A Survey of Interest Information Technology Trends: Undergraduate Student Viewpoint towards Business, Government and Academic Considerations

Maleerat Sodanil^{1*}, Hathairat Ketmaneechairat², Puttakul Sakul-Ung¹

¹ Faculty of Information Technology, King Mongkut's University of Technology North Bangkok, Thailand. ² College of Industrial Technology, King Mongkut's University of Technology North Bangkok, Thailand.

* Corresponding author. Email: maleerat.s@it.kmutnb.ac.th, hathairat.k@cit.kmutnb.ac.th, puttakul.s@gmail.com Manuscript submitted December 5, 2019; accepted February 13, 2020. doi: 10.17706/ijeeee.2020.10.3.249-258

Abstract: Information Technology (IT) Trends plays an important role in rapid adaptation of business, government, and academic sectors. This paper presents quantitative and qualitative analysis of IT trends survey results responded by IT undergraduate students. The technologies including in the IT trends were selected based on studies, reports from related sectors and well-known consulting firms. The questions used in the survey were passed the Index of Coherence (IOC) test from domain experts with high reliable level 63 (α = .96) The results show significant contributions toward survey objectives, which impact opportunities for improving knowledge and understanding of IT trends in business, government and academic perspectives.

Key words: Information technology trends, academic survey, undergraduate student viewpoint.

1. Introduction

Recently, consulting firms have surveyed and launched reports about the Information Technology (IT) trends for the near future, which the business sector should take into consideration before launching products or services [1], [2]. These trends will affect cost reduction, risk mitigation, maximizing return of investment, etc. Meanwhile, the government motivates companies to employ the IT trends by providing support such as funding, tax deductions, tax exemptions, and collaboration [3], [4]. Academies also adjust their curriculum to match the change of technology in order to forge new knowledge into students and prepare the students for working with the IT trends. This phenomenon shows the relationship between sectors requiring strong commitment of representatives in order to bring the most effective implementation of the IT trends. Undergraduate students studying Information Technology (UGs) are the most affecting group based on this change while the business and government sectors are also affected by this change subsequently [5], [6]. The UGs will enter the labor market to work in the business sector and government in the near future [7]. This paper presents the analysis of survey results responded by UGs designed using the Likert scale towards survey objectives which are: (1) to evaluate the level of consideration of UGs towards IT trends, (2) to evaluate the level of consideration of UGs towards selecting career, and (3) to evaluate the level of sufficiency of IT trends in the curriculum. Moreover, the analysis will

significantly contribute to the mentioned sectors to beware of the knowledge of IT trends with the sectors.

2. Related Works

Nowadays, technologies have rapidly developed and changed to support a new generation of people. [8] In order to outline the scope of IT trends correctly, several researches and studies from the business sector [9], [10], government sector, and academic sector have been reviewed [11], [12]. It has been found that the IT trends have been reflected in these sectors using multiple sources of information. In the business and government sectors, we deployed search criteria "IT trends" to find the recent works and study (2018-2019) published by the top five international consulting firms ranked by consulting revenue [13], and international government sectors related to the IT fields. In the academic sector, we used similar criteria looking for published journals and conference papers in four major online databases, IEEE, ACM, Elsevier and ScienceDirect. The inclusion criteria include the works or studies published since 2018, being written in Thai or English languages, and presenting IT trends and innovative trends.

Importance of Information Technology Trends.Academic work has revealed changes in technology while consulting firms have taken this opportunity to predict business perspectives and values. Importantly, motivating and supporting business and academic sectors are directly under the government's responsibility. Many government agencies have tried to raise awareness of the IT trends among these sectors by launching campaigns such as tax-reduction, funding, scholarships, and job vacations [6]. Since 2018, the information technology trends have been taken as awareness of its rapid emersion [14].

3. Survey Design

To ensure survey objective adherence, we invited 5 domain experts (DEs) from government, academic, and business sectors including: 1) 1 DE from the government sector, 2) 2 DEs from the academic sector, and 3) 2 DEs from the IT business sector, to consolidate the Index of Item Objective Congruence (IOC). The IOC is an index used to indicate objective adherence between questions towards each objective; [15] it is then used to determine and select questions to be included in a survey. Finally, the survey contains 9 core questions based on the IOC, which are aligned to survey objectives as shown in Table 1.

Objective I:(01) To evaluate the level of consideration in IT trends.					
Q#	Question	IOC			
Q1	You agree that these IT trends are currently considered to be trends in the future.	1.0			
Q2	You agree that these IT trends play an important role in your study.	0.8			
Q3	You agree that these IT trends are going to impact your daily life and society.	1.0			
Objective II:(02) To evaluate the level of consideration in IT trends for selecting career.					
Q#	Question	IOC			
Q4	You agree that these IT trends will influence your decision in choosing a career.	1.0			
Q5	You agree that knowing these IT trends will create good opportunities in your career.	0.8			
Objective III:(O3) To evaluate the level of sufficiency of IT trends knowledge in the current curriculum					
Q#	Question	IOC			
Q6	You are confident that you will obtain sufficient knowledge in these IT trends.	1.0			
Q7	You are confident that your current curriculum contains a good basis for these IT trends.	1.0			
Q8	You are confident that your current curriculum will identify these IT trends as important	0.8			
	content.				
Q9	You are confident that your current curriculum will help you in selecting a good career related	1.0			
	to these IT trends.				

Table 1. Index of Item Objective Congruence (IOC) for Selecting Questions

Each question is designed to be the Likert Item with 5 Scale and applied to each and every selected technology in the IT trend.

3.1. Scope of Information Technology Trends

To limit the scope of selected technologies in IT trends, the qualitative reviews by domain experts were developed in order to select technologies in the IT trends; firstly, the reviewed works and studies have been grouped into information technology categories. Secondly, the domain experts (DEs) performed reviews and created a consensus for selecting and scoping the IT trends, which should be included in the survey. The consensus reveals that there are 7 technologies being the IT trends including: (T1) Artificial Intelligence [16]-[18], Machine Learning and Robotics Technology, (T2) Big Data and Data Analytics [19], [20], (T3) Blockchain Technology [12], [21], (T4) Internet of Things [22], (T5) Virtual and Extended Reality [23], (T6) Cyber Security and Privacy [24], [25], and (T7) Cloud Technology [26].



Fig. 1. The framework of a survey of interest in information technology trends.

The survey contains 2 sets of questions, which are 1) general questions and 2) the IT trends questions. The general questions used for collecting individual information including Gender, Grade Point Average (GPA), Family Income, College Year, Number of Family Member, and Faculty, and the IT trends questions are questions reflecting awareness of the IT trends denoted by Q(n)T(i). For example, question 1 of technology 4 can be expressed as Q1T4.

3.2. Sample Size Determination

Undergraduate students studying Information Technology (UGs) are the target group of the survey. The Yamane method [27] has been applied to estimate the sample size with scoped characteristics, which are enrolling a major curriculum in IT fields, being Thai Nationality, and having GPA from 1.75 to 4.00.

3.3. Validate Survey Results

In order to validate and interpret survey results qualitatively, several interview sessions with DEs have been conducted. The interview sessions aim to obtain DEs' attitudes and interpretations towards the quantitative results of the survey for the real-world scenarios.

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4. Survey and Results

Based on the characteristics of the sampling size, 338 UGs have been selected for the survey including 63.6% male students and 36.4% female students. The respondents were grouped by several dimensions as stratifies, 1) Grade Point Average (GPA), 2) Family Income, 3) College Year, and (4) Faculty.

The survey results were analyzed in several perspectives towards survey objectives and its correlations between technologies and sample groups. This survey employs Likert scale that is classified into 5 scales ranging from "Strongly Disagree" to "Strongly Agree". "Strongly Disagree" and "Disagree" are negative attitudes denoted by interval values 1 and 2. "Neutral" is a neutral attitude denoted by 3. "Agree" and "Strongly Agree" are positive attitudes denoted by 4 and 5. To report the survey results in percentage of each scale, we mainly report in the form of the first and second of "Maximum Percentage of Positive Attitude" (MPPA) and "Maximum Percentage of Negative Attitude" (MPNA). Furthermore, statistical analysis is reported in both ordinal and interval manners.

4.1. Reliability of Questions

To validate the IOC on selected questions, we performed reliability testing to determine whether any questions should have been removed. However, it has been found that these items were highly reliable (63 items; α =.96) Removing any question would contribute to no better reliability.

4.2. Stratification

The results have been stratified using classes shown in Table 2.

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#	Description	Label	Percentage			
GPA						
1	1.75 – 2.49	Low GPA	39.1			
2	2.50 - 3.24	Medium GPA	47.6			
3	3.25 - 4.00	High GPA	13.3			
College Year						
1	First Year	1-Year	32.5			
2	Second Year	2-Year	10.1			
3	Third Year	3-Year	38.2			
4	Last Year	4-Year	19.2			
	Gender					
1	Male	Male	63.6			
2	Female	Female	36.4			
Family Income						
#	Description (baht/month)	Label	Percentage			
1	< 20,000	Very Low	23.4			
2	20,001 - 30,000	Low	22.2			
3	30,001 - 40,000	Medium	16.3			
4	40,001 - 50,000	High	9.5			
5	> 50,000	Very High	28.7			
Faculty						
1	In Science	Science	27.2			
2	In Education	Education	33.1			
3	In Business administration	Management	39.6			

Table 2. The Stratification of the Sampling Group Derived by Categories

4.3. Acceptance of IT Trends

In order to measure the acceptance of the IT trends, the attitude of the IT trends acceptance has been examined by the following questions: Q1 ("You agree that these IT trends are currently considered to be trends in the future."), Q2 ("You agree that these IT trends play an important role in your study") and Q3 ("You agree that these IT trends are going to impact your daily life and society"). We consider Mode and

Mean values as shown in Table 3.

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Q#	Mean/	Technology in Trends						
	Mode	T1	T2	T3	T4	T5	T6	T7
Q1	Mean	4.10	4.07	3.90	4.18	3.99	4.00	4.29
	Mode	4.00	4.00	4.00	5.00	4.00	4.00	4.00
Q2	Mean	4.03	4.08	3.95	4.24	3.97	4.04	4.22
	Mode	4.00	5.00	4.00	5.00	4.00	4.00	5.00
Q3	Mean	4.06	4.01	3.95	4.22	3.96	4.08	3.90
	Mode	4.00	5.00	4.00	5.00	4.00	4.00	4.00

Table 3. The Stratification of the Acceptance of It Trends towards q1 to q3

4.4. Awareness of IT Trends in Studying

Question 2 (Q2) implicates the consideration and awareness of IT trends in the UGs. The results reveal that nearly half of the sampling (46.4%) has agreed with T5 (Virtual and Extended Reality) and (45.9%) strongly agree with T7 (Cloud Technology). It can be explained that these technologies relate to their curriculum. In contrast, (3.8%) and (3.6%) disagreed with T1 and T7.

4.5. Awareness of IT Trends in Daily Life and Society

Question 3 (Q3) implies the awareness and consideration of IT trends in daily life and society. The results revealed that (48.2%) strongly agreed with the influences of T4 (Internet of Thing) and (42.0%) agreed with T1 and T5. However, (3.6%) disagreed with T2 (Big Data and Data Analytics) and T3 (Blockchain Technology) and (2.7%) strongly disagreed with T1.

4.6. Influencer on the Decision of Selecting a Career

Question 4 (Q4) ("You agree that these IT trends will influence your decision in choosing career.") represented the technologies that influenced UGs' decision in selecting their future career. The results show that (48.8%) and (45.3%) strongly agreed that T1 and T7 is their decision influencer. (3.6%) disagreed with T1 and (3.3%) disagreed with T2 and T6 (Cyber Security and Privacy).

4.7. Creating Opportunity for a Future Career

Question 5 (Q5) ("You agree that knowing these IT trends will create good opportunity in your career.") describes the phenomenon of having knowledge in IT trends that are believed to give a good opportunity in future career. Nearly half of the sampling (47.0%) agreed with T5 and (46.7%) strongly agreed with T4. However, (4.1%) disagreed with T1, T2 and T3; (3.8%) disagreed with T6.

4.8. The Sufficiency of Knowledge in IT Trends

Question 6 (Q6) ("You are confident that you obtain sufficient knowledge in these IT trends.") intentionally asks UGs to evaluate the confidence level of having knowledge in IT trends. Only a few (29.6%) agreed that they are confident in having sufficient knowledge of T4 while (27.2%) agreed with T1. The technology that the UGs mostly disagreed is T5 (29%) and T2 (28.7%).

4.9. Good Basis Knowledge Provided by Curriculum

Question 7 (Q7) ("You are confident that your current curriculum contains good basic of these IT trends.") evaluates the confidence level of UGs toward their curriculum that their curriculum has provided a good basis of knowledge of IT trends. Surprisingly, only (28.1%) agreed that their current curriculum has

provided a good basis of knowledge in T4 and (25.7%) agreed with T1. On the other hand, (28.7%) and (27.2%) have disagreed with T6 and T3.

4.10. IT Trends as Important Contents Provided by Curriculum

Question 8 (Q8) ("You are confident that your current curriculum identifies these IT trends as important contents.") implies the UGs' attitude towards their curriculum (32.5%) and (31.4%) agreed that their current curriculum identifies T4 and T2 as important contents. Contrastingly, (18.9%) disagreed with T4 while (18.3%) disagreed with T5 and T6.

4.11. Impact of Curriculum for Future Career

Question 9 (Q9) represents how the current curriculum could benefit the UGs on getting a career that is related to the IT trends. (33.4%) and (31.7%) agreed that they are benefited by current curriculum that related to T5 and T7. However, (19.2%) disagreed with T5 and (18.6%) disagreed with T2 and T3.

4.12. Dimension Reduction: Technology to Questions

In order to reduce the dimension of the IT trends, the factor analysis has been applied using Exploratory Factor Analysis (EFA) for each technology in associated questions. A new set of data for further analysis has been found. The processes of this dimension reduction are as follows: 1) observing the correction of each technology under associated question, 2) applied the Kaiser-Meyer-Olkin measure of sampling adequacy. It has been found that the observed correction was between 0.5 and 0.7, which can be identified as acceptable correction. The measure of sampling adequacy was between 0.86 and 0.93 above the commonly recommended value of 0.6 and the Bartlett's test of sphericity was significant (p < .001).

Dimension reduction has been reduced from 63 to 9 questions. A new set of variables represents a set of average scores for each question denoted by

$$Q_{i} = \frac{\sum_{j=1}^{7} (QT_{ij})}{7}$$
(1)

When *i* is the number of questions $(1 \le i \le 9)$

The reliability check has been performed on this new set of variables, the reliability was still confirmed and acceptable (9 items; α = .82). Moreover, a new set of data has been tested to ensure met the assumption of collinearity. This indicated that multicollinearity was not a concern (VIF < 5).

4.13. The Effect of the Size of Stratifies

We deployed ANOVA in order to determine the significant stratifies to Q_i in terms of significant value as well as effect size. Gender: It shows the main effect of gender on Q_6 , F(1, 336)=7.96, p=.005, η 2 = .020

- 1) GPA: Analysis shows the main effect of GPA on all Q_i except Q_5 . Post-Hoc comparison using Tukey HSD identifies that high GPA (3.25 4.00) has significantly different Mean value compared to Medium and Low GPA for Q_i .
- College Year: The significant effect measures of College Year on Q₁, F(3, 334)=3.57, *p*=0.014, *η*2=0.031 and on Q₅, F(3, 334)=2.88, *p*=.036, *η*2=0.025.
- 3) Family Income: There is a main effect of Family Income on all Q_i except Q_9 . The post-Hoc comparison using the Tukey HSD implies a variety of combination groups where the significance of Mean difference occurred.

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4) Faculty: There is a main effect of Faculty on Q_3 , Q_4 , and Q_6 . Post-Hoc comparison using Tukey HSD implies that the case of Q_3 , Science (M = 4.19, SD=0.66) is significantly different than Management (M=3.97, SD=0.56) and Education (M=3.95, SD=0.78), Q_4 , Science (M=4.32, SD=0.75) is significantly different than Management (M=4.08, SD=0.69) and Education (M=4.03, SD=0.71). However, Post-Hoc for Q_6 , Science (M = 3.20, SD=1.36) is significantly different than Education (M=2.82, SD=0.92) but Management (M=3.13, SD=1.05) is significantly different than Science and Education.

5. Interview Results

In order to collect interview results, several interview sessions have been arranged. Each session took around 25 minutes for each participant. There are three questions regarding survey objectives, the participants given information about quantitative survey results. Some of the significant answers, attitudes and reactions of the interviewees were recorded to match particular quantitative results as in Table 4.

Q	Records	DE
1	Regarding the survey on technology acceptance, it's quite normal to see that the majority of the sampling has low interest rates in the Blockchain Technology while the Cloud technology received the highest acceptance rate. This is due to the fact that the majority (freshman to junior students) of the sampling has more interest in studying than working. Moreover, Cloud technology is a technology that students have been using in most institutions.	4
2	IOTs (Internet of Things) has received the highest interest among the technologies. This is due to the fact that the IOTs are more practical than other technologies while the Blockchain technology is more abstract so it'll receive lowest interest from the sampling group. This technology's output is in the form of innovative devices.	4
3	In the impact of IT trends toward daily life, it is normal to see that the Cloud Technology has received the lowest impact because this technology has been widely used already. In contrast, the Internet of Things (IOTs) has received the highest impact due to the public relation from the government.	4
4	AI, ML and robotics are innovative technologies that industry seeks new graduates who are capable of these skills. As a result, these technologies have received the highest impact rate.	4
5	Cyber security and privacy have received the lowest impact toward opportunities in future careers. This is due to the fact that the Cyber security and privacy are common knowledge that everyone has to understand and protect their own privacy.	4
6	Big data and data analytics are new technologies that have emerged in Thailand recently. Education institutions are in the process of adapting to these technologies, which is why these technologies have not been put into the current curriculum yet.	4
7	The internet of thing is a technology adopted from current technologies (electronic and network technology). This is the reason why undergraduate students found that this technology is close to their current knowledge	4
8	The current virtual and extended reality technologies are improvised in a form of entertainment such as games rather than a practical application to impact daily life. This may affect the decision of the sampling group	4
9	Virtual reality and extended technology have received both agreement and disagreement as a technology that impacts the decision of choosing a career. This may be because of differences in curriculum, e.g. IT students may believe this technology is the most important while the other strongly disagree with this technology	4

Table 4. The Recorded Interview Results of Question 1 to 9 towards Objectives 1 to 3

6. Interpreations

For the first objective (01), Q1 to Q3 have been used to confirm that the IT trends were agreed by the UGs $(Q_1: M=4.08, SD=0.66, Likert scale=4)$. Moreover, $Q_2(M=4.08, SD=0.69)$ and $Q_3(M=4.03, SD=0.67)$ represent a level of consideration of the IT trends in their study and daily life, which can also implies acceptance attitude. Moreover, the Virtual Reality, Cloud Technology and Internet of Thing are trends that were mostly mentioned by the UGs. For the second objective (02), $Q_4(M=4.13, SD=0.72)$ and $Q_5(M=4.11, SD=0.69)$ shows the consideration of selecting careers related to the IT trends, which can be implied that the UGs have willingness to work within the business sector involving the IT trends with agreed attitudes. Nevertheless, the last objective (03), academic sector shall be aware of the results of $Q_6(M=3.05, SD=1.12)$, $Q_7(M=3.13, SD=1.07)$, $Q_8(M=3.39, SD=0.96)$, and $Q_9(M=3.43, SD=0.98)$ that represent "trust" in UGs' curriculum relating to IT trends. UGs showed a neutral attitude when they were asked about their curriculum, whether it provides the basis and content of the IT trends or whether it helps in selecting a career or not. It should be noted that the academic sector cannot or partially fulfill knowledge and confidence to their students about the IT trends.

The business sector will have this indirect impact as it employs low quality knowledge domain workers. This may result in "unemployment" that must be dealt with by the government sector. This shows the chain impact that all sectors shall take into consideration in order to prevent such problems. This study also fundamentally provides factors which impact each attitude. In this paper, we intend to highlight and interpret only moderate ($0.06 \le \eta 2 < 0.14$) and large ($\eta 2 \ge 0.14$) effect sizes according to the rule of thumb given by Cohen and Miles & Shevlin (2001) [28]. In short, only GPA seems to have moderate effect toward Q_1 and Q_6 . This implies that the UGs with high GPA (3.25-4.00) are significantly more interested in the IT trends than other groups and they tend to agree that their current curriculum provides sufficient knowledge of basis in the IT trends. The rest of stratifies, Gender, College Year, Family Income and Faculty, have a small effect size ($0.01 \le \eta 2 < 0.06$) toward different questions.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Maleerat Sodanil and Puttakul Sakul-Ung conducted the research. All authors wrote and approved the final version.

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Maleerat Sodanil received the Ph.D in information technology (international program) with the thesis title "Thai speech-to-text translation of spontaneous speech" from the King Mongkut's University of Technology North Bangkok, Thailand. Currently, she is a lecturer at the Faculty of Information Technology, King Mongkut's University of Technology North Bangkok. Her research areas are natural language processing and information retrieval, machine learning and artificial intelligence.



Hathairat Ketmaneechairat received the Ph.D in electrical engineering with the thesis title "Smart buffer management for different start video broadcasting" from the King Mongkut's University of Technology North Bangkok, Thailand. Currently, she is a lecturer at the College of Industrial Technology, King Mongkut's University of Technology North Bangkok. Her research areas are natural language processing and data mining, machine learning and artificial intelligence.



Puttakul Sakul-Ung received the master degree from King Mongkut's University of Technology Thonburi. Currently, she is working as research and development director for Innovative Information Technology Consulting Company Limited. Her research areas are software development frameworks, and machine learning.