

The Effect of Information Communication Technology and Cash Conversion Cycle on Firm Performance

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Abstract— This research has attempted to examine the impact of information communication technology (ICT) and cash conversion cycle (CCC) on a firm's profitability. The major distinction of this study with the prior research is to compare the influence of ICT and CCC across industry in Thailand. The dependent variable was firms' profitability, which employed return on assets (ROA). Two key explanatory variables were ICT and CCC. The ICT quite stimulates market demand. While CCC is used for liquidity management, which measures the time lag between cash inflows from sales and cash outflows from goods purchase. Firms' size also was included in the study as control variable. The research scope focused on listed companies in the Stock exchange of Thailand (SET) for 6 sectors, consisting of automotive (AU), materials & machinery (MM), petrochemicals & chemicals (PC), commerce (CO), health care service (HC) and transportation & logistics (TL) within 2 industry groups: industry and service. Data were collected in annual basis during 2014 – 2017. Panel regression models were employed for data analysis. The major findings revealed that firms in transportation & logistics had the shortest cash conversion cycle (CCC); while, materials & machinery sector had the longest of CCC. The information communication technology (ICT) has increased dramatically, especially during 2016 – 2017. The results found a significant negative relationship between ICT and ROA at statistically significant 1% level for automotive sector. Interestingly, the results showed that all factors: ICT, CCC and firms' size provided significant impact on firm performance for health care sector. The cash conversion cycle and firm size had a negative relation to ROA of health care sector at statistically significant 1% level. Additionally, ICT had a positive relation to ROA of health care sector at statistically significant 1% level. Among three industry groups, the AU model provided the highest of R^2 of 0.83. The HC model provided the highest of R^2 of 0.97 for service sector.

Keywords: cash conversion cycle; profitability; firms' size

I. Introduction

In present, technology innovation is massively developed, especially, information communication technology (ICT). The technology changes stimulate market demand and also customer disruption; as a result, firms should develop their strategies and policies to respond to the changes of business circumstance. A major technique for liquidity management is Working Capital Management (WCM), which is a strategic priority to generate cash for firms' operating. The core objective of WCM is to maintain firms' liquidity. In the other word, firms have to manage the timing of cash inflows and cash outflows properly. A tool for liquidity measurement is Cash Conversion Cycle (CCC) which is a key factor of an efficiency working capital management. Cash Conversion Cycle stimulates companies to negotiate payment terms, trade credits and the optimal inventory they should have to fulfill their needs. Therefore, researcher interests in the impact of ICT and CCC on firm performance and how industries do differ from the others.

The organization of the rest of the paper is as follows: Section II deals with the literature review. Section III is concerned with data and methodology, including the data, dependent variables and explanatory variables. Section IV discusses empirical model used and the research findings, and finally the discussions and conclusion are provided in Section V.

II. LITERATURE REVIEW

Presently, the information and communication technology (ICT) seems to leap up into new technology era. The technology changes stimulate to social disruption in many dimension such as customer need and social behaviour. Importantly, Frank Lasc, Fr  d  ric Le Roy and Saïd Yami (2007) found that human capital and working experience have no significant impact on the success of young ICT firms [1], implying the lower important of human capital in the future.

A key success for business is liquidity management. If a firm does not manage liquidity well, leading to finding external financing or bankruptcy. A common way to evaluate firm's liquidity is to employ cash conversion

cycle (CCC). CCC measures the time lag between cash inflows from sales and cash outflows from goods purchase.

According to Uyar (2009), CCC can be calculated as following equation [2].

$$CCC = \text{Days of sales outstanding} + \text{Days of Sales in inventory} - \text{Days of payable outstanding}$$

Cash conversion cycle is likely to be both negative and positive. When CCC provides positive, meaning that the length of cash inflows from sales is longer than the cash payment from purchase. This brings about the firms to raise funds to offset the time gap. In contrast, the negative CCC reflects that firms decrease working capital due to the length of payment is longer than the cash collection. Thus, the shorten CCC, the more efficient of working capital management.

Cash conversion cycle is a popular topic among scholars to examine its impact on firms in many dimensions. Upadhyay, Sen and Smith (2015) studied cash conversion cycle and profitability of hospitals in Washington and found negative relationship between CCC and total margin [3]. Deloof (2003) studied 1,009 large Belgian non-financial firms for a period of five years and found a negative relation between CCC and profitability due to the fact that smaller and less profitable firms wait longer to pay their bills [4]. Fillbeck and Krueger (2005) found out the different WCM measures among industries and across time [5].

This study aims to study in a deeper way of ICT and CCC and how it differs among industries in Thailand. Besides so many studies there is a void to fill regarding research about ICT, CCC and industry. This research adds to the literature through a comparison between two industries groups, consisting industry (Automotive (AU), Materials & machinery (MM) and Petrochemicals & chemicals (PC) and service (Commerce (CO), Health care service (HC) and Transportation & logistics (TL)) that have never been studied before.

Thai Industrial and Service Sectors

The Thai capital market has been developed into two phases, starting with the Bangkok Stock Exchange, and followed by the Securities Exchange of Thailand (SET) on May 1974, which officially started trading in 1991. The major aims are to promote securities trading for stimulate savings and mobilize domestic capital. The Securities and Exchange Commission (SEC) provided many stock indexes to serve investors. Each industry group indices and sector indices are also provides. The SET (2019) [6] divided into eight industry groups: agricultural and food, industry, consumer products, financials, industrial, property and construction, resources, services and technology.

III. DATA AND METHODOLOGY

1. Data

This research employed panel data. The data were of Thai listed companies on the Stock Exchange of Thailand (SET) during 2014 – 2017. The paper included three industry groups; consisting of automotive sector, materials & machinery sector and petrochemicals & chemicals sector, and also studied three service industries, consisting of commerce, health care service and transportation & logistics. The data were of annual basis. Delist and new list companies were excluded because of unavailable data. As a result, the samples of this research consisted of 90 companies as shown in table 1 below [7].

Table 1: The research population

Industry	Sector	A number of companies	Total assets (millions baht)
Industry	Automotive (AU)	18	420,733.60
	Materials & machinery (MM)	9	170,580.48
	Petrochemicals & chemicals (PC)	14	3,708,429.82
Service	Commerce (CO)	20	4,129,610.67
	Health care service (HC)	15	1,045,144.82
	Transportation & logistics. (TL)	14	3,840,260.53

2. Research Variable

Because of focusing on the effect of cash conversion cycle on firms' profitability, the study employed Return on Asset (ROA) as a dependent variable. While, information communication technology and cash conversion cycle (CCC) are two major explanatory variables. In addition, the study included firms' size as control variable. The proxy of each variable was measured as shown in Table 2.

In this research, panel data regression was employed, by considering both fixed effects (FE) and random effects (RE) models. The FE model was developed to take account with heterogeneity effect. While, the RE models assumes a random variable uncorrelated with independent variables. Then the Hausman (HS) test was used in order to selecting the appropriate model between the FE model and the RE model. The null hypothesis of the HS test is that there are no considerable difference between the FE and the RE. As a result, if the null hypothesis is rejected, the RE is rejected [9].

Table 2: The mnemonics and definitions of variables

Variables	Mnemonic	Definition
Dependent variable		
1. Return on Asset	<i>ROA</i>	Earnings after tax / total assets
Explanatory variable		
1. Days of sale outstanding	<i>DS</i>	(365x the average of account receivable) / Sales revenue
2. Days of sales in inventory	<i>DI</i>	(365x the average of inventory) / Cost of goods sold
3. Days of payable outstanding	<i>DP</i>	(365x the average of account payable) / Cost of goods sold
4. Cash conversion cycle	<i>CCC</i>	$DS+DI-DP$
5. Information communication technology	<i>ICT</i>	The percentage of availability and use of computers and internet of firms in Thailand (from National Statistical office (NSO), Thailand) [8]
Control Variable		
1. Firm size	<i>Size</i>	Natural Logarithm of firms' total assets

IV. EMPIRICAL MODELS AND FINDINGS

1. Descriptive statistics

During 2014 – 2017, the percentage of availability and use of computers and internet of firms in Thailand were compared in terms of line graph as shown in Figure 1 below.

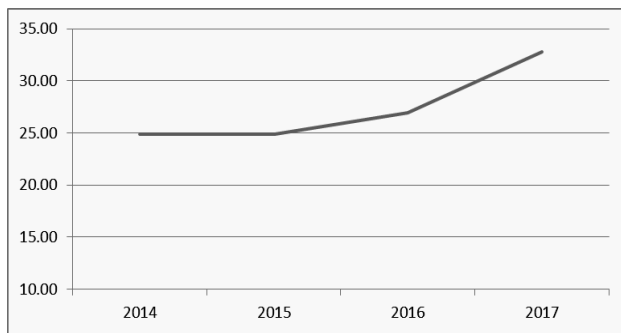


Figure 1: the employed ICT by firms in Thailand
Sources: National Statistical office (NSO), Thailand, 2018

From figure 1, the percentage of availability and use of computers and internet of firms in Thailand increased from 24.90 in 2014 to 32.76 in 2017. The line graph revealed the dramatically increase of the growth of ICT during 2016 – 2017.

Regarding to cash conversion cycle, CCC of each sectors were compared by line graph as shown in Figure 2 below. The result shows that materials & machinery sector had the highest of CCC. Interestingly, transportation & logistics sector had negative CCC during

2016 – 2017, reflecting an efficiency of working capital management.

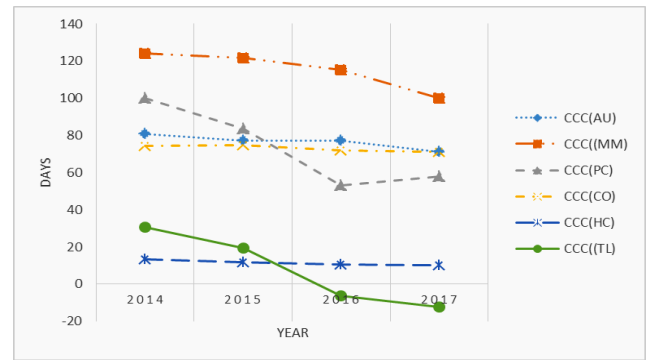


Figure 2: Cash conversion cycle of each sector

Then, the descriptive statistics of dependent and independent variables of the sample were summarized during 2014 – 2017 as shown in Table 3 below.

Table 3: Descriptive statistics of variables

Variable	Mean	Median	Min	Max	Std. Dev.
Dependent variable:					
<i>ROA(AU)</i>	5.77	6.15	-10.12	29.80	6.52
<i>ROA(MM)</i>	3.27	2.68	-9.71	9.90	4.21
<i>ROA(PC)</i>	8.12	7.23	-31.60	38.75	10.18
<i>ROA(CO)</i>	8.05	6.17	-2.47	52.64	8.23
<i>ROA(HC)</i>	7.96	7.43	-6.65	17.00	5.48
<i>ROA(TL)</i>	0.07	1.83	-46.58	17.02	10.77
Explanatory variables:					
<i>CCC(AU)</i>	76.60	66.83	-47.08	194.65	57.93
<i>CCC(MM)</i>	115.20	113.42	-3.22	197.24	56.39
<i>CCC(PC)</i>	73.61	83.38	-257.71	338.38	79.19
<i>CCC(CO)</i>	73.07	23.19	-47.24	618.90	139.87
<i>CCC(HC)</i>	11.41	8.66	-40.15	83.35	26.90
<i>CCC(TL)</i>	7.83	13.88	-149.42	244.39	92.37
<i>ICT</i>	27.36	25.90	24.90	32.76	3.22
Control Variable					
<i>Size (AU)</i>	15.03	15.07	13.65	16.54	0.78
<i>Size (MM)</i>	14.99	14.94	13.78	16.01	0.57
<i>Size (PC)</i>	14.71	13.97	11.30	19.89	1.95
<i>Size (CO)</i>	16.23	15.99	13.73	19.70	1.48
<i>Size (HC)</i>	15.39	15.44	13.02	18.62	1.40
<i>Size (TL)</i>	16.01	15.57	12.75	19.54	1.97

From Table 3, petrochemicals & chemicals sector provided the highest mean of ROA at 8.12 across industries, followed by health care service at 8.05. However, during 2014 – 2017 the means of ROA were positive, implying that all sectors gain profits. Regarding to the efficient of working capital management, transportation & logistics sector provided the shortest CCC of 7.38 days, implying that the companies held the lowest amount of working capital for operation, or the other words they were able to increase investment for higher returns. In contrast, materials & machinery sector had the highest CCC of 115.20 days. The percentage of availability and use of computers and internet of firms in

Thailand (ICT) had the mean at 27.36. The firms' sizes across industry were similar, which range 14.74 – 16.23.

2. Regression results

Prior to conduct panel regressions, multicollinearity was analyzed by using the Pearson correlation as shown in Table 4 below.

Table 4: Correlation

Correlation				
	ROA	CCC	Size	ICT
ROA	1.00			
CCC	0.11*	1.00		
Size	-0.03	-0.13***	1.00	
ICT	0.03	-0.07	0.04	1.00

Note: **5% significance level, ***1% significance level

The results in Table 4 showed that no explanatory variables provided multicollinearity due to all correlation below 0.80 [9].

In this research, panel regression was employed to study the effect of information communication technology (ICT) and cash conversion cycle (CCC) on firms' performance as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 ICT_{i,t} + \beta_3 Size_{i,t} + \varepsilon_{i,t}$$

Where, i and t denote i and year t , respectively. $\varepsilon_{i,t}$ is error term for individual i in year t .

Finally, the fixed effects (FE) models were employed for all sectors because the Hausman (HS) test rejected the random models.

The panel regression results showed the explanatory power of independent variables with regard to firms' performance of industry sector shown in Table 5 and of service sector in Table 6 as below.

Table 5: Panel regression results of industry

Variable	AU	MM	PC
Constant	-91.37	-23.88	39.98
CCC	0.03	0.03	-0.04
ICT	-0.27***	0.10	0.40
Size	6.78	1.41	-2.65
R ²	0.83	0.62	0.70
F-statistic	12.23***	3.56***	5.67***
Observations	72	36	56

Note: ** and *** refer to 5% and 1% significance level respectively

From Table 5, ICT was negatively related to automotive firms' ROA at the 1% significance level. Interestingly, no significant impact of CCC and firm size on firms' performance showed for all industry sectors. The automotive also provided the highest of explanatory power of independent variables among three industry firms.

Table 6: Panel regression results of service sector

Variable	CO	HC	TL
Constant	13.90	82.99***	5.80
CCC	-0.02	-0.03***	0.04***
ICT	0.26***	0.10***	0.13
Size	-0.71	-5.02***	-0.60
R ²	0.86	0.97	0.72
F-statistic	16.55***	91.13***	6.39***
Observations	80	60	56

Note: ** and *** refer to 5% and 1% significance level respectively

Move to service sector, CCC was negatively related to ROA of health care sector at the 1% significance level but it provided positive sign for transportation & logistics at the 1% significance level. Importantly, ICT provided positive relation to ROA at the 1% significance level for commerce sector and health care sector. However, firms' size provided negative relation to performance at the 1% significance level of health care service sector. The health care sector also provided the highest of explanatory power of independent variables among three service firms.

V. DISCUSSIONS AND CONCLUSIONS

The study was conducted on listed companies in the Stock exchange of Thailand (SET) for 6 sectors, consisting of automotive (AU), materials & machinery (MM), petrochemicals & chemicals (PC), commerce (CO), health care service (HC) and transportation & logistics (TL) within 2 industry groups: industry and service. The major findings revealed that firms in transportation & logistics had the shortest cash conversion cycle (CCC) across sectors. The main reasons are that this sector provided service rather than products; as a result, a few inventories holding and a few days sales inventory. Importantly, during 2016 – 2017, companies in transportation & logistics sector had negative CCC, reflecting the efficient of working capital management. The firms in materials & machinery sector had the longest of CCC; implying that this sector may have liquidity problems.

Table 4 showed that firm size provided insignificant negative related to firm's profitability. This implied that firm size might be positive or negative relation to ROA. A reason of negative relation was that a larger firm had more operating expenses than a smaller firm, which is in line with Anser and Malik (2013) [10]. However, a positive relation implied that a larger firm had efficient account receivable management, inventory management and purchasing management, leading to minimize operating cost and increase operating profits. Obviously, CCC had a negative relation to firms' size at statistically significant 1% level, implying that a larger firm had an efficient operating system to reduce operating period and also had negotiation power with suppliers to prolong

purchasing credit term. This led to minimize cash conversion cycle.

Table 5 reported the results of automotive sector (AU) that ICT provided a statistically significant negative relation to ROA at 1% significance level. This implied that ICT was a key factor of success for AU. Because of this sector need more information communication tools to stimulate customer demand. Indeed, automotive sector currently has high business competition; thus, the automotive firms should employ ICT to maintain customer base and pull for new customers by media advertising. Among three industry groups, the AU model provided the highest of R² of 0.83, followed by petrochemicals & chemicals (PC) of 0.70.

Interestingly, the results of health care service (HC) showed that firms 'size and CCC provided a statistically significant negative relation to ROA at 1% significance level. The significant negative CCC to ROA implied that longer CCC, lower profitability. This evidence was associated with Yazdanfar and Ohman (2014), which examine the impact of CCC on Swedish firm profitability [11]. Furthermore,

Additionally, ICT provided a statistically significant positive relation to performance at 1% significance level. These implied that all independent variables played key role on ROA of health care service. Whilst, CCC had a significant positive sign for transportation & logistics (TL) at statistically significant 1% level and ICT has a significant positive sign for commerce (CO) at statistically significant 1% level. Among three service groups, the HC model provided the highest of R² of 0.97, followed by CO of 0.86.

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