Research Article

Diffusing the Innovation of Cloud Computing Implementation: International Marketing Organization Perspective

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Abstract
The risk associated with the cloud computing implementation has become a growing concern within the context of international marketing organizations. The staggering report of cloud computing implementation failures poses increasing challenges for organizations of sizes. Research studies have advocated the importance of using diffusion of innovation theory to mitigate the risk posture documented during implementation process. Therefore, the study addressed the lack of understanding of the diffusion of innovation theory in cloud computing implementation from the international marketing organization's perspectives. The correlational quantitative-based study examined the diffusion of innovation theory. The DOI was used as a guiding theoretical framework for the study. The implementation factors were used to examine the influence of the diffusion of innovation in the cloud computing implementation process from the international marketing organization's perspectives. Findings in this study confirmed DOI as a valid model to determine the successful implementation of cloud computing technology.

Introduction

The cloud computing model allows computing resources access anywhere through shared services such as software, platform, and infrastructure instances based on the billing consumption arrangement between the cloud service provider and the client. The disruptive nature of cloud computing entails information system scalability, improvement of working procedures, and a new economic paradigm built around d service model that is identifiable, accountable, and accessible for the end-users without significant capital investment in initial IT infrastructures [1, 2]. However, many cloud computing implementations have been reported to be a huge failure due to poor cloud computing adoption processes and hence eluding the benefits of cloud instances. The previous research studies that have examined the cloud computing adoption process have advocated the importance of using diffusion of innovation theory to mitigate some of the perceived challenges during the implementation process [3]. This research study has a leading research objective: to investigate the role of the diffusion of innovation theory in cloud computing implementation from international marketing organizations.

Part 2 of this paper reviews the extant literature on the nature and evolution of the diffusion of innovation in cloud computing adoption. Part 3 presents the theoretical background of the research model employed in the study and the results will be discussed in part 4. Finally, part 5 concludes with a discussion of the findings, limitations, and implications of the study.

Literature Review

The diffusion of innovation theory (DOI) was discussed historically in 1903 by French scholar Gabriel Tarde [4,5]. He was the researcher who plotted the original S-shape diffusion curve to shed light on the social process of spreading innovative ideas. This was accompanied by adopter categories, which were developed by. Hence, this formed the cardinal elements of the current theory propounded by is also credited with the original idea of leaders with a positive influence on opinions and how the social media world interrelates to change the groups' narratives through strategic deliberation [6]. The diffusion of innovation theory has been noted as an invaluable model for managing technological innovation within social systems. DOI is also relevant to information sharing and vertical communication within the adoption implementation.

The diffusion of innovation (DOI) describes the events that occur as organizations embrace innovative ideas, processes, products, and philosophies. Rogers did map out these constructs, emphasizing that very few people or organizations are susceptible to new ideas and acceptance. New ideas always channel through the early adopters and pass on to the networking channels, it then leads to critical mass acceptance of the new ideas, and over time, the new idea becomes absorbed among the target market until a satisfactory curve is attained [8-10]. Furthermore, innovation is an idea that could be used in terms of technology, business process, or way of doing things that potential adopters accept as being new and evolutionary [11]. Notable scholars have also described DOI as a process of communicating innovative ideas

over time through individually defined channels among the social system members. The diffusion of innovation can be direct or indirect depending on the channels of communication used within the social systems to facilitate innovation awareness, subsequently altering the behavior of members of social systems in a certain way to accept the change brought about by the innovativeness [12-14].

Observed a gap in the systemic description of implementation design during innovative product adoption and diffusion [15]. The model adopted leans toward diffusion of innovation [16]. This approach used an exhaustive review of the theoretical and empirical literature. Furthermore, the model highlights the challenges with consumer innovation adoption in the healthcare industry. Greenhalgh et al.'s model detailed the socio-political climate that shapes innovation diffusion within an ecosystem in which organizations and individuals interact in a complex manner. According to information technology is the primary reason for economic growth, while observed that technological progress is equivalent to social progress drivers in the marketplace [17-18]. The diffusion of innovation studies has always been a significant part of global marketing strategies when an innovation or new service is introduced to the marketplace [19]. The "diffusion of innovation theory" has been used worldwide to examine many phenomena [20].

Investigated cloud computing implementation at the firm level using a diffusion of innovation framework. A survey is conducted where employees of both professional and non-professional job roles and companies were sampled to identify these advantages and disadvantages. Building on the cited studies above and perceived variables of diffusion of innovation, Lee, Smith, and investigated the causal relationship between diffusion of innovation and cloud computing technology adoption rate using descriptive correlation analysis. By combining the collection and analysis of historical data with survey techniques, Lee et al. identified the scope of diffusion of innovation across three different industries. Diffusion rates were determined using data from 1975 – 1990, choosing three industries with broad product portfolios during the period analyzed: brewing, far-away telecommunication, and information technology industries [21,22].

Indicated a correlation between innovation diffusion and cloud computing adoption within three industries. Therefore, these factors were examined within the construct of innovation characteristics with the expectation of cloud computing adoption success. Consequent upon a literature review, four leading independent variables were hypothesized to have substantial effects on the diffusion of innovation of cloud computing adoption from international marketing organizations' perspective: the relevance of diffusion innovation theory factors towards cloud computing adoption process, the relationship between digital marketing process and successful implementation of cloud computing, efficient marketing planning influence on the successful implementation of cloud computing, and what extent can cloud computing implementation plan predict the successful outcomes.

Methodology

The examination of critical success factors in the cloud computing adoption process has been the objective of previous research efforts from both regional and national organizations' perspectives. As such, critical success factors influencing cloud computing implementation from the international marketing organization's perspectives have not been fully identified and examined [23-25]. Therefore, this research study examined the role of diffusion of innovation theory on the successful implementation of cloud computing. It is a correlational quantitative-based research study examining the diffusion of innovation theory in the cloud computing implementation process from the international marketing organization perspective. This correlational quantitative-based research method evaluated the critical success factors of the diffusion of innovation in the cloud computing implementation process in the international marketing organization. The research data was obtained through a self-reported survey. The acceptance of this organization to train and maintain professional certifications, development, and networks has led to the emergence of various professionals with international affiliations.

Furthermore, the self-administered survey generated data employing Qualtrics—an online survey. The collected research information was loaded into the Statistical Package for the Social Sciences (SPSS) for analysis. I collected the data from cybersecurity professionals, IT auditors, and IT risk experts through membership in "the International Information System Security Certification Consortium (ISC)²." Participants were identified and contacted through their email addresses. Based on the G*Power analysis (alpha = .05, power = .80), the minimum sample required 92 participants. The researcher recruited 250 potential participants to achieve a minimum response of 92 participants. The contact email addresses were obtained from the International Information System Security Certification Consortium (ISC)² leveraging the relationship the researcher has built over the years with the organization. A simple random sampling method was used to select participants for the online survey.

Results and Discussion

The online survey used to gather data was divided into four sections to examine the diffusion of innovation (DOI) and cloud computing implementation (CCI). Data was collected using an adapted online survey instrument administered to 250 cybersecurity professionals. An adequate sample size was obtained; the data were analyzed using SPSS version 26. Background Information. Based on the G*Power analysis (alpha = .05, power = .80), the minimum sample requires 92 participants. According to Monroe and Adams (2012), a minimum response of 92 or more participants was needed to achieve a sample requirement. A total of 141 out of 250 of the administered responded to the online survey representing a response rate of 56.4%. However, only 101 survey responses were valid and eligible for statistical analyses representing 40.4% of the total administered responses. Hence, the survey responses surpassed the minimum required sample with an additional nine valid responses.

Table 1: Cronbach's Alphas for the Four Variables

Variables	Number of items	Cronbach's Alpha
Diffusion of Innovation (DOI)	4	.637
Digital Marketing Process (DMP)	4	.704
Cloud Computing Implementation (CCI)	4	.646
Efficient Marketing Plan (EMP)	4	.607

Checking the Assumptions of Multiple Linear Regression

Table 2 shows the results of the normality test that the data of the four scales are normally distributed, especially for DOI and CCI. The Shapiro-Wilk test is significant at .001, W (101) = .957, .949, .965 and .9.49 p, for DOI, DMP, CCI and EMP respectively.

Table 2: *Tests of Normality*

	Kolmogorov-Smirnovª			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
DOI	.128	101	.000	.957	101	.002
DMP	.121	101	.001	.949	101	.001
CCI	.108	101	.006	.965	101	.009
EMP	.132	101	.000	.949	101	.001
Note. a. Lilliefors Significance Correction						

Table 3 shows the Mean for the DOI variable. The Mean for the four scales ranged from 2.07 to 2.81, which is very significant. The standard deviation ranged from 1.094 to 1.333. Since the statements are coded from one strongly disagree to seven for strongly agree, the more respondents agree, the higher the Mean. The first statement with a somehow higher Mean is that it is easy to diffuse cloud computing technical components after adoption (M=2.81, SD=1.33). The second statement that innovation is a significant driver for cloud computing implementation has a mean score of 2.80 and a standard deviation of 1.23. The third-ranked information about diffusing cloud computing innovation helps to accomplish adoption more quickly and has a mean score of 2.18 and a standard deviation of 1.10. The fourth-ranked item on the statement that learning to use cloud computing has been accessible for my team has a mean score of 2.07 and a standard deviation of 1.09.

Table 3: Descriptive Statistics of Diffusion of Innovation (DOI)

	N	Minimum	Maximum	Mean	Std. Deviation
Diffusing cloud computing innovation helps to accomplish adoption more quickly	119	1	7	2.18	1.104
Learning to use cloud computing has been easy for my team	120	1	6	2.07	1.094
It is easy to diffuse cloud computing technical components after adoption	102	1	7	2.81	1.333
Innovation is a major driver for cloud computing implementation	100	1	6	2.80	1.239

Table 4 shows that the majority of the DMP items have low Means. The fact that digital marketing planning helps with the successful implementation of cloud computing is not agreed with (M=1.97, SD= 1.09). However, the fact that the adoption of cloud computing improves an organization's marketing competitiveness is agreed with (M=2.67, SD= 1.35). As to the trust in the cloud computing service provider to provide data security and privacy, the mean score of agreement is low (M=2.15, SD= 1.14). Finally, cloud computing adoption helps improve new product knowledge with a low mean score of (M=1.62, SD=.786).

Table 4: Descriptive Statistics of Digital Marketing Process (DMP)

N		Minimum	Maximum	Mean	Std. Deviation
Digital marketing planning helps with the successful implementation of cloud computing	101	1	6	1.97	1.090
The adoption of cloud computing improves an organization's marketing competitiveness	102	1	7	2.67	1.352
I trust the cloud computing service provider to provide data security and privacy	101	1	6	2.15	1.144
Cloud computing adoption helps improve new product knowledge	101	1	5	1.62	.786

Table 5 shows that the majority of the CCI items have low Means. Cybersecurity professional engagement during cloud computing implementation helps with a successful outcome and has a high mean score (M=2.98, SD= 1.53). However, the IT auditor's involvement in the cloud computing implementation helps with successful results undecided (M=1.98, SD= .98). As to the cloud computing implementation plan and the prediction of a successful cloud computing adoption, the mean score of agreement is low (M=2.76, SD= 1.39). Finally, an IT risk expert in the cloud computing implementation team helps with data security and privacy with a low mean score (M=2.43, SD=1.20).

Table 5: Descriptive Statistics of Cloud Computing Implementation (CCI)

N		Minimum	Maximum	Mean	Std. Deviation
Cybersecurity professional engagement during cloud computing implementation helps with a successful outcome	101	1	7	2.98	1.536
IT auditor's involvement in the cloud computing implementation helps with successful outcomes	101	1	5	1.98	.980
Cloud computing implementation plan helps predict a successful cloud computing adoption	100	1	7	2.67	1.393
IT risk expert in the cloud computing implementation team helps with data security and privacy	101	1	6	2.43	1.203

Table 6 shows that the majority of the EMP items have lower Means on the scale. Receiving enough information about cloud computing marketing benefits is somehow agreed with (M=2.05, SD= .94). However, efficient marketing planning influences a successful cloud computing adoption did not agree with, (M=2.33, SD= 1.13). As to the cloud computing operation's easiness to learn and use, the mean score of agreement is the lowest (M=1.75, SD= .96). Finally, cloud computing is helpful because it helps my organization to improve marketing performance with the highest mean score (M=2.82, SD=1.42).

Table 6: Descriptive Statistics of Efficient Marketing Plan (EMP)

N		Minimum	Maximum	Mean	Std. Deviation
I received enough information about cloud computing marketing benefits	101	1	5	2.05	.942
Efficient marketing planning influences a successful cloud computing adoption	102	1	6	2.33	1.137
Cloud computing operation is easy to learn and use	102	1	6	1.75	.969
Cloud computing is useful because it helps my organization to improve marketing performance	102	1	7	2.82	1.424

RQ1. The relationship between the diffusion of innovation (DOI) theory factors and the successful implementation of cloud computing?

Table 7 shows the correlation matrix of CCI: Cloud Computing; DOI: Diffusion of Information; DMP: Digital marketing process; EMP: Efficient marketing plan. The correlation results show that there is a statistically significant positive correlation between CCI and DOI, DMP and EMP, r= .520, .503 and .627, n=101, p < .001. A positive statistically significant correlation is also found between DOI, DMP and EMP, r=.447, .470, n=101, p < .001. The relationship between DMP and EMP shows a significant positive correlation r= .456, n=102, p < .001. The result aligned with the study conducted by Lee (2019) that there was a significant correlation between the CCI and DOI.

Table 7: Correlation matrix of CCI, DOI, DMP and EMP

Correlations		CCI	DOI	DMP	EMP
CCI	Pearson Correlation	1	.520**	.503**	.627**
	Sig. (2-tailed)		.000	.000	.000
	N	101	101	101	101
DOI	Pearson Correlation	.520**	1	.447**	.470**
	Sig. (2-tailed)	.000		.000	.000
	N	101	121	102	102
DMP	Pearson Correlation	.503**	.447**	1	.456**
	Sig. (2-tailed)	.000	.000		.000
	N	101	102	102	102

EMP	Pearson Correlation	.627**	.470**	.456**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	101	102	102	102

**. Correlation is significant at the 0.01 level (2-tailed).
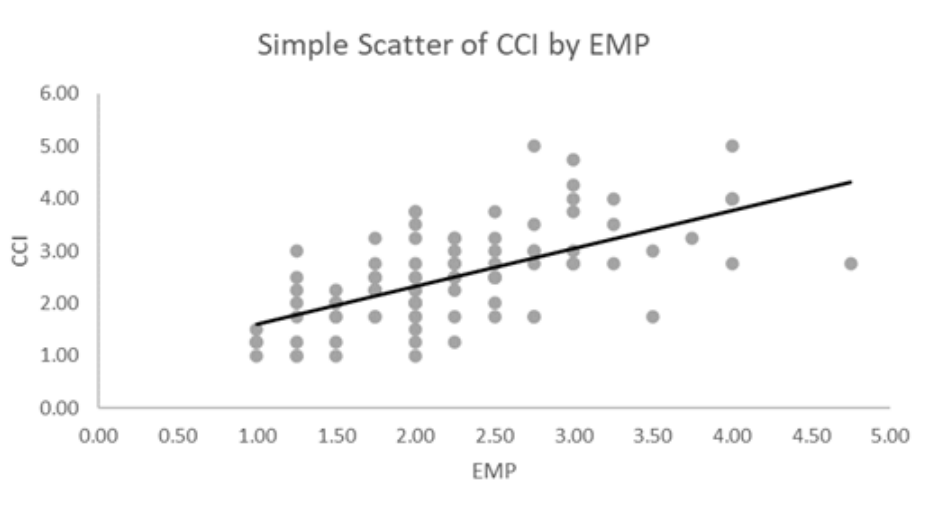

Simple Scatter of CCI by EMP

Table 9 shows that the cloud computing implementation plan statistically significantly predicted the successful implementation of cloud computing, $F_{(1, 99)} = 64.29$, $p < .001$, accounting for 39.4% of the variability in the successful implementation of cloud computing with adjusted $R^2 = .38\%$. It was a moderately strong relationship. The correlation between the cloud computing implementation plan and successful implementation of cloud computing was statistically significant, $r_{(99)} = .627$, $p < .001$. The regression equation for predicting the successful implementation of cloud computing from the cloud computing implementation plan was (The successful implementation of cloud computing) $\hat{y} = 0.89 – 0.72x$ (Efficient Marketing Plan). The confidence interval for the slope to predict CCI from EMP was 95% CI [.901, .544] with a B = .723; the slope coefficient for EMP was 0.723, so the weight of the successful ICC increases by 0.723 for each improvement of the marketing plan where ICC and EMP are scaled from 1 to 7. The results agreed with the study's findings conducted by that the cloud computing implementation plan significantly predicted the successful implementation of cloud computing.

Table 9: ANOVA of the Predictor Variable (IV)

Model	Sum of Squares	Df	Mean Square	F	Sig.
1Regression	31.890	1	31.890	64.298	.000[b]
Residual	49.101	99	.496		
Total	80.990	100			

Note. a. Dependent Variable: CCI

b. Predictors: (Constant), EMP
Figure 2 shows the relationship in the histogram of dependent variables and independent variables.

Histogram
Dependent Variable: CCI

Mean = 1.98E-16
Std. Dev. = 0.995
N = 101
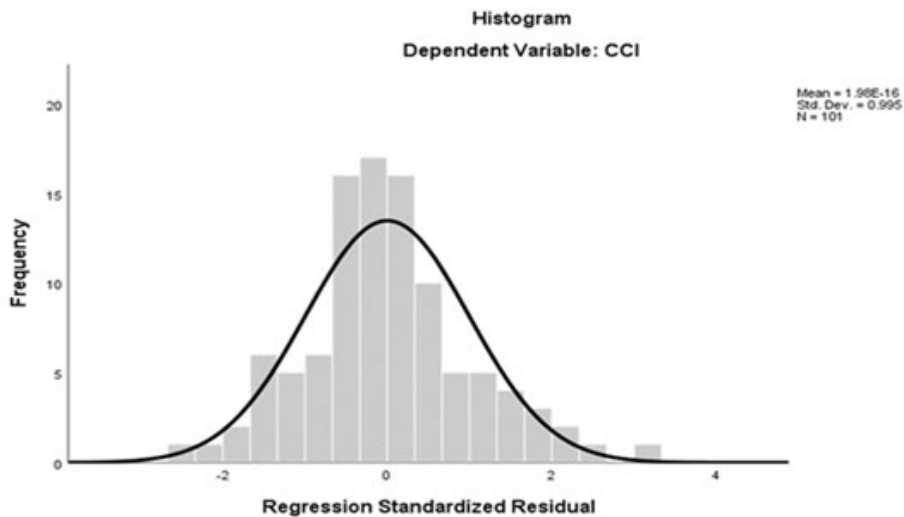
The regression analysis result showed that the cloud computing implementation plan was a positive predictor of the successful cloud computing implementation as aligned with diffusion of innovation framework. The scatterplots of the differences between the obtained and the predicted dependent variable values (residuals) generated from the multiple regression analysis could be used to check assumptions for all relationships. The reliability of multi-item scales determines the extent to which the instruments are consistent and free from random error. Cronbach's alpha is one of the widely used measures of reliability in social and organizational sciences to determine internal consistency. Cronbach's alpha ranges from 0.0 to 1.0. As table 1 indicated, alphas for the three independent variables and one dependent variable exceeded the minimum value of .70 required for acceptable reliability.

Findings showed that EMP was a significant predictor of CCI. A scatterplot showed that the relationship between efficient marketing plans that influences the successful implementation of cloud computing was positive and linear and did not reveal any bivariate outliers. An analysis of standard residuals showed that the data contained no outliers (Std. Residual Min. = -2.34, Std. Residual Max. = 3.02). The independence of residual errors was confirmed with a Durbin-Watson test (d = 2.072). Residual plots showed homoscedasticity and normality of the residuals. Thus, for this single study, the construct was significant, as the diffusion of innovation model had suggested.

Results of regression analyses showed that EMP was a significant predictor of CCI. The cloud computing implementation plan statistically significantly predicted the successful implementation of cloud computing, $F(1, 99) = 64.29$, $p < .001$, accounting for 39.4% of the variability in the successful implementation of cloud computing with adjusted $R^2 = .38\%$. This is a moderately strong relationship. The correlation between the cloud computing implementation plan and successful implementation of cloud computing was statistically significant, $r(99) = .627$, $p < .001$. The regression equation for predicting the successful implementation of cloud computing from the cloud computing implementation plan was (The successful implementation of cloud computing) $\hat{y} = 0.89 - 0.72x$ (Efficient Marketing Plan). The confidence interval for the slope to predict CCI from EMP was 95% CI [.901, .544] with a $B = .723$; the slope coefficient for EMP was 0.723, so the weight of the successful ICC increases by 0.723 for each improvement of the marketing plan where ICC and EMP are scaled from 1 to 7. Consequently, the efficient marketing plan and successful implementation of the cloud computing plan were important antecedents of CCI as suggested.

Conclusions

This quantitative correlational research study aimed to test the diffusion of innovation theory (DOI) to determine the variables influencing international marketing organization's cloud computing implementation (CCI). According to DOI is the fundamental determinant of cloud computing technology adoption. Three independent variables of DOI, EMP, and DMP and one dependent variable of CCI were investigated.

Findings in this study confirmed DOI as a valid model to determine the successful implementation of cloud computing technol-ogy. The results also showed that it was necessary to include other variables that influence the cloud computing decision-making process. In the current study, the EMP and DMP significantly influenced the successful implementation of cloud computing. Contrary to the results of studies conducted to test the original TAM, this study reinforced the findings in a previous cloud computing study. Results showed that the relationship between the diffusion of innovation (DOI) and cloud computing implementation (CCI) decision was stronger than the relationship between the digital marketing process (DMP) and cloud computing implementation (CCI). These findings represent a contribution to the body of knowledge on cloud computing adoption research.

In summary, the study builds on the diffusion of innovation theory and cloud computing literature. Specifically, the findings advance the diffusion of innovation in the cloud computing implementation process using international marketing organizations' perspectives. Future research into the diffusion of innovation in cloud computing implementation using different contexts and methodology to optimize, create and foster effective cloud computing technology adoption process. Given the interesting findings, there are opportunities to replicate this study to compare results and extend the results of the cloud computing implementation factors.

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