

## THE INFORMATION AGED: EXAMINATION OF UNIVERSITY STUDENTS' ATTITUDES TOWARDS PERSONAL DIGITAL ASSISTANTS (PDAS) USAGE IN TERMS OF GENDER, AGE AND SCHOOL VARIABLES

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### ABSTRACT

Recently, there has been a rapid development of new technology devices that were proved to have significant effects on education, one of which is known as Personal Digital Assistant (PDA). PDAs offer new possibilities for providing better learning experiences and more learning opportunities in the sector of higher education. A quantitative design was utilised to examine university students' attitudes towards the use of PDAs. A cross-sectional survey was conducted to obtain data from participants. The sample was comprised of 250 participants. Gender, age and school major were selected as student's demographic variables for the study. The data were analysed by calculating frequencies, percentages and by conducting t-test and One-Way ANOVA. The results of this study revealed that firstly, the university students' attitudes towards PDA usage are positive, secondly, attitudes were significantly different in accordance with students' gender, it was found that males' attitude scores are significantly higher than that of the females, and thirdly, no significant differences were found in students' attitudes towards the PDA in terms of age and school-variables. Besides, the findings indicated that university students were overall satisfied with their earlier experience of using PDAs for learning purposes.

**Keywords:** Attitudes, Personal Digital Assistants, Gender, Age, Faculty

### INTRODUCTION

Technologies help to run almost all aspects of life. In this era, there has been an extensive number of technologies come forward to enhance the quality of education. New technologies are mainly developed and being built up to improve the process of teaching and learning. One of these technologies is called Mobile-learning, which is considered as a new source of learning. Mobile-learning is a part of E-learning and refers to learning using a mobile device. Besides, it has been defined as a form of providing learning opportunities characterised by the separation of a teacher and learners in terms of time and a fixed location (Alexander, 2004). Some educators have suggested that the use of mobile devices is new in education and could have a particularly significant role to play in order to perform learning process accurately and effectively (Traxler, 2005). Nowadays, and with the development of modern mobile phones learners can "access to the web-based content, remix it, share it, collaborate with others, and create media-rich deliverables for the classroom teacher as well as a global audience" (Ferry, 2009, p.19). Moreover, mobile devices can offer different forms of information. However, the benefits of using mobile phones can highly affect learners' learning process (Switzer & Csapo, 2005). There are a number of factors that affect the successful usage of technology in the educational settings. Among these factors, attitude is a key factor to affect users' success in using and accepting technology. Previous researches suggest that individuals' attitudes should be assessed because attitudes can influence the acceptance of technology and future behaviour regarding the actual usage (Woodrow, 1991).

### RELATED LITERATURE

#### The use of PDAs in education

In recent years, the internet and other technology devices have gained much popularity in the field of education. These technologies have been quickly adopted and are becoming mainstream methods. One of these technologies is Modern Mobile Phones with software. Recently, many Mobile Phones' companies have started selling a brand new generation of handheld mobile devices called a 'Personal Digital Assistance' (PDA). Kitchiner (2006, p.447) defines PDA as "a term for any small mobile hand-held device that provides computing and information storage and retrieval capabilities for personal or business use". The visual and communication technologies associated with text, sound, audio, picture, and internet access were integrated in these devices. The popularity of pdas is increasing and has received a rapid growth under the popularisation of internet. Guthery and Cronin (2002) reported that by 2003 more than a billion people will be using a PDA for voice and data communications. Educators and researchers have been keen to incorporate pdas in the educational activities.

They suggest that there are a number of distinctive characteristics of pdas compared to desktop and laptop computers. Pdas are more portable because of their small size keyboard with a wide range of available applications (Pattillo, Brewer, & Smith, 2007), their cost substantially less than a laptop or desktop computer, easier to transport than laptop computers, and they allow for greater flexibility in the testing venue compared with laptops (Trapl et al., 2005).

In the field of education a PDA becomes a powerful educational tool because it includes new features, which might be used for several purposes in the context of education (Boticki, Mornar & Andric, 2006; Pattillo, Brewer, & Smith, 2007). There are various advantages for using the PDAs to support students' learning, including (1) PDA enables learning to occur virtually anywhere and anytime, (2) it can be used to collect data about various subjects (Belanger, 2005), (3) it is a useful tool for sharing information among students via a wireless network (Sheehy et al., 2005), (4) it can serve as a channel of communication, (5) it is a great tool to improve students' learning vocabulary (Song & Fox, 2008), and (6) it has a positive role on improving students' collaboration (Finn & Vandenharm, 2004). Although, PDAs help students to view articles transferred from computers or any other sources (Bodomo, 2009). According to Dale and LeFlore (2007), the most common use of PDAs as a tool includes 'accessing the Internet, sending and receiving e-mail messages, video recording, word processing, developing spread sheets, accessing the radio or stereo, and accessing a global positioning system'. With PDA new possibilities of learning are offered. Song and Fox (2008) conducted a multiple case-study approach to investigate undergraduate students' PDAs dictionary use to enhance their incidental vocabulary learning and found that students made a variety of uses of PDAs to improve their vocabulary learning. Kim, Mims, and Holmes (2006) reviewed the ways using personal digital assistants (PDAs) in some universities. They found that the most general use of using PDSs at these universities is to retrieve information such as e-books, courseware, and timetables. Thus, with the PDAs students can read their e-mails, search the Web, write letters, send SMS, make voice recordings, read books, take photos, write notes, play games and listen to music. In the case of the PDAs, all these things are possible.

### **The importance of attitudes**

Attitude is an important key in the field of technology integration. There is an extensive body of literature demonstrates the importance of attitudes on technology acceptance. Moreover, in the technology acceptance, users' attitudes towards innovations have been recognised as powerful predictors to adopt a wide variety of technological innovations among users (Rogers, 2003). Vishwanath et al. (2009) described attitudes as the main factor drive the choice to adopt innovative technologies. Attitudes towards technology influence users' acceptance of the usefulness of technology (Clark, 2001). Agarwal and Prasad, (2000) posits that attitudes towards technology utilisation represents the degree to which an individual likes various attributes of a given technology. According to Watson (1998), developing positive attitudes towards technology is a key element not only for enhancing technology integration but also for avoiding users' resistance to technology use. Thus, negative attitudes towards technology among users represent a serious problem and it may drive the choice of users not to adopt innovative technologies

### **The purpose and questions of the study**

A number of studies investigated people's attitudes towards technology. Yet, studies on the attitudes of students towards the use of PDA are limited. PDAs become an important tool in students' education. According to Caruso (2004), there is a strong adoption of the PDAs among professionals in some areas. In the same time, there is a slower rate of PDAs' adoption among students. The reason for measuring students' attitudes towards the use of PDAs is related to the fact that students' attitudes may affect their success in actual use of PDAs for their academic lives. The research concentrated on answering the following questions:

- 1) What are the attitudes towards using PDAs for learning purposes among university students?
- 2) Are there any differences between the attitudes of university students according to their gender?
- 3) Are there any differences between the attitudes of university students according to their age?
- 4) Are there any differences between the attitudes of university students according to their school?

### **METHOD**

This study was carried out by using a survey method. In this study, the data is presented to examine the attitudes of university students' towards the use of PDAs for learning purposes.

### **Population and sample**

An opportunity sample of under and post graduate students enrolled in School of Educational Studies, Computer Science, Pharmacy, Social Science, Humanities, Management and Housing Building and Planning courses at Universiti Sains Malaysia served as subjects in this study. In total, 250 university students answered the

questionnaire. All the participants own a PDA or a touch screen mobile phone.

### Instrument

This is a quantitative study aims to examine the university students' attitudes towards the use of PDAs. The dependent variable has been identified as attitudes towards PDA. Independent variables are determined as gender, age, level of education and school's major. A pool of statements about attitudes towards PDAs was developed using existing well documented instruments adopted from some previous studies done by Loyd and Gressard (1984b), Smith, Caputi, and Rawstorne (2000), Popovich, Hyde, Zakrajsek, and Blumer (1987) and Albirini (2006) in the context of attitudes towards technology. Respondents were required to complete two parts of the survey. The first section of the survey required respondents to provide basic demographic information such as gender, age and school. The second part of the instrument is composed of 26 items divided into 4 categories (Perceived Usefulness 9 items, Perceived Ease of Use 7 items, Enjoyment 5 items and Perceived Satisfaction 5 items). Each item is to be responded on a five-point Likert-scale. This measurement tool which was of the Likert type was made up of the following options; 'Strongly Disagree', 'Disagree', 'Undecided', 'Agree', and 'Strongly Agree'.

### Data analysis

Data was collected using a questionnaire. Statistical Package for Social Science (SPSS) 16.0 was used to analyse the collected data. Descriptive statistics such as means, standard deviations, and percentages were used to depict the demographic information of the participants and their responses to the items to determine their attitudes towards the use of PDAs. To further analyse the data, an independent sample *t*-test and ANOVA were used to determine if there were any significant differences in students' attitudes towards the use of PDAs based on their gender, age, and school's major.

## RESULTS

### Validity and reliability of scales

The face validity and content validity of the questionnaire were assessed individually by four experts in the field of educational technology. Cronbach's reliability analysis was performed to test internal consistency of the variables.

Table 1: Reliability Assessment

Variables	Cronbach alpha ( $\alpha$ )	Mean	SD
Usefulness (PU)	.96	3.91	.90
Ease of Use (PEOU)	.89	3.35	1.13
Enjoyment (PE)	.85	3.75	.72
Satisfaction (PS)	.90	3.00	1.01

Table 1 displays the means and standard deviations and the Cronbach's Alpha reliabilities value of all the research variables. The Cronbach's alpha values were 0.85 for the Perceived Enjoyment (PE), 0.90 for the Perceived Satisfaction (PS), 0.89 for the Perceived Ease of Use (PEU), and 0.96 for the Perceived Usefulness (PU). The results of the Cronbach's Alpha for the scale reliabilities were extraordinarily high and indicated that the items for each scale were internally consistent and reliable.

### Questionnaire Construct validity: Factor Analysis

The principal component analysis (PCA) was conducted to determine the underlying factors of attitudes' questionnaire. The assumptions of inter-correlation of variables suggested that the data was appropriate for the usage of PCA. Bartlett's Test of Sphericity was found to be statistically significant [ $(325) = 3614.56, p = 0.001$ ]. The measure of Kaiser-Meyer-Olkin (KMO) was 0.790 indicating adequate information about the measure of each construct. The overall measurement of sampling adequacy (MSA) fulfilled the requirement ( $> 0.50$ ). The factor loadings at  $> 0.30$  were accepted, while the loadings of  $< 0.30$  were suppressed. The attitudes (29) items were subjected to Varimax rotation method using PCA as a test of construct validity. After conducting the analysis the items with weak loadings  $< 0.30$  or with negative values were deleted. The results revealed four factors measured by the data with only 39 items retained for further analysis as shown in Table 2. Three items were dropped from the analysis as they displayed a cross loading values exceeding 0.50.

Table 2: Confirmatory Factor Analysis of the Measurement Scales, PE, PS, PU, PEU

	Items	Factor 1	Factor 2	Factor 3	Factor 4
1	Many learning tasks can be done easier and faster using a PDA.	0.58			
2	PDA can be very useful in the teaching delivery of some subjects.	0.77			
3	I like to do assignments that allow me to use the PDA	0.77			
4	In many cases, PDA is superior to traditional instruction because it provides teaching suited to the individual student's needs.	0.74			
5	PDA makes it possible to work more productively	0.79			
6	PDA can allow me to do more interesting and imaginative work	0.63			
7	I find it useful to have a PDA when I am working or studying.	0,77			
8	It saves time when I use it	0.82			
9	PDA helps me to organize my work better	0.68			
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1	I am satisfied with my PDA		0.75		
2	I would recommend my friends to use the PDA		0.79		
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3	I feel I always need to use the PDA		0.70		
4	Using PDA is a pleasant experience.		0.69		
5	I welcome PDA because it permits smooth, quick information exchanges.		0.56		
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1	I enjoy using the PDA			0.58	
2	It is fun to use the PDA			0.70	
3	The PDA enriches my leisure time.			0.66	
4	I spend a lot of time playing games using my PDA			0.77	
5	I used my PDA for chatting with friends			0.78	
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1	It is easy for me to learn how to use the PDA				0.59
2	The PDA is easy to use				0.77
3	Using PDA does not scare me at all				0.63
4	The PDA is fixable				0.59
5	Using the PDA is effortless				0.68
6	I can use the PDA successfully every time				0.51
7	I feel that I am in control when I use a PDA				0.68
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	<i>Eigen</i> Values	5.14	3.53	3.18	3.13
	% of Variance	19.78	13.6	12.25	12.05
	KMO	0.79			
	Sphericity Bartlett Test	3614.56*			
	Cumullative Variance	57.68			

Factors with Eigen values greater or equal to one accounted for about 57.68% of the total variance. The first rotated factor comprised 9 items. The factor loadings were from 0.58 to 0.82 which accounted for 19.78 % of variance. These items addressed 'Perceived Enjoyment'. The second rotated factor comprised 5 items. The factor loadings were from 0.56 to 0.79 which accounted for 13.60% of variance. These items addressed 'Perceived

Satisfaction'. The third rotated factor comprised 5 items. The factor loadings were from 0.58 to 0.78 which accounted for 12.25 % of variance. These items addressed 'Perceived Ease of Use'. The fourth rotated factor comprised 7 items. The factor loadings were from 0.51 to 0.77 which accounted for 12.05 % of variance. These items addressed 'Perceived Usefulness'.

### Demographics of participants

The results are based on the questionnaire responses of 250 study participants. Table 3 depicts the distribution of the characteristics of the population surveyed. Of the students included in the study, 114 (45.6%) were males and 136 (54.4%) were females. The mean age of the respondents was 33.75 (S.D. = 6.43). Those aged between 30–39 years old form the largest group of all, (41.2%), followed by those between 20–29 years old (36.0%), those aged between 40–49 years old (12.8%) and those above 50 years old (10.0%). According to analysis; 41 students were enrolled in School of Educational Studies (16.4%), 41 students enrolled in School of Computer Science (16.4%), 23 students enrolled in School of Pharmacy (9.2%), 44 students enrolled in School of Social Science (17.6%), 26 students enrolled in School of Humanities (10.4%), 50 students enrolled in School of Management (20.0%), and 25 students enrolled in School of Housing Building and Planning (10.0%).

Table 3: Demographics of the Study Sample

Characteristics		Frequency	Percent %
Gender	male	114	45.6
	female	136	54.4
Age	20-29	90	36
	30-39	103	41.2
	40-49	32	12.8
	More than 50	25	10
Faculty	Education	41	16.4
	Management	50	20
	Housing	25	10
	Social	44	17.6
	Pharmacy	23	9.2
	Humanities	26	10.4
	Computer	41	16.4

### Attitudes towards PDAs by gender

An independent samples *t*-test was conducted to determine differences among the university students' attitudes towards the use of PDAs according to their gender. The results from Levene's Test for homogeneity of variance across the males and females groups for each variable indicated that homogeneity of variance was met for all the five variables. As  $p > 0.05$  for all variables, Levene's Test shows that the groups were homogenous as shown in Table 4.

Table 4: *T*-test scores for students attitudes towards PDAs' usage according to gender

Variables	Gender	N	Mean	SD	Levene's Test for Equality of Variances	<b>F</b>	<b>Sig.</b>	<b>t-value</b>	<b>df</b>	<b>Sig. (2- tailed)</b>
Usefulness	Male	114	4.20	0.75	0.814	0.431	9.498	248, 1	0.000**	
	Female	136	3.36	0.64						
Ease of use	Male	114	3.68	0.67	0.585	0.557	4.104	248, 1	0.000**	
	Female	136	3.37	0.51						
Enjoyment	Male	114	3.36	0.82	0.943	0.147	2.775	248, 1	0.000**	
	Female	136	3.11	0.65						
Satisfaction	Male	114	3.45	0.67	1.481	0.116	3.512	248, 1	0.013*	
	Female	136	3.04	0.59						
Overall	Male	114	3.69	0.58	1.241	0.179	5.969	248, 1	0.000**	
	Female	136	3.29	0.47						

As shown in Table 4, for the usefulness, the males' group reported a Mean ( $M= 4.20$ ) with Standard Deviation ( $SD= 0.75$ ) while females' group reported a Mean ( $M= 3.36$ ) with Standard Deviation ( $SD= 0.64$ ). A  $T$ -test between the Means gave ( $t(1, 248) = 9.498, p= 0.000$  at  $p < 0.05$ ). The results indicated that there was a statistically significant difference in the usefulness Means among the gender groups favouring males. In other words, males exhibited higher attitudes towards PDAs' usefulness than females. Regarding the ease of use variable, the males' group reported a Mean ( $M= 3.68$ ) with Standard Deviation ( $SD= 0.67$ ) while females' group reported a Mean ( $M= 3.37$ ) with Standard Deviation ( $SD= 0.51$ ). A  $T$ -test between the Means gave ( $t(1, 248) = 4.104, p= 0.000$  at  $p < 0.05$ ). The results indicated that there was a statistically significant difference in the ease of use Means among the gender groups favouring males. In other words, males showed higher attitudes towards PDAs' ease of use than females.

For the enjoyment variable, the males' group reported a Mean ( $M= 3.36$ ) with Standard Deviation ( $SD= 0.82$ ) while females' group reported a Mean ( $M= 3.11$ ) with Standard Deviation ( $SD= 0.65$ ). A  $T$ -test between the Means gave ( $t(1, 248) = 2.775, p= 0.000$  at  $p < 0.05$ ). The results revealed that there was a statistically significant difference in the ease of use Means among the gender groups favouring males. In other words, males showed higher attitudes towards PDAs enjoyment than females. Regarding the satisfaction variable, the males' group reported a Mean ( $M= 3.45$ ) with Standard Deviation ( $SD= 0.67$ ) while females' group reported a Mean ( $M= 3.04$ ) with Standard Deviation ( $SD= 0.59$ ). A  $T$ -test between the Means gave ( $t(1, 248) = 3.512, p= 0.013$  at  $p < 0.05$ ). The results revealed that there was a statistically significant difference in the satisfaction Means among the gender groups favouring males. In other words, males showed higher attitudes towards PDAs' satisfaction than females. The examination of the overall attitudes showed that the males' group reported a Mean ( $M= 3.69$ ) with Standard Deviation ( $SD= 0.58$ ) while females' group reported a Mean ( $M= 3.29$ ) with Standard Deviation ( $SD= 0.47$ ). A  $T$ -test between the Means gave ( $t(1, 248) = 5.969, p= 0.000$  at  $p < 0.05$ ). The results revealed that there was a statistically significant difference in the satisfaction's Means among the gender groups favouring males. According to Table 4, the degree of perceived usefulness, ease of use, enjoyment and satisfaction of PDAs' use did differ depending on students' gender. The findings indicated that the male students reported higher values of perceived usefulness, ease of use, enjoyment and satisfaction more than the female students.

#### Attitudes towards PDAs in terms of age variable

This section details with the findings regarding the attitudes of the university students towards the PDAs according to students' ages. The results from Levene's Test for homogeneity of variance of comparing the dependent variable across the age groups indicated that homogeneity of variance was met for the dependent variable. As  $p > 0.05$  for all variables, the results showed that the groups were homogenous as shown in Table 5.

Table 5: Test of Homogeneity of Variances for the Variables by Age Groups

Variables	F	df1	df2	Sig.
Overall Attitudes	0.672	3	246	0.246

To examine the differences in university students' attitudes towards the PDAs according to their ages; the One-Way ANOVA test was conducted.

Table 6: Means, standard deviations, and results of analysis of variance (ANOVA) on the overall attitudes by age groups

Overall Attitudes	N	Mean	SD	ANOVA	Tukey Summary
20-29	90	3.47	0.61	F(3, 246)= 2.725 p= 0.065	—
30-39	103	3.45	0.54		
40-49	32	3.46	0.58		
more than 50	25	3.44	0.49		

For the group of 20-29 years old reported a mean ( $M = 3.47$ ) with a standard deviation ( $SD = 0.61$ ) while the group of 30-39 years old reported a mean ( $M = 3.45$ ) with a standard deviation ( $SD = 0.54$ ), the group of 40-49 years old reported a mean ( $M= 3.46$ ) with a standard deviation ( $SD = 0.58$ ), and the group of over 50 years old reported a mean ( $M= 3.44$ ) with a standard deviation ( $SD = 0.49$ ). An ANOVA test between the means gave  $F(3, 246) = 2.725$  at  $p = 0.065$ . As  $p > 0.05$ , the results indicated that there were no statistical significant differences in the overall mean groups. As seen in Table 6, no statistically significant differences were found ( $p = 0.212$ ) in university students' attitudes towards the use of PDAs based on their age. According to the findings,

age did not appear to make a significant difference in university students' attitudes towards PDAs' use.

#### Attitudes towards PDAs in terms of school

The results from Levene's Test for homogeneity of variance of comparing the dependent variable across the age groups indicated that homogeneity of variance was met for the dependent variable. As  $p > 0.05$  for all variables, the results showed that the groups were homogenous as shown in Table 7.

Table 7: Test of Homogeneity of Variances for the Variables by Age Groups

Variables	F	df1	df2	Sig.
Overall Attitudes	1.582	6	246	0.153

One-Way ANOVA was used to test whether there was a significant difference in university students' attitudes towards the PDAs according to their schools.

Table 8: Means, standard deviations, and results of analysis of variance (ANOVA) on the overall attitudes by schools' groups

Overall Attitudes	N	Mean	SD	ANOVA	Tukey Summary
Education	41	3.38	0.53	F(6, 243) = 0.901 p= 0.494	—
Management	50	3.57	0.63		
Housing	25	3.56	0.59		
Social	44	3.45	0.56		
Pharmacy	23	3.36	0.29		
Humanities	26	3.40	0.56		
Computer	41	3.56	0.61		

Regarding the group of students from School of educational Studies, they scored a mean ( $M = 3.38$ ) with a standard deviation ( $SD = 0.53$ ), while the group of Management students scored a mean ( $M = 3.57$ ) with a standard deviation ( $SD = 0.63$ ), the group of Housing students scored a mean ( $M = 3.56$ ) with a standard deviation ( $SD = 0.59$ ), the group of Social Studies' students scored a mean ( $M = 3.45$ ) with a standard deviation ( $SD = 0.56$ ), the group of Pharmacy students scored a mean ( $M = 3.36$ ) with a standard deviation ( $SD = 0.29$ ), the group of Humanities students scored a mean ( $M = 3.40$ ) with a standard deviation ( $SD = 0.56$ ), and the group of Computer Sciences' students scored a mean ( $M = 3.56$ ) with a standard deviation ( $SD = 0.61$ ). An ANOVA test between the means gave  $F(6, 243) = 0.901$  at  $p = 0.494$ . As  $p > 0.05$ , the results indicated that there were no statistical significant differences in the overall mean groups as shown in Table 8. The findings showed that the school did not significantly favour respondents on the overall attitudes towards PDAs among the seven school groups.

#### CONCLUSIONS AND SUGGESTIONS

The success of technology implementation within organisations depends on users' attitudes. The aim of the present study was to examine the attitudes of university students towards the use of PDAs for learning purposes. A second goal was to find out if there are there any differences between the attitudes of university students according to their gender, age and school. As a result; it is found that university students' attitudes towards PDAs are positive indicating that the majority of the students accepted the use of PDAs for learning purposes. This may be due to the fact that the new mobile phones especially the PDAs have become widespread enabling an entirely new way of learning. With regard to differences in mean levels of attitude towards PDAs, it was found that students' attitudes were significantly different in accordance with their gender, in other words, male students were found to have a higher level of attitude towards the PDAs' usage than the female students. Also, the results revealed that the attitudes of students towards PDAs did not differ according to age and school.

This study offered an important implication for the future professional development programs to prepare university students to use PDAs for educational purposes. The fact is for teachers to effectively use technology for educational purposes, they need to be familiar and comfortable with ICT use first. As a result of this study, the following recommendations are made:

1. Students should be motivated about developing their PDAs' skills.
2. Female students should be motivated about PDAs' usage for learning purposes.

3. Lectures must encourage their students to make use of the PDAs as a learning tool.
4. Future researchers need to consider the in-depth qualitative studies.
5. It is recommended that further researches can be done in various institutions and at various education levels to confirm the results of this study.
6. More research is needed to corroborate these findings.

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