHZAN
MOHD TAUFIK MISHAN
Ts. NOR AZLIN ROSLI
SITI FAIRUS FUZI
SITI RAMIZAH JAMA
SITI NURSYAHIRA ZAINUDIN
MOHAMAD HAFIZ KHAIRUDDIN
NORAINI HASAN
NURUL EMYZA ZAHIDI
FATIMAH HASHIM
ZAMLINA ABDULLAH
ALIAS DERAMAN

PROMOTION & PUBLICITY

SYAFNIDAR ABDUL HALIM (*Leader*)
NOR AZIDA MOHAMED NOH
FARIDAH SAPPAR
FADILAH EZLINA SHAHBUDIN
Ts. NURUL NAJWA ABDUL RAHID @ ABDUL RASHID
MOHAMAD ASROL ARSHAD

LANGUAGE EDITOR

MOHD AMIRUL ATAN
NUR AQILAH NORWAHI

COMPUTER SCIENCE

NO	TITLE	PAGE NUMBER
1	INTERNET OF THINGS BASED MONITORING SYSTEM ON SMART HOME MICRO GRID <i>Nur Iksan, Erika Devi Udayanti, Djoko Adi Widodo, Djuniadi</i>	1 – 4
2	NEURAGEN-A LOW-RESOURCE NEURAL NETWORK BASED APPROACH FOR GENDER CLASSIFICATION <i>Shankhanil Ghosh, Chhanda Saha, Nagamani Molakatala</i>	5 – 10
3	NEWS SENTIMENT AND ACTUAL PRICE OF STOCK DATA: USING NEWS CLASSIFICATION TECHNIQUE <i>Anupong Sukprasert, Weerasak Sawangloke, Benchamaphorn Sombatthira</i>	11 – 17
4	STOCK MARKET TURNING POINTS RULE-BASED PREDICTION <i>Lersak Photong, Anupong Sukprasert, Sutana Boonlua, Pravi Ampant</i>	18 – 21
5	THE INTERACTION EFFECT BETWEEN INFORMATION MANAGEMENT AND INNOVATION MODEL ON PERFORMANCE OF INNOVATIVE STARTUPS IN THAILAND <i>Rattanawadee Sonthiprasat, Julsuchada Sirisom</i>	22 – 26
6	PROCESS IMPROVEMENT SOFTWARE THROUGH ASSESSMENT USING CMMI FRAMEWORK <i>Yaya Sudarya Triana</i>	27 – 30
7	ENHANCED KIOSKS MAPPING ON TRADITIONAL MARKET USING APRIORI ALGORITHM <i>Ardiansyah Does, Rifqi Hasani, Tazkiyah Herdi</i>	31 – 35
8	DATA VISUALIZATION OF VIOLENT CRIME ANALYSIS USING PLOTTING MAP TECHNIQUE <i>Adam Juhari M Wahi, Nur Asyira Naziron</i>	36 – 41
9	THE VISUAL ANALYSIS OF TWITTER SENTIMENT AND CRUDE OIL PRICE MOVEMENT IN THE WEST TEXAS INTERMEDIATE MARKET <i>Sarinthree Udchachone, Utis Bhongchirawattana, Jiraroj Tosasukul, Nantana Ngamtampong</i>	42 – 47

NETWORKING / NETCENTRIC

NO	TITLE	PAGE NUMBER
10	NFC-BASED MERIT POINT ATTENDANCE SYSTEM (MPAZ) <i>Syafnidar Abdul Halim, Zulhaiman Mohd Nasir, Faridah Sappar</i>	48 – 52
11	ASSISTIVE TECHNOLOGY FOR SPEECH DISABILITY PATIENTS VIA GESTURE RECOGNITION <i>Nor Adora Endut, Nurin Hazirah Mohd Zakir</i>	53 – 57

INFORMATION SYSTEM ENGINEERING

NO	TITLE	PAGE NUMBER
12	FIRM'S STRATEGY AND SOCIAL MEDIA ADOPTION: THE DYNAMIC CAPABILITIES PERSPECTIVE <i>Atthaphon Mumi</i>	58 – 62
13	BUSINESS-IT STRATEGIC ALIGNMENT: EXPLORING A CONCEPT OF BETWEEN IT FLEXIBILITY AND IT CAPABILITY IN SAUDI ARABIA <i>Nawal Olayan Rashed Alharbi</i>	63 – 68
14	INFORMATION SYSTEM IAPS 4.0 USING FUZZY LOGIC DECISSION SUPPORT SYSTEM FOR STUDY PROGRAM ACCREDITATION <i>Ahmad Fashiha Hastawan, Dhidik Prastiyanto, Riska Dami Ristanto</i>	69 – 74

EDUCATIONAL TECHNOLOGY

NO	TITLE	PAGE NUMBER
15	ANALYSIS OF STUDENTS' MOTIVATION IN DISTANCE EDUCATION ON DEPARTMENT OF AUDIO VIDEO ENGINEERING <i>Widha Finagara, Adi Susanto, Sita Nurmasitah, Khalifatun Nisa Amini, Roni Saputra</i>	75 – 78
16	DYNAMIC ASSESSMENT IN ESL WRITING WITH LEARNING MEDIA BASED ON AUGMENTED REALITY <i>Virgiawan Adi Kristianto, Harijadi Gunawan Buntoro Wahjono, Sri Handayani</i>	79 – 82
17	ENHANCED VIRTUAL LEARNING USING GOOGLE EDUCATION & PADLET AS A TOOL FOR INQUIRY- BASED LEARNING FOR THE SPECIATION TOPIC <i>Nashimah Banu Habeeb Mohamed</i>	83 – 88

- 18 INVESTIGATING THE RELATIONSHIP BETWEEN STUDENT ENGAGEMENT AND LEARNING OUTCOMES VIA FLASH CARD TECHNOLOGY IN SAUDI ARABIA 89 – 94**

Azira Ab Aziz, Noornina Dahlan, Noor Awawdeh

- 19 ADAPTING COMPUTER-BASED MICRO LEARNING TO ENHANCE STUDENT RETENTION OF SQL KEY TERMS 95 – 99**

Noor Awawdeh, Noornina Dahlan, Azira Ab Aziz

MATHEMATICAL SCIENCES

NO	TITLE	PAGE NUMBER
20	PREDICTORS OF PERCEIVED HIGHER ORDER THINKING SKILLS (HOTS) AMONG DIPLOMA AND UNDERGRADUATE STUDENTS	100 – 106
	<i>Nurul Emyza Zahidi, Siti Ramizah Jama, Bushra Abdul Halim, Siti Fairus Fuzi, Siti Nursyahira Zainudin, Nordianah Jusoh, Wan Hartini Wan Hassan</i>	

MULTIMEDIA

NO	TITLE	PAGE NUMBER
21	DESIGN AND DEVELOPMENT OF I DIETKIDS COURSEWARE FOR HEARING IMPAIRED CHILDREN GUIDED BY COURSEWARE ENGINEERING METHODOLOGY	107 – 112
	<i>Norizan Mohamad, Sharifah Nurulhikmah Syed Yasin, Hayati Adilin Mohd Abd Majid, Hasiah Mohamed@Omar, Adida Muhammad</i>	
22	GAME BASED APPROACH IN TEACHING AND LEARNING OF MALAY PROVERB	113 – 117
	<i>Siti Nur Shafirah Mokhtar, Mazliana Hasnan, Zamlina Abdullah, Azlin Dahlan</i>	

Firm's Strategy and Social Media Adoption: The Dynamic Capabilities Perspective

Atthaphon Mumi
Maharakham Business School
Maharakham University
Maha Sarakham, Thailand
atthaphon.m@mbs.msu.ac.th

Abstract— The literature emphasizes social media as one of the effective communication platforms for firms in connecting with potential customers. Although scholars have investigated various benefits of social media, limited studies have explored the antecedences of social media adoption for firms. Drawing from the dynamic capabilities perspective, this study utilizes logistic regression analysis with the data from 1,392 public firms to investigate how strategies could influence social media adoption. The results indicate that firm's market diversification strategies act as the significant determinant of social media adoption while product diversification strategies relatively play the less important role. The findings of this study contribute to the existing social media research and shed light on strategic implementations that lead to social media usage for firms.

Keywords—market diversification strategy, product diversification strategy, social media adoption

I. INTRODUCTION

The topic of social media has received emerging attention from managers and research scholars due to the platforms' mechanism that enhance people's interaction and connectivity. Also, social media has become the crucial venue for information sharing and media diffusion. The application of social media has shifted the new ways of communication that influence business practices [1], [2]. Specifically, social media is defined as the online platforms built on the technology of Web 2.0 that encourage the creation and exchange of information from individual users [3]. The communication between people, communities, and/or organizations has substantially changed due to the advancement of social media. People can easily create, share, and exchange information in an online community to express their opinions and knowledge for various topics of interest. Therefore, social media has been regarded as a crucial phenomenon in enhancing user-generated content which empower the social communication. People participating on social media can also build reputations and find career opportunities, and/or even earn monetary revenue [4]. Thus, it has become the consensus that people and/or organizations nowadays are utilizing social media for various purposes.

Particularly for organizations, social media has become the significant tools in supporting business processes and operations [1]. Prior literature exhibits that social media help firms achieve marketing activities such as increasing sales [5]–[9], building customer relationship [10], and improving positive brand evaluation [11]. Scholars in various disciplines especially in the marketing area have also been emphasizing the phenomena appearing on social media as the effects of online word of mouth (eWOM) [12]. It is believed that for the effective marketing approach, what really matters is the

communication between customers. Besides, social media appear in information and finance literature for its advantages toward firm's value and stock performance [13]–[15] as well as the IPO phenomena [16]. The aforementioned evidence provides us with the increasing number of business activity that depends on unique communicative functions available on social media.

Despite the importance of social media for both individual and organizational contexts, the understanding of research stream for this domain is still fragmented and lacking consensus of whether how and when social media should be implemented. In the scholarly community, we still have limited, yet to be holistic, understanding of the behaviors involving social media [17]. Although prior studies have shown various efforts in consolidating the research that centering on social media [12], [17]–[19], and relating topic of online word-of-mouth phenomena [20], we still know a little about the foundations and motivations of such behaviors happening on social media. Therefore, this study aims at exploring the antecedence of firm's social media adoption through the dynamic capabilities theory [21], [22]. The dynamic capabilities theory manifests how firm apply various strategies to achieve sustainable competitive advantages [21]. Firm's strategies may influence various activities such as social media adoption. This study, therefore, proposes that firm's strategy influence the decision in using social media.

Based on a sample of 1,392 public firms, this study provides empirical evidence supporting firm's strategy as the determinant of social media adoption. More specifically, we found that firm's market diversification strategy act as the crucial factor in explaining social media adoption while no effect was found for the product diversification strategy. The results from our findings contribute to the dynamic capabilities theory and provide the better understanding of firm's decision in implementing social media. Furthermore, this study also contributes to the limited discussion regarding social media research in the literature. Regarding the organization of this paper, we will discuss the theory and hypotheses in the following section, before describing our research methodology. Then, we highlight the results before ending with a discussion and conclusion.

II. LITERATURE REVIEW

A. Social Media Adoption

Regarding the unique functions of social media that can enhance public opinions over the Internet, the concept of social media may originally have begun during 1979 when the Usenet was created [1]. Usenet was a worldwide discussion system on which people could post public

messages on the Internet and was similar to the social media that people use currently. However, a recent study of social media probably started about 20 years ago, when Bruce and Susan Abelson established “Open Diary,” the social networking site for online diary writers in 1997 [1]. One of the founders described Open Diary as the first website that brought online diary writers together into a community [22]. Furthermore, the rapid growth of high-speed Internet has brought the concept of social media into extensive use and resulted in the emergence of many social media platforms such as MySpace (in 2003), Facebook (in 2004), and Twitter (in 2006). First, confirm that you have the correct template for your paper size. This template has been tailored for output on the A4 paper size. If you are using US letter-sized paper, please close this file and download the Microsoft Word, Letter file.

The topic of social media has been widely investigated by various researchers; there are more than 4 million results from an article search in Google Scholars and about 50,000 results in Thomson Reuters’s Web of Science. The article entitled “Users of the world, united! The challenges and opportunities of social media” by Kaplan and Haenlein [1] has generated the biggest impact on the social media research community, as it has been cited more than 9,000 times in other articles in Google Scholars and more than 1,700 times in Web of Science. Kaplan and Haenlein [1] have done an excellent job in providing the clarification and classification of social media. Their article also distinguishes social media by drawing a line from Web 2.0 and user-generated content [1]. In addition, Kaplan and Haenlein provide the most cited definition of social media as follows:

“Social media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content” [1, p. 61].

This definition represents social media as platforms that are built by utilization of both Web 2.0 and user-generated content. In another study, social media are defined in terms of emphasizing the interactive social information, such as:

“Social media are internet platforms used to disseminate information through social interaction that provide decentralized user level content, social interaction and public membership” [14, p. 912].

Another study focuses on the impact of information technology for organizational uses, for example:

“Social media are fundamentally changing the way we communicate, collaborate, consume, and create. They represent one of the most transformative impacts of information technology on business, both within and outside firm boundaries” [17, p. 3].

While some studies may integrate social media functions by referring to particular groups of the researcher’s interest, for example, social networking sites were defined as being utilized by individual consumers as follows:

“Social networking sites have emerged as important communication channels used by individual consumers to create content, distribute materials, share ideas, express opinions, and use information and knowledge” [23, p. 347].

These definitions of social media may deliver a better understanding of what social media are and their importance

in many business-related disciplines. Social media have been a topic of interest among managers and research scholars because of their ability to enhance people’s interaction and connectivity. Communication between people, communities and organizations has substantially changed because of advances in social media. People can easily create, share, and exchange information in online communities to express their opinions and knowledge on various topics of interest. Thus, social media have been the crucial platforms for sharing user-generated content, a very powerful part of modern social communication. People participating on social media can also build reputations, find career opportunities, and even earn commercial revenue [2]. Thus, social media have affected people’s behaviors as well as their communications.

Organizations have also recognized social media as a new set of business processes and operations [3]. Social media help firms achieve marketing objectives such as sales [4]–[8], building of customer relationships [9] and brand evaluation [10]. Scholars in the marketing domain have emphasized the social media phenomena regarding the effects of online word-of-mouth (eWOM) [11] in analyzing communication between customers. Social media also appear in information systems and finance literature because of their advantages toward building a firm’s value and stock performance [12]–[14]. According to a recent review that explored the social media phenomena in the organization [24], Social media have become a part of the crucial communication technologies used in the workplace.

B. *Dynamic Capabilities Theory*

Dynamic capabilities (DC) theory emerged as both an extension to and a reaction against the inability of the resource-based view (RBV) to interpret the development and redevelopment of resources and capabilities to address rapidly changing environments. DC may be considered as a source of competitive advantage [21]. Dynamic Capabilities are processes that enable an organization to reconfigure its strategy and resources to achieve sustainable competitive advantages and superior performance in rapidly changing environments [20]. Therefore, firms that mostly operate under the uncertain environment should embed the dynamic capabilities through various decision making such as social media adoption. Prior studies have emphasized the antecedences of decision related to dynamic capabilities of the firms [25], [26] as well as the decision in stimulating dynamic capabilities through social media performance [27]. Therefore, in this study, we focus on firm’s strategy that is curial to the decision-making process especially regarding firm’s competitiveness especially through social media adoption. More specifically, this study is focusing on the dynamic capabilities through the signal of diversification strategy as influencing the social media adoption.

C. *Diversification Strategy*

Diversification strategy is the firm-level strategic approach in enhancing the competitive advantage for highly competitive environment as responding to the dynamic capabilities approach. Although, prior literature may discuss various diversification strategies, two most common diversification strategies that are being emphasized in this study are product diversification strategy and market diversification strategy [28]. A firm’s product diversification strategy aims at leveraging the competitiveness through the resources across product lines [29] in responding to various and unique demands from potential customers. Firms with

product diversification strategy would offer products or services in more than one industry or market that can be either related or unrelated diversification [30].

Prior study argues that the product diversification strategy of within industry is correlated with sales growth [31] and market share [32]. Accordingly, Lee and Habte-Giorgis [28] provide the evidence for positive relationship between product diversification and firm's performance. To be highly adaptive in the social media era, firm that focus on product diversification strategy may emphasize social media as one of the tools for retrieving information regarding demand of the customer. Therefore, we hypothesize that product diversification strategy may influence the social media adoption as follows:

Hypothesis 1: Product diversification strategy is positively related with social media adoption.

Furthermore, for the diversification strategy, firm may also emphasize its product on different geographic market location through market diversification strategy [33]. A market diversification strategy benefits the firms for the economies of scale and scope for sustainability purposes [34] such as the scale of production, marketing, research and development (R&D) and also the overall operations [35]. In addition, market diversification strategy is argued to be one of the most important strategies for risk reduction and long-term achievement [36]. Accordingly, other studies also support the positive effect of firm's market diversification strategy toward performance [28], [29]. Therefore, we also believe that social media could enhance the success of market diversification as it provides the better outreach to the potential audience in different markets. Put differently, firm's with market diversification strategy may be likely to use social media as it is perceived to be beneficial for firms.

Hypothesis 2: Market diversification strategy is positively related with social media adoption.

Based on the prior hypotheses development, this study proposes the conceptual framework as appear in Fig. 1. The Fig. 1. manifests the direct and positive relationships between firm's strategies namely—product diversification strategy and market diversification strategy—that positively influence social media adoption for firms.

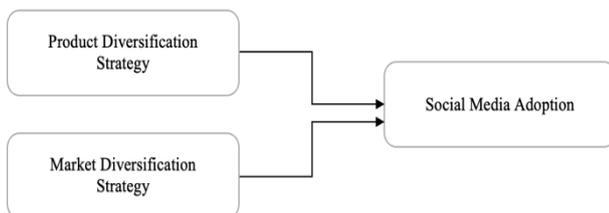


Fig. 1. The proposed conceptual framework

III. METHODOLOGY

Based on the data from S&P COMPUSTAT [22], the observations used in this study comprising of 1,392 public firms. The logistic regression was used as the primary analysis in testing the hypothesized relationships. Existing literature supports the use of logistic regression for investigating the relationship in relation to the dependent variable that is collected as binary data [23] such as social media adoption. More specifically, social media adoption was operationalized by following prior study that collects a binary data of whether a firm was active on social media [24]. Besides, social media data were manually retrieved using data-crawling technique from firms' official websites listed at COMPUSTAT database. We created programming codes using Python to access each company's websites to find out whether any social media accounts were listed. Relying on the parsimony approach, we particularly focused on four most popular social media platforms for social networking (Facebook and LinkedIn), for microblogging (Twitter), and for video sharing (Youtube) [25]. Moreover, the product and market diversification were computed using the entropy measure [26]. Regarding the confounding factors, we controlled for potential confounders by including Age, Size, Industries (service or else), U.S. based, and firm's Total Debt as our control variables in the analyses.

IV. RESULTS AND DISCUSSION

In testing the hypotheses, Table I manifests the empirical results from the logistic regression. We regressed a binary variable—social media adoption on the control variables (Model 1) and with our hypothesized variables (Model 2). Referring to the results in Model 1, it was found that firms in the U.S. used social media more than their counterparts. Moreover, the total debt negatively influences social media adoption. Firm's size and firms in the service industry significantly apply social media in their organization more than their counterparts. The relationships between our independent variables and dependent variable are exhibits in Model 2. The analyses show that a firm's market diversification strategy has a positive relationship with social media adoption ($p < 0.01$) supporting our Hypothesis 2. However, firm's product diversification strategy has no relationship with social media adoption. Therefore, we cannot find the evidence that support our hypothesis 1.

The findings in this study reveal the importance of firm's decision in targeting different markets would also rely on the use of social media. The results are consistent with prior study that argue that social media can be used for entering different markets [27]. Therefore, it is evident that firm's strategy regarding the market diversification would serve as the important strategic decision when applying social media within the organization. Interestingly, this study manifests no evidence supporting the decision of implementing social media based on product diversification strategy. The findings can be explained as social media have been often used for reaching out to potential buyers. Put differently, social media have been mainly adopted for marketing purposes in enhancing the effective communication [11], [28] to the wide array of audience. The strategy related to product innovation in which emphasizing on R&D activities may require less of the use of social media in Table I.

TABLE 1. THE RESULTS FROM LOGISTIC REGRESSION ANALYSIS OF SOCIAL MEDIA ADOPTION

	(1) Model 1	(2) Model 2
US Based	0.379** (0.176)	0.472*** (0.181)
Total Debt	-0.000*** (0.000)	-0.000*** (0.000)
Age	-0.005 (0.006)	-0.007 (0.007)
Service	0.652*** (0.142)	0.646*** (0.142)
Size	0.215*** (0.027)	0.203*** (0.029)
Product Divers.		-0.217 (0.139)
Market Divers.		0.279*** (0.103)
Constant	-0.012 (0.191)	-0.169 (0.206)
Observations	1,392	1,392

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

V. CONCLUSION

The current study aims at investigating the determinants of firm's decision in using social media based on the dynamic capabilities perspective. More specially, we argue that a firm's diversification strategy—product diversification and market diversification—serves as the crucial role that influences firm's decision for social media adoption. Regarding the results, we found that firm's market diversification strategy significantly influences social media adoption. Firms with the strategy of targeting different markets also emphasize the importance of information diffusion through social media. They also consider social media as one of the marketing techniques that can reach potential customers more effectively. Therefore, social media become one of the priority tools for firms that oriented toward different markets to utilize in their organizations.

However, the data did not support our hypothesis 1 showing that product diversification strategy has no significant effect on social media adoption. The possible reason for this can be discussed as firms with many products and services may focus more on strengthening their R&D activities rather than marketing activities. Besides, firms with product diversification strategies may involve more with the business-to-business type of approach in which social media may not be as effective.

The findings of this study contribute to the ongoing stream of social media research, especially concerning the firm's strategy. We extend the research in this area by providing a better understanding of an unexplored area of strategy and social media. We show that firms emphasize social media differently based on their strategies. More particularly, diversification strategy may be beneficial in using social media when entering different markets rather than launching new products. Future studies may use our results as initial evidence for further investigation and provide a better understanding of other strategies that may influence a firm's decision in using social media.

ACKNOWLEDGMENT

This research was supported by Mahasarakham Business School, Mahasarakham University, Thailand.

REFERENCES

- [1] R. Hanna, A. Rohm, and V. L. Crittenden, "We're all connected: The power of the social media ecosystem," *Bus. Horiz.*, vol. 54, no. 3, pp. 265–273, 2011.
- [2] E. Arrigo, "Social media marketing in luxury brands: A systematic literature review and implications for management research," *Manag. Res. Rev.*, 2018.
- [3] A. M. Kaplan and M. Haenlein, "Users of the world, unite! The challenges and opportunities of Social Media," *Bus. Horiz.*, vol. 53, no. 1, pp. 59–68, 2010.
- [4] Q. Tang, B. Gu, and A. B. Whinston, "Content contribution for revenue sharing and reputation in social media: A dynamic structural model," *J. Manag. Inf. Syst.*, vol. 29, no. 2, pp. 41–76, 2012.
- [5] S. Dewan and J. Ramaprasad, "Social media, traditional media, and music sales," *Mis Q.*, vol. 38, no. 1, pp. 101–122, 2014.
- [6] S. Gopinath, P. K. Chintagunta, and S. Venkataraman, "Blogs, advertising, and local-market movie box office performance," *Manage. Sci.*, vol. 59, no. 12, pp. 2635–2654, 2013.
- [7] H. Nam and P. K. Kannan, "The informational value of social tagging networks," *J. Mark.*, vol. 78, no. 4, pp. 21–40, 2014.
- [8] H. Rui, Y. Liu, and A. Whinston, "Whose and what chatter matters? The effect of tweets on movie sales," *Decis. Support Syst.*, vol. 55, no. 4, pp. 863–870, 2013.
- [9] Y. Yu, W. Duan, and Q. Cao, "The impact of social and conventional media on firm equity value: A sentiment analysis approach," *Decis. Support Syst.*, vol. 55, no. 4, pp. 919–926, 2013.
- [10] M. Laroche, M. R. Habibi, and M.-O. Richard, "To be or not to be in social media: How brand loyalty is affected by social media?," *Int. J. Inf. Manage.*, vol. 33, no. 1, pp. 76–82, 2013.
- [11] R. W. Naylor, C. P. Lamberton, and P. M. West, "Beyond the 'like' button: The impact of mere virtual presence on brand evaluations and purchase intentions in social media settings," *J. Mark.*, vol. 76, no. 6, pp. 105–120, 2012.
- [12] A. J. Kimmel and P. J. Kitchen, "WOM and social media: Presaging future directions for research and practice," *J. Mark. Commun.*, vol. 20, no. 1–2, pp. 5–20, 2014.
- [13] S. Jiang, H. Chen, J. F. Nunamaker, and D. Zimbra, "Analyzing firm-specific social media and market: A stakeholder-based event analysis framework," *Decis. Support Syst.*, vol. 67, pp. 30–39, 2014.
- [14] X. Luo, J. Zhang, and W. Duan, "Social media and firm equity value," *Inf. Syst. Res.*, vol. 24, no. 1, pp. 146–163, 2013.
- [15] D. Schniederjans, E. S. Cao, and M. Schniederjans, "Enhancing financial performance with social media: An impression management perspective," *Decis. Support Syst.*, vol. 55, no. 4, pp. 911–918, 2013.
- [16] A. Mumi, M. Obal, and Y. Yang, "Investigating social media as a firm's signaling strategy through an IPO," *Small Bus. Econ.*, vol. 53, no. 3, pp. 631–645, 2019.
- [17] A. A. Alalwan, N. P. Rana, Y. K. Dwivedi, and R. Algharabat, "Social media in marketing: A review and analysis of the existing literature," *Telemat. Informatics*, vol. 34, no. 7, pp. 1177–1190, 2017.
- [18] S. Aral, C. Dellarocas, and D. Godes, "Introduction to the special issue—social media and business transformation: a framework for research," *Inf. Syst. Res.*, vol. 24, no. 1, pp. 3–13, 2013.
- [19] E. W. T. Ngai, S. S. C. Tao, and K. K. L. Moon, "Social media research: Theories, constructs, and conceptual frameworks," *Int. J. Inf. Manage.*, vol. 35, no. 1, pp. 33–44, 2015.
- [20] R. A. King, P. Racherla, and V. D. Bush, "What we know and don't know about online word-of-mouth: A review and synthesis of the literature," *J. Interact. Mark.*, vol. 28, no. 3, pp. 167–183, 2014.
- [21] K. Eisenhardt and J. Martin, "Dynamic capabilities: What are they? *Strategic Management Journal*, 21 (10/11): 1105–1121." October–November, 2000.
- [22] D. J. Teece, G. Pisano, and A. Shuen, "Dynamic capabilities and strategic management," *Strateg. Manag. J.*, vol. 18, no. 7, pp. 509–533, 1997.
- [23] E. Loughane, *Net Success Interviews*. Lulu. com, 2005.

- [24] J. H. Heinrichs, J. Lim, and K. Lim, "Influence of social networking site and user access method on social media evaluation," *J. Consum. Behav.*, vol. 10, no. 6, pp. 347–355, 2011.
- [25] P. M. Leonardi and E. Vaast, "Social media and their affordances for organizing: A review and agenda for research," *Acad. Manag. Ann.*, vol. 11, no. 1, pp. 150–188, 2017.
- [26] T. Eriksson, "Processes, antecedents and outcomes of dynamic capabilities," *Scand. J. Manag.*, vol. 30, no. 1, pp. 65–82, 2014.
- [27] E. P. Piening and T. O. Salge, "Understanding the antecedents, contingencies, and performance implications of process innovation: A dynamic capabilities perspective," *J. Prod. Innov. Manag.*, vol. 32, no. 1, pp. 80–97, 2015.
- [28] A. Marchand, T. Hennig-Thurau, and J. Flemming, "Social media resources and capabilities as strategic determinants of social media performance," *Int. J. Res. Mark.*, 2020.
- [29] J. Lee and B. Habte-Giorgis, "Empirical approach to the sequential relationships between firm strategy, export activity, and performance in US manufacturing firms," *Int. Bus. Rev.*, vol. 13, no. 1, pp. 101–129, 2004.
- [30] J. M. Geringer, S. Tallman, and D. M. Olsen, "Product and international diversification among Japanese multinational firms," *Strateg. Manag. J.*, vol. 21, no. 1, pp. 51–80, 2000.
- [31] K. Palepu, "Diversification strategy, profit performance and the entropy measure," *Strateg. Manag. J.*, vol. 6, no. 3, pp. 239–255, 1985.
- [32] K. Nobeoka and M. A. Cusumano, "Multiproject strategy and sales growth: the benefits of rapid design transfer in new product development," *Strateg. Manag. J.*, vol. 18, no. 3, pp. 169–186, 1997.
- [33] S. Kekre and K. Srinivasan, "Broader product line: a necessity to achieve success?," *Manage. Sci.*, vol. 36, no. 10, pp. 1216–1232, 1990.
- [34] K. N. M. Dundas and P. R. Richardson, "Corporate strategy and the concept of market failure," *Strateg. Manag. J.*, vol. 1, no. 2, pp. 177–188, 1980.
- [35] M. A. Hitt, R. E. Hoskisson, and H. Kim, "International diversification: effects on innovation and firm performance in product-diversified firms," *Acad. Manag. J.*, vol. 40, no. 4, pp. 767–798, 1997.
- [36] R. Amit and J. Livnat, "Diversification and the risk-return trade-off," *Acad. Manag. J.*, vol. 31, no. 1, pp. 154–166, 1988.
- [37] M. J. Lee and S. S. Jang, "Market diversification and financial performance and stability: A study of hotel companies," *Int. J. Hosp. Manag.*, vol. 26, no. 2, pp. 362–375, 2007.
- [38] R. J. Casey, F. Gao, M. T. Kirschenheiter, S. Li, and S. Pandit, "Do compustat financial statement data articulate?," *J. Financ. Report.*, vol. 1, no. 1, pp. 37–59, 2016.
- [39] D. W. Hosmer Jr, S. Lemeshow, and R. X. Sturdivant, *Applied logistic regression*, vol. 398. John Wiley & Sons, 2013.
- [40] A. R. Miller and C. Tucker, "Active social media management: the case of health care," *Inf. Syst. Res.*, vol. 24, no. 1, pp. 52–70, 2013.
- [41] M. J. Culnan, P. J. McHugh, and J. I. Zubillaga, "How large US companies can use twitter and other social media to gain business value.," *MIS Q. Exec.*, vol. 9, no. 4, 2010.
- [42] A. P. Jacquemin and C. H. Berry, "Entropy measure of diversification and corporate growth," *J. Ind. Econ.*, pp. 359–369, 1979.
- [43] W. Wang, Q. Liang, R. V Mahto, W. Deng, and S. X. Zhang, "Entrepreneurial entry: The role of social media," *Technol. Forecast. Soc. Change*, vol. 161, p. 120337, 2020.
- [44] D. L. Hoffman and M. Fodor, "Can you measure the ROI of your social media marketing?," *MIT Sloan Manag. Rev.*, vol. 52, no. 1, p. 41, 2010.