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Comparative Study of U-Healthcare Applications between Google Play Store and Apple iTunes App Store in Korea

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ABSTRACT

In this paper, we collect and analyze the status of mobile phone applications (hereafter apps) in the healthcare and fitness category of the Apple iTunes App Store and Google Play Store. We determine the number of apps and analyze statistical aspects such as classifications, age rating, fees, and user evaluation of the popular items. As of September 30, 2013, there were 236 popular apps available from iTunes. Google Play offered 720 apps. We discover that apps for healthcare and fitness are diverse. Apps for physical exercise have the greatest popularity. The proportions of apps that are suitable for all ages among the Google and iTunes popular apps are 55.8% and 89.4%, respectively. The user evaluation of apps in iTunes is relatively less positive. We determine that the proportion of paid apps to free apps in Google is higher than that of the apps in iTunes. We perform hypothesis tests and find statistically significant differences in age rating and perceived satisfaction between the apps of the Apple iTunes App Store and Google Play Store. However, we find no meaningful differences in the classification and price of the apps between the two app stores. We perform hypothesis tests to verify the differences in age rating and perceived satisfaction between the paid and free apps within and across the Google Play Store and iTunes App Store. There are statistically significant differences in the age rating between the paid and free apps in the Google play store, between the Google free and iTunes free apps, between the Google paid and iTunes paid apps, between the Google free and iTunes paid apps, and between the Google paid and iTunes free apps. There are statistically significant differences in the perceived satisfaction between the Google free and iTunes free apps, between the Google paid and iTunes paid apps, between the Google free and iTunes paid apps, and between the Google paid and iTunes free apps.

***Key words**: Application, Smartphone, Application store, App, U-healthcare.*

1. INTRODUCTION

With high-speed mobile Internet and smartphone market penetration, usage of smartphones has evolved to provide services that span camera use, games, mobile Internet, digital multimedia broadcasting, and so on [1]. A number of early studies proposed smartphone functions [2] - [6]. Eventually, smartphones became an integrated terminal and evolved into an essential device in this era. Further, a study appeared which reported preferences for smartphone usage [7].

Among the various business models that rely on smartphones, the u-healthcare business has bright prospects. From the early age of smartphones, smartphone based applications for HRV (Heart Rate Variability) analyses were reported [8]. Recently, u-healthcare services have diversified into numerous businesses such as diet, workout, menstrual cycle tracking, etc.

Those various business models of smartphone have been realized in practicable forms via applications. Such applications are provided to users through the numerous existing application stores. As the personal computer is divided into the Apple line and IBM compatibles, the smartphone can be divided into iPhones and others. Like the IBM compatible PCs that stand against Apple computers, Android O/S smartphones compete with the iPhone. Applications are separately developed attuned to iPhone O/S or Android O/S. The application store for the iPhone is Apple iTunes App Store, and the primary application store of Android phones is Google Play Store. Therefore, Apple's iTunes App Store and Google Play Store are the major markets for applications, and this has become an area of cutthroat competition.

Competitive aspects among app stores can be an interesting and important research area. Rosa and Lee reported a comparative study between two Android app stores [9]. However, a comparative analysis between the two major global app stores, Google Play and Apple iTunes, has yet to be reported.

The goal of the present study is to carry out a comparison of the healthcare and fitness application status between Google Play Store and iTunes App Store. First, this study searched quantities of healthcare and fitness apps of Google Play Store and iTunes App Store. Second, we examined qualitative aspects such as classifications, age rating, user charges, and

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user evaluation of healthcare and fitness apps in popular apps of Google Play Store and iTunes App Store, and performed a statistical comparison. Also, we statistically examined the differences in age rating and user evaluation between paid and free apps within and across the Google Play Store and iTunes App Store.

2. RESEARCH BACKGROUND

2.1 Application Stores

Smartphone users are usually linked to a specific app store according to their choice of smartphone [10]. Application services are developed by OS developers such as iTunes of Apple iPhones, WP7 Marketplace of Microsoft, and Google Play of Android OS. In addition, mobile network operators such as SK Telecom, KT, and LG Uplus in Korea provide their own app store, such as T-Store, Olleh Market, and U+Store, respectively, for their Android based smartphone subscribers. Phone manufacturers provide app stores such as Nokia Ovi Store, Samsung Apps, and BlackBerry World. Some content providers provide app stores such as Naver Nstore and Amazon Appstore.

Nevertheless, the major app stores are Apple iTunes and Google Play of Android OS. Rosa and Lee [11] compared the user preference between two Android-based app stores: Google Play and T-store. Lee et al. [12] compared mobile value chains among China, Japan, and Korea.

2.2 U-healthcare

Demaerschalk et al. reported the transportation of medical images through smartphones to evaluate stroke patients in remote locations [13]. Also, Robson et al. reported a smartphone application for assessing melanoma risk [14]. Tolentino and Park developed a u-healthcare system to provide continuous monitoring of patients in an emergency care setting [15]. A number of hospitals have provided app services wherein diabetic patients input personal data and then receive feedback from medical teams in charge [16]. Lee et al. proposed a smartphone based personalized menu management system for diabetes patients [17]. Smartphone apps can also train memory impaired patients [18].

Wang et al. defined healthcare applications as application programs of which the purpose or content is related to health management such as medical or health information, workouts, diets and so on [19]. They also proposed the factors influencing the usage intention of u-healthcare application as follows: user interface design, self-efficacy, innovativeness, and entertainment. They classified u-healthcare applications as women healthcare, diet, medical treatment, information for hospital and drug store, other medical information. Kim searched acceptance intention of mobile devices and applications for healthcare services, and he classified healthcare service into the areas of wellness, healthcare, and care [20]. Also, he classified healthcare applications as personal applications, and applications for hospitals.

Recently, u-healthcare applications have diversified into more segmented businesses than prior classifications. Google Play and Apple iTunes app stores have a separate category of "healthcare and fitness", and they contain various kinds of healthcare related applications. Therefore, we classified u-healthcare applications in both app stores into the categories of menstrual cycle & pregnancy tracking & maternity, diet, workout, relaxation and sleep melodies, and so on as shown in Table 1.

3. QUANTITAVE COMPARISION OF U-HEALTHCARE APPS BETWEEN GOOGLE PLAY STORE AND ITUNES APP STORE

3.1 Methodology of Quantitative Comparison of U-Healthcare Apps between Google Play Store and iTunes App Store

We searched the numbers of apps in Google Play and iTunes App stores. We found that iTunes App Store provides 32,576 apps and 236 popular apps in the healthcare and fitness category as of the end of September 2013. However, Google Play Store shows popular domestic apps only. Google popular apps in the healthcare and fitness category contain 720 apps. We searched quantities of apps according to sub-categories such as “Period & Pregnancy Tracking, Maternity”, “Diet”, “Workout”, “Relaxation, Sleep Melodies & Images”, “Cardiograph”, “Recipe & Food”, “Healthcare”, “Medical Treatment”, “Beauty Treatment”, “Sex: Knowledge & Business”, and “Fate, Fortune”. Also, we searched and compared age rating, user evaluation, and price status of popular apps between Google Play and iTunes App stores.

3.2 Analysis of Quantitative Comparison of U-Healthcare Apps between Google Play Store and iTunes App Store

3.2.1 Classification: As we can see from Table 1, apps for workouts ranked at the top in the Google Play and iTunes popular apps. Apps for diet ranked second in Google and iTunes apps. However, healthcare apps ranked third in Google Play store but ranked fifth after Period & Pregnancy Tracking, Maternity apps and Relaxation, Sleep Melodies & Images apps in the iTunes store.

Table 1. Classification

Classification	Google	iTunes
Menstrual Cycle & Pregnancy Tracking, Maternity	61	26
Diet	104	43
Workout	257	77
Relaxation, Sleep Melodies & Images	79	25
Cardiograph	17	5
Recipe & Food	23	9
Healthcare Information	90	21
Medical Treatment	48	15
Beauty Treatment	14	6
Sex: Knowledge & Business	23	5
Fate, Fortune	4	4
Total	720	236

3.2.2 Age rating title: The proportions of apps that are general audience-rated in Google Play and iTunes App stores are 55.9%, and 89.4% respectively. We can see that the

proportion of apps for general audiences in iTunes holds the highest rank. Also, the NC17-rated portions are 3.9%, and 5.5% respectively.

Table 2. Age rating

Age rating	Google		iTunes	
4+	402	55.9%	211	89.4%
9+	240	33.3%	3	1.3%
12+	50	6.9%	9	3.8%
17+	28	3.9%	13	5.5%
Total	720	100%	236	100%

3.2.3 User evaluation: Both stores show the user evaluation for each app on a 5-point scale, where a score of 5 is the highest in perceived satisfaction. The average level of satisfaction of Google Play apps is 4.22, and it is higher than that of iTunes apps of 3.64. Users evaluated iTunes popular apps relatively less positively.

Table 3. User evaluation

	Google	iTunes
Average(5-point scale)	4.22	3.64

3.2.4 Price: There is a difference in price range between iTunes and Google paid apps. More than half of Google paid apps are in a price range of $2-$10 and 33% of apps cost $1-$2. Meanwhile, 55% of iTunes paid apps cost $1-$2 and 24% of apps cost less than 1$. However, the average price of iTunes paid apps is $3.64, which is much higher than that of Google paid apps. The reason is that the number of popular paid apps in the iTunes healthcare and fitness category is only 29, and 2 apps priced at more than $10 skewed the average cost of iTunes apps. If we eliminate 3 apps among Google paid apps and 2 apps among iTunes paid apps which were priced at more than $10, the averages are $2.56 and $2.05, respectively. Therefore, Google paid apps are less skewed and usually cost more than iTunes paid apps excluding extraordinarily high priced apps.

Table 4. Price range

Price range	Google paid		iTunes paid	
- $1	22	11.3%	7	24.1%
$1 - $2	64	33.0%	16	55.2%
$2 - $10	105	54.1%	4	13.8%
$10 +	3	1.6%	2	6.9%
Total	194	100%	29	100%
Average	$2.68($2.56)		$3.65($2.05)	

4. STATISTICAL COMPARISION OF U-HEALTHCARE APPS BETWEEN GOOGLE PLAY STORE AND ITUNES APP STORE

4.1 Study Methodology of Statistical Comparison of Healthcare Apps between Google Play Store and iTunes App Store

4.1.1 Hypotheses: We developed the following hypotheses.

1) Difference in classification
   H0: There is no difference in classification between the Google and iTunes popular apps
   H1: There is a difference in classification between the Google and iTunes popular apps
2) Difference in age rating
   H0: There is no difference in age rating between the Google and iTunes popular apps
   H1: There is a difference in age rating between the Google and iTunes popular apps
3) Difference in perceived satisfaction
   H0: There is no difference in perceived satisfaction between the Google and iTunes popular apps
   H1: There is a difference in perceived satisfaction between the Google and iTunes popular apps
4) Difference in price
   H0: There is no difference in price between the Google and iTunes popular apps
   H1: There is a difference in price between the Google and iTunes popular apps

4.1.2 Statistical method: We performed chi-square tests for the analysis of classification difference and age rating difference, which are nominal scales, and performed t-tests for the analysis of perceived satisfaction difference and price difference, which are ordinal scales, using IBM SPSS 20.

4.2 Analysis of Difference According to Classifications, Age Rating, Perceived Satisfaction, and Price of U-Healthcare Apps between Google Play Store and iTunes App Store

4.2.1 Difference in classification: We found from the chi-square test that the asymptotic significance (2-sided) is much higher than .05, which means there is no statistically significant difference in classification between the Google and iTunes popular apps at a 95 percent accuracy level.

Table 5. Chi-square test results: Difference in classification

	value	asymp. sig.(2-sided)
Pearson's chi-square	9.439	.491

4.2.2 Difference in age rating: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the Google and iTunes popular apps at a 95 percent accuracy level. As we can find from Table 2, the 89.4% proportion of general audience-rated iTunes apps accounts for the statistically significant difference.

Table 6. Chi-square test results: Difference in age rating

	value	asymp. sig.(2-sided)
Pearson's chi-square	107.037	.000

4.2.3 Difference in perceived satisfaction: We found from the t-test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in perceived satisfaction between the Google and iTunes popular apps. User evaluation of Google apps is

significantly more positive than that of iTunes apps.

Table 7. T-test results: Difference in perceived satisfaction

t-value	asymp. sig.(2-sided)
11.639	.000

4.2.4 Difference in price: We found from the t-test that the asymptotic significance (2-sided) is over .05, which means there is no statistically significant difference in price between the Google and iTunes popular apps at a 95 percent accuracy level.

Table 8. T-test results: Difference in price

t-value	asymp. sig.(2-sided)
-1.718	.087

5. STATISTICAL COMPARISION OF PAID AND FREE U-HEALTHCARE APPS WITHIN AND BETWEEN GOOGLE PLAY STORE AND ITUNES APP STORE

5.1 Study Methodology of Statistical Comparison of Paid and Free U-healthcare Apps within and between Google Play Store and iTunes App Store

As for the classification, some categories do not have enough samples to verify statistical significance. Also, we compared the difference in price between Google paid and iTunes paid apps at 4.2.4. Therefore, we compared differences in age rating and perceived satisfaction between Google free and paid popular apps, between iTunes free and paid popular apps, between Google free and iTunes paid popular apps, and between Google paid and iTunes free popular apps.

A frequency list in age rating of Google free, Google paid, iTunes free, and iTunes paid apps is provided in Table 9. The average and frequency list in the user evaluation of Google free, Google paid, iTunes free, and iTunes paid apps is shown in Table 10.

Table 9. Frequency table in age rating

	4+	9+	12+	17+	Total
Google free	275	201	33	17	526
Google paid	127	39	17	11	194
iTunes free	184	3	9	11	207
iTunes paid	27	0	0	2	29
Total	613	243	59	41	956

Table 10. Average and frequency table in user evaluation

	average	number	standard deviation
Google free	4.23	526	.548
Google paid	4.18	194	.701
iTunes free	3.61	207	.799
iTunes paid	3.84	29	1.078
Total	4.08	956	.707

5.1.1 Hypotheses: We developed the following hypotheses.

1) Difference in age rating between the Google free and paid popular apps
   H0: There is no difference in age rating between the Google free and paid popular apps
   H1: There is a difference in age rating between the Google free and paid popular apps
2) Difference in perceived satisfaction between Google free and paid popular apps
   H0: There is no difference in perceived satisfaction between the Google free and paid popular apps
   H1: There is a difference in perceived satisfaction between the Google free and paid popular apps
3) Difference in age rating between the iTunes free and paid popular apps
   H0: There is no difference in age rating between the iTunes free and paid popular apps
   H1: There is a difference in age rating between the iTunes free and paid popular apps
4) Difference in perceived satisfaction between the iTunes free and paid popular apps
   H0: There is no difference in perceived satisfaction between the iTunes free and paid popular apps
   H1: There is a difference in perceived satisfaction between the iTunes free and paid popular apps
5) Difference in age rating between the Google free and iTunes free popular apps
   H0: There is no difference in age rating between the Google free and iTunes free popular apps
   H1: There is a difference in age rating between the Google free and iTunes free popular apps
6) Difference in perceived satisfaction between the Google free and iTunes free popular apps
   H0: There is no difference in perceived satisfaction between the Google free and iTunes free popular apps
   H1: There is a difference in perceived satisfaction between the Google free and iTunes free popular apps
7) Difference in age rating between the Google paid and iTunes paid popular apps
   H0: There is no difference in age rating between the Google paid and iTunes paid popular apps
   H1: There is a difference in age rating between the Google paid and iTunes paid popular apps
8) Difference in perceived satisfaction between the Google paid and iTunes paid popular apps
   H0: There is no difference in perceived satisfaction between the Google paid and iTunes paid popular apps
   H1: There is a difference in perceived satisfaction between the Google paid and iTunes paid popular apps
9) Difference in age rating between the Google free and iTunes paid popular apps
   H0: There is no difference in age rating between the Google free and iTunes paid popular apps
   H1: There is a difference in age rating between the Google free and iTunes paid popular apps
10) Difference in perceived satisfaction between the Google free and iTunes paid popular apps
   H0: There is no difference in perceived satisfaction between the Google free and iTunes paid popular apps
   H1: There is a difference in perceived satisfaction between the Google free and iTunes paid popular apps

11) Difference in age rating between the Google paid and iTunes free popular apps
H0: There is no difference in age rating between the Google paid and iTunes free popular apps
H1: There is a difference in age rating between the Google paid and iTunes free popular apps
12) Difference in perceived satisfaction between Google paid and iTunes free popular apps
H0: There is no difference in perceived satisfaction between the Google paid and iTunes free popular apps
H1: There is a difference in perceived satisfaction between the Google paid and iTunes free popular apps

5.1.2 Statistical method: We performed a chi-square test for the analysis of age rating difference and performed a t-test for the analysis of perceived satisfaction difference using IBM SPSS 20.

5.2 Analysis of Difference According to Age Rating and Perceived Satisfaction of U-Healthcare Apps between Paid and Free Healthcare Apps within and between the Google Play Store and iTunes App Store

5.2.1 Difference in age rating between the Google free and paid popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the paid and free apps in Google Play store at a 95 percent accuracy level. The absolute proportion of suitable apps for all age paid apps accounts for the statistically significant difference between the Google free and Google paid apps.

Table 11. Chi-square test results: Difference in age rating between the Google free and paid popular apps

	value	asymp. sig.(2-sided)
Pearson's chi-square	21.787	.000

5.2.2 Difference in perceived satisfaction between the Google free and paid popular apps: We found from the t-test that the asymptotic significance (2-sided) is much higher than .05, which means there is no statistically significant difference in perceived satisfaction between the paid and free apps in Google Play store at a 95 percent accuracy level.

Table 12. T-test results: Difference in perceived satisfaction between the Google free and paid popular apps

t-value	asymp. sig.(2-sided)
-1.055	.292

5.2.3 Difference in age rating between the iTunes free and paid popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much higher than .05, which means there is no statistically significant difference in age rating between the paid and free apps in the iTunes app store at a 95 percent accuracy level.

Table 13. Chi-square test results: Difference in age rating between the iTunes free and paid popular apps

	value	asymp. sig.(2-sided)
Pearson's chi-square	1.847	.605

5.2.4 Difference in perceived satisfaction between the iTunes free and paid popular apps: We found from the t-test that the asymptotic significance (2-sided) is much higher than .05, which means there is no statistically significant difference in perceived satisfaction between the paid and free apps in the iTunes app store at a 95 percent accuracy level.

Table 14. T-test results: Difference in perceived satisfaction between the iTunes free and paid popular apps

t-value	asymp. sig.(2-sided)
1.408	.160

5.2.5 Difference in age rating between the Google free and iTunes free popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the Google free and iTunes free apps at a 95 percent accuracy level. The absolute proportion of suitable apps for all age iTunes free apps is responsible for the statistically significant difference between the Google free and iTunes free apps.

Table 15. Chi-square test results: Difference in age rating between the Google free and iTunes free popular apps

	Value	asymp. sig.(2-sided)
Pearson's chi-square	106.575	.000

5.2.6 Difference in perceived satisfaction between the Google free and iTunes free popular apps: We found from the t-test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in perceived satisfaction between the Google free and iTunes free apps at a 95 percent accuracy level. The average (4.23 in 5 point scale) perceived satisfaction of Google free apps is significantly higher than that (3.61 in 5 point scale) of iTunes free apps.

Table 16. T-test results: Difference in perceived satisfaction between the Google free and iTunes free popular apps

t-value	asymp. sig.(2-sided)
12.035	.000

5.2.7 Difference in age rating between the Google paid and iTunes paid popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the Google paid and iTunes paid apps at a 95 percent accuracy level. The absolute proportion of suitable apps for all age iTunes paid apps is responsible for the statistically significant difference between the Google paid and iTunes paid apps.

Table 17. Chi-square test results: Difference in age rating between the Google paid and iTunes paid popular apps

	value	asymp. sig.(2-sided)
Pearson's chi-square	11.227	.011

5.2.8 Difference in perceived satisfaction between the Google paid and iTunes paid popular apps: We found from the t-test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in perceived satisfaction between the Google paid and iTunes paid apps at a 95 percent accuracy level. The average (4.18 in 5 point scale) perceived satisfaction of Google paid apps is significantly higher than that (3.61 in 5 point scale) of iTunes free apps.

Table 18. T-test results: Difference in perceived satisfaction between the Google paid and iTunes paid popular apps

t-value	asymp. sig.(2-sided)
2.213	.028

5.2.9 Difference in age rating between the Google free and iTunes paid popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the Google free and iTunes paid apps at a 95 percent accuracy level. The absolute proportion of apps that are suitable for all age iTunes paid apps is responsible for the statistically significant difference between the Google free and iTunes paid apps.

Table 19. Chi-square test results: Difference in age rating between the Google free and iTunes paid popular apps

	value	asymp. sig.(2-sided)
Pearson's chi-square	22.396	.000

5.2.10 Difference in perceived satisfaction between the Google free and iTunes paid popular apps: We found from the t-test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in perceived satisfaction between the Google free and iTunes paid apps at a 95 percent accuracy level. The average (4.23 in 5 point scale) perceived satisfaction of Google free apps is significantly higher than that (3.84 in 5 point scale) of iTunes paid apps.

Table 20. T-test results: Difference in perceived satisfaction between the Google free and iTunes paid popular apps

t-value	asymp. sig.(2-sided)
3.462	.001

5.2.11 Difference in age rating between the Google paid and iTunes free popular apps: We found from the chi-square test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in age rating between the Google paid and iTunes free apps at a 95 percent accuracy level. The absolute proportion of apps that are suitable for all ages of iTunes free apps is responsible for the statistically significant difference between the Google paid and iTunes free apps.

Table 15. Chi-square test results: Difference in age rating between the Google paid and iTunes free popular apps

	value	asymp. sig.(2-sided)
Pearson's chi-square	43.390	.000

5.2.12 Difference in perceived satisfaction between the Google paid and iTunes free popular apps: We found from the t-test that the asymptotic significance (2-sided) is much less than .05, which means there is a statistically significant difference in perceived satisfaction between the Google paid and iTunes free apps at a 95 percent accuracy level. The average (4.18 in 5 point scale) perceived satisfaction of Google paid apps is significantly higher than that (3.61 in 5 point scale) of iTunes free apps.

Table 16. T-test results: Difference in perceived satisfaction between the Google paid and iTunes free popular apps

t-value	asymp. sig.(2-sided)
7.552	.000

6. CONCLUSION

We analyzed the status of apps in the healthcare and fitness category in popular apps of Google Play Store and iTunes App Store. We found that apps for physical exercise are the most popular. Apps for diet are the second most popular and women's apps for menstrual period, pregnancy tracking, and maternity are the third most popular in the iTunes cases. In the Google apps case, the second highest ranking category is apps for diet, while the third is healthcare apps. Applications that have a general audience age rating (i.e. suitable for all ages) are the clear majority in terms of quantity in Google paid apps and iTunes popular apps. User evaluations for Google apps and iTunes apps are quite high at 4.22 and 3.64, respectively, on a five-point scale. User evaluations for apps in iTunes App Store are relatively less positive than those for apps in Google Play Store. The average prices of apps in Google and iTunes are $2.56 and $2.05, respectively, after eliminating extreme outliers. We found that the average price of apps in Google is higher than that of apps in iTunes. However, we must consider the market characteristics in Korea, where Android phones are more popular than iPhones.

We found that the proportion of paid apps to free apps in Google is higher than that of apps in iTunes. We performed hypothesis tests and found statistically significant differences in age rating and perceived satisfaction between the apps of Apple iTunes App Store and Google Play Store. However, we found no statistically meaningful differences in classification and price of apps between the two app stores. Also, we performed hypothesis tests to verify the differences in age rating and perceived satisfaction between the paid and free apps within and across the Google Play Store and iTunes App Store. There are statistically significant differences in age rating between the

paid and free apps in Google play store, between the Google free and iTunes free apps, between the Google paid and iTunes paid apps, between the Google free and iTunes paid apps, and between the Google paid and iTunes free apps. Google paid apps (65%) show as higher proportion of suitable apps for all age ratings than Google free apps (52%). The absolute proportions of apps that are suitable for all age rating of iTunes free (89%) and paid (93%) apps are responsible for the statistically significant differences compared to Google free (52%) and paid (65%) apps. There are statistically significant differences in perceived satisfaction between the Google free and iTunes free apps, between the Google paid and iTunes paid apps, between the Google free and iTunes paid apps, and between the Google paid and iTunes free apps. Perceived satisfaction values are similar between the Google free (4.23) and Google paid (4.18), and between the iTunes free (3.61) and iTunes paid (3.84) apps. However, perceived satisfaction values of Google free and paid apps are significantly different from those of iTunes free and paid apps.

We anticipate that this research will provide important information for ascertaining the status of applications related to healthcare and fitness commerce. Companies that make apps can identify popular business areas. They can also find appropriate strategies for the u-healthcare market.

Further complementary study can be carried out by researching other business areas or other application stores. As for the domain of future study, the category of games is a popular and interesting subject of research. Furthermore, there are various types of applications in the game category. The reason for selecting a specific game application and correlation with expanse to pay for it can be a contributive research. As for the methodology of future research, comparative analyses in app stores in the United States, China, or Japan are speculated to be contributive to practical business.

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