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Pricing strategy in App market, a developer's perspective

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Abstract

The study conducted in this thesis aims to investigate app's rationale for pricing decision from the app manufacturer point of view. In particular, apps characteristics related to product features, market launch conditions and app developer experience have been analysed as potential pricing strategy drivers. Previous researches on mobile market suggested price as the most critical factor for costumer when evaluating apps, especially when Freemium pricing model was found to be an effective strategy to increase apps demand. We analyse app data from Health&Fitness apps category, identifing Paid pricing as the most successful model. Additonally, price model was found to be influenced by competition level as well as apps developer's product portfolio composition. Also, app manufacturer who already own other H&F apps, occupy a better ranking position. Apps product characteristics were not crucial in determinating pricing strategy, nevertheless features promoting app synergies are often associated with Freemium models. In conclusion, findings show an interesting approach H&F app developer's are using to enter mobile platforms, targeting a niche of costumers who are less price sensitive and who have a higher willingness to pay.

1. Introduction

1.1 Motivation

The App business is growing at unbelievable rates lately; One of the main causes is the switching trend in laptop usage, where mobile devices such as smartphones are being preferred over fixed desktop interfaces. New business models are being created in order to adapt online marketing theory to a new environment: the mobile apps market. Empirical studies about this new field are only few and very recent, which make this topic relatively new, although mobile market strategy is a valuable asset to be considered by each company when promoting their brands. In fact, according to the study conducted by Wang, W. T., & Li, H. M. (2012) empirical results show how mobile services such as apps, add value to brand equity[1], causing in positive spill overs on overall brand profits.

Further researches, focused on individual app characteristics and components able to catch costumer interest the most, when browsing among different apps. One recent study on the App market was conducted by Helby (2012), who aimed to investigate the willingness to pay for Apps according to different moderator attributes such as price, customer ratings, best seller rank etc.. Interestingly, Helby's research led to one conclusion: **App's price is the most important factor in customer purchase decision.** Differently from Helbi, we want to further investigate app's pricing strategy: Building a model that shed insights on the selection of the best pricing strategies to adopt in accordance with different app characteristics. Consequently, the research environment involves the side of apps manufacturers, since they are in charge of pricing decision as a part of market strategy planning before the app is offcially published.

[1] Keller (2001) - Strong brands have great brand equity able to provide them plurious benefits such as customer loyalty and less vulnerability to competitiors marketing actions or marketing crises; larger margins as well as less price sensitive customers; more trade and intermediary cooperation and support; effectiv marketing communications; more licensing and brand extensions opportunity.

In this particular research, Health&Fitness app category[2] has been selected as analysis subject for two main reasons. First, the market has not reached saturation in terms of competition level, contrary to gaming app category where too many players are already present. Secondly, Health&Fitness is a monopoly-free market; New apps face the same growth opportunity since no barriers have been built by any strong competitior[3].

Since the app manufactuer chooses pricing strategy before app launch, the results found will be used in a post-analysis test in order to check how best pricing choice actually performs on the market according to each app's ranking position.

1.2 Research Question

The research question of this study is:

"Which factors among product's features, market features and developer's feature drive pricing decisions in fitness apps business?".

1.3 Layout of the paper

SPSS analytic software has been used to perform a multinomial choice model first, in order to find which variables influence pricing decision the most. Surprisingly, only one product characteristic affect price strategy decision; app sub-category, app size and connectivity features are the product related variables considered. In particular, connectivity features do not add meaningful value to the product, hence those are more likely to be associated with Freemium pricing instead of Paid pricing. Moreover, connectivity features significantly decrease overall app ranking when they are present. In conclusion, no particular pricing schemes have been planned upon the product characteristics analysed, therefore app itself does not play an important role in deveoper's pricing strategy decisions.

On the contrary, market environment at launch time does have a significant impact on price; As Paid pricing is preferred when more H&F apps competitiors are already present on the

[2] Scolari (2012) - The term is traditionally used in category management merchandising. In mobile environment product categories stands for a new taxonomy based on the content genre and the final purpose of communication.

[3] An example of monopoly in mobile app market is given by "communication apps", in other words social media applications, where players such as Facebook, WhatsApp or Twitter make up the most market downloads.

market. Thus when the whole category grows, paid apps have been published more often than free and freemium. Althuogh, those findings are relevant only for competition in overall app market in realtion to H&F category, while sub-category or intra-category competition does not show any significant influence on pricing model choice.

Among developer's experience variables, the composition of developer's portofolio showed a switch towards a Paid pricing as the percentage of H&F apps increases over the total number of apps published by the same developer. Moreover, developers experienced in H&F apps, performs better on overall ranking. Although, experience in terms of number of days since the app manufacturers entered mobile market, does not influence pricing strategy at all, neither apps ranking.

In conclusion, those findings could lead to important pricing leverage information for manager who want to introduce/extend their product portfolio to the health&fitness mobile market. Thus, empirical results show how most H&F successful apps adopted a Paid pricing model independently from app characteristics analysed. Additionally, developers history in H&F apps market suggests Free or Freemium pricing adoption where experience in the market is lower and Paid pricing variables where a consistent amount of H&F apps is already present in manufacturer portfolio. The last and most important factor to be considered by app developer when launching a new H&F app is the mobile market in terms of category competition. Differently from traditional market entrants, a paid pricing does not scare costumer purchases as they are willing to pay for a valuable app. Lastly, those findings, lead to meaningful insight in costumer targeted by H&F apps at the moment, which is a niche of high spending users interested in health and wellness attracted by the lower cost of mobile services offered by the apps.

2 Mobile Ecosystem

The mobile business market can be described as a very dynamic ecosystem, characterized by complex relationships between players.

This market is very fast growing due to the exponential rise of technology and innovation, allowing development of new devices, new concepts and new business models based on

mobile data usage. Consequently, mobile is a highly attractive market representing a big opportunity for both new players, who need to align their businesses with the challenging mobile ecosystem; And existing players who need to always re-adjust their strategies in order to not fall behind competitors.

To understand the reasoning behind the mobile market structure nowadays, it is important to see how it has been established and why the participants gained the role they have today.

Apple created the very first successful mobile ecosystem in 2007 when launching the iPhone; interestingly, the revolutionary aspect brought by this new technology did not resiled in the device itself, but in the integrated system that was included. Starting with the success of iTunes concept, Apple introduced a platform called Apple store where users could download and manage apps through a platform only featured by the iPhone smartphone. The same concept was quickly adopted by other device developers who released their own platform ecosystem; Although, the beginning of the mobile era turned out to be especially profitable for Mobile App Developers (MAD) and Mobile Platform Providers (MPP) (Basole, R. C., & Karla, J., 2011). Previously, the mobile ecosystem was widely controlled by Mobile Network Operators (MNO) who managed content distribution. Moreover, MAD would have to contract with MNO to have their content's featured on the operator's portal. Platforms introduction reduced the barriers for MAD to enter the mobile market, on top of that, search cost decreased and the platform provider handled payment process.

Later on, platforms only strengthen their leading role in the app economy as stated by Gans (2012) in his paper Mobile Application Pricing. Infact, application providers must offer their products through mobile platforms, those last ones charge the developer a cost according to a certain percentage of sales depending on the contract (Apple's App Store charges 30% of the value sold on Application Developers). One more advantage platform developers obtained, is exclusivity of their distribution channel; as developers often have to agree within specific conditions which forbid them to sell the same product through a different channel at a lower price (Hebly, 2012).

2.1 Platforms and Two-Sided Markets

Two-sided markets occurs when different parties interact with each other through a platform and network externalities are present. Network effects are analysed by Katz and Shapiro (1994), they have a positive impact when a new user joins a network and the value perceived by the other users increases as an effect.

We can apply this concept to the platform business, as Hagiu (2009) describes, a platform is considered a two-sided market when both the consumers and app-developers are able to access the same portal to interact with each other, additionally, the more valuable is one side of the platform access, the more members will be present on the other side.

The distribution process in two-sided markets can be summarized as two parties, which are exchanging a product through an intermediary. Holzer & Ondrus, (2011) explains the market from the developer's point of view; First, the developer publishes the products on the platform, according to the tool provided by the service and contract specifications, next the consumer downloads the app with the eventual payment of a fee. Once the transaction has occurred, the platform retains from the revenues the service cost as well as royalties and finally pays the developer his part.

As we go more in depth to analyse the two sides of this market, we need to remark the crucial role invested by the platform providers, in charge of creation and delivery of new contents (Basole 2009,) bringing beneficial values to all players of the system and function as a gateway between the parties.

Within the app store concept, control over content and usage as well as over handling of payment processes for mobile data services, is no longer handled by Mobile Network Operators, since the role was taken over by platform providers and to a certain extent Mobile Device Managers (Suarez et al. 2009, pp. 2–10). Although MNOs are trying to catch up by offering their own app stores, they have yet to experience any notable success (Distimo 2010b. Basole 2011).

Moreover, Platforms are now able to differentiate their products and service offerings concerning different roles and different customer segments. In the past, iOS and Android devices, for example, first were primarily used by consumers, whereas Blackberry focused on business professionals. With the recent surge in the consumer segment and growing

recognition of the enormous enterprise mobility opportunity, however, virtually all mobile platforms are targeting both consumer and enterprise markets. The goal of MPPs is therefore to become the preferred platform through collaborations and partnerships with its key enabling players: app developers, mobile device managements and mobile network operators. This side of the market needs to create a valuable offer in order to attract more members on the other side (customer side), therefore is it crucial to understand the reasoning as well as the impact of different business models on the market, which complexity is quickly growing and evolving, bringing new challenges for mobile marketers.

2.2 Google Play vs Apple Store Business Model

Google Play is the platform name created for the Android Market, which is featured by almost every Android devices; Google is both the owner and the developer of this platfom system (Heikkinen, L. 2013). Although it was born after the launch of Apple Store and had to compete with the giant player which is Apple nowadays, Google Play sold over one million application surpassing Apple App Stores' 900 000 applications in July 2013 and has thus become the largest app store in the world.

Google Play does not only offers different types of apps but also a wide selection of other digital contents such as e-books, e-magazines, movies, music, TV. The specific content availability as well as pricing may differ according to different geographic areas.
An important development owned by Google Play is Google Wallet payment system, an easy and secure payment tool for customers. In addition to credit card payment, available payment methods include direct carrier billing, gift cards, and stored value on Google Play.

The most common pricing options in app stores include:
- Free apps, with advertisement
- Priced apps, without advertisement
- Subscription based apps
- In-app purchases which could come from free downloadable apps or paid apps.

The major issue found in the latest year with Google Play resiles in its offering, which often includes low quality products. In order to reduce screening costs before the publication of apps, Google uses its own search algorithm. Although the algorithm used is still being upgraded, the openness of the platform to developers attracts many members but also lower quality offer (Heikkinen, L. 2013) and more spam.

The lower quality content could also be explained by the registration fee charged by Google, which is only $25 per year (Heikkinen, L. 2013). This is significantly low compared to, for example, Google Play's biggest cross operating system competitor, Apple's App Store, which charges its developers an annual fee of $99.

Although, most of the profits made by Google are not through the annual fee but through in-app purchases, especially the ones generated by free downloadable apps, since the provider's policies force developers to use Google Wallet in in-app purchases in products distributed through Google Play. Furthermore, Google Play withholds 30 % transaction fee from all the payments including application purchases, in-app purchases and subscriptions. In addition to the payment solutions, Google has harnessed its powerful search engine and offers the utilization of AdMob mobile advertising system through an API.

However, probably the biggest strength of Google Play are Google's own proprietary applications and services it entails, which are able to fully link the developer to the platform. Google manages its licensed Android partners through Open Handset Alliance (OHA). Members of OHA are prohibited to produce devices that run incompatible versions of Android, and only the members of OHA are allowed to install the Google's Android to their devices (Rubin, 2012). Thus, Google Play, among other Google's services, is not available for a large number of OEMs who are not licensed with OHA. As we are talking about immensely popular end-user services, such as Gmail, Hangouts, YouTube and Google Play, users of non-Google Android devices miss on a lot. Similarly, developer focused proprietary services include maps, in-app billing, wallet, Google+ social media, analytics, cloud platform, cloud messaging services, and multiplayer game services – all of which are able to bring significant value for developers and which will not work on non-Google licensed devices. Moreover, Google has brought its services available for iOS developers as well so they can be easily integrated with iOS apps.

Google's core business is advertising and Google Play is one cog in the machine as it offers a new channel to utilize the advertising system. As it happens, for the time being mobile advertising is the most popular form of monetization in the Android mobile applications and the advertising field is currently being dominated by Google services (Vallina-Rodriguez et al., 2012). By intelligently creating more value for developers while at the same time locking them in, it has managed to create more value for the users as well.

On the other side, Apple's App Store was born in 2008 has integrating part of iTunes platform; with the App Store update, iTunes was able to create a user interface specifically for mobile apps download. Thus, iTunes was still used for other digital content such as music, movies and ebooks, while App Store was selling only one type of product. According to Cusumano (2010) Apple's products, despite their elegant designs and unique user interfaces, are not very valuable without external digital content such as music and video files and a variety of applications and accessories, moreover, these are automated services, with low costs and high potential profit margins. Apple's strategy involves sharing most (about 70%) of revenues from the ecosystem development with the content owners and application developers, nevertheless they are also charged an annual fee of $99.

Overall, recent data confirmed the major profitability of iOS App Store compared to Google Play. As reported by "Venturebeat" news on Q1, according to AppAnnie: App Store revenues for Q1 2016 were 90 percent higher than those of Google Play, driven — in part — by in-app subscriptions within the likes of HBO NOW, Spotify, and Netflix. Although, this market has very low customer based compared to Google Play, Fabien Pierre-Nicolas, VP of MarCom at App Annie explains in the same article Apple's mobile strategy behind profit flow: "*App Annie is seeing a 63 percent increase of overall time spent year-over-year. In turn, Apple's user-centric operating systems and devices are more likely to delight their users and facilitate strong monetization when combined with the often higher income demographics purchasing iPhones".* The potential growth is limited by the prices of devices, which also limit the audience addressable, leaving room to Google Play who turned this issue in a competitive advantage.

2.3 Health&Fitness App Market

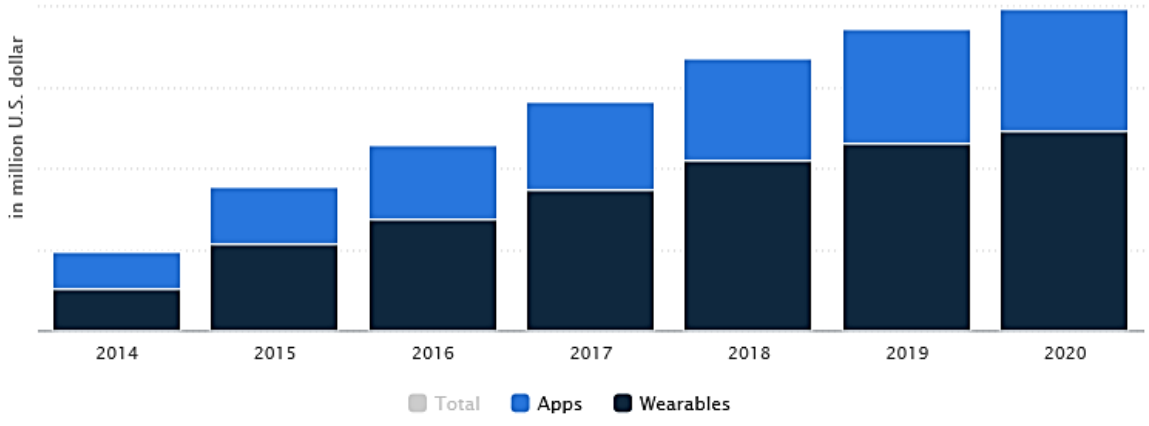
As public awareness on health issues rises, especially in developed countries, people seek for more health-related information on the internet. Users' preferred medium to acknowledge and self educate themselves on this subject is smartphones, due to the increase in mobile devices ownerships (Smith, 2011). Consequently, app developers respond to the customer's need by expanding the health category apps offer (Dolan, 2010).

Although the game category remains the widest and most profitable app segment (Roma, 2013); the increase interest and concern of population on individual health optimization combined with accessible latest self-tracking technologies, leaves room for mobile health development.

The reasons why the digitalisation of the health&fitness trend is such an attractive field for both the consumers and the developers are supported by recent behavioural studies such as the "Quantified Self movement" (QS) by Neff (2013). QS community underline an enthusiastic behaviour in tracking and measuring different aspects of their every day life. This phenomenon is becoming more common and mainstream outside of QS community; "60% of US adults are currently tracking their weight, diet, or exercise routine, and 33% are monitoring other factors such as blood sugar, blood pressure, headaches, or sleep patterns" (Swan, 2013, p. 86). Other recent studies show how health and fitness apps aims to both "optimize" personal health and fortify online communities (Millington, 2014).

More evidence of the increase interest in fitness applications is supported by statista.com. In 2016 Revenue in the "Fitness" segment amounts to 1,142.5 million $ in 2016 and this number is expected to grow even more as showed in the graph below.

Graph 1 – Revenues from both Health and Fitness Apps and Wearables business



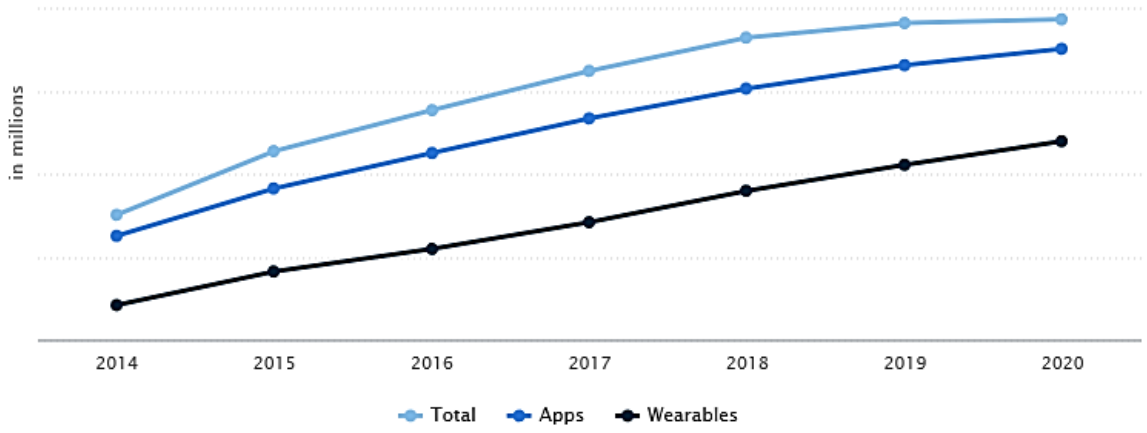
However, the revenues coming from “Apps” only are less compared to “Wearables”. The difference could be explained by the diverse nature of the two type of products as well as different pricing strategies. Especially in the competitive app market, pricing is key and significantly lower compared to the wearables market.

The business opportunity of this segment is represented by the amount of present and future users: In the "Fitness" segment, the number estimated will reach 38.7 million by 2020[4].

The following graph evidence how the number of app users overcomes the number of app wearables.

[4] Source: https://www.statista.com/outlook/313/109/fitness/united-states#market-revenue

Graph 2 – Users of both Health and Fitness Apps and Wearables



2.4 Mobile Business Models and Pricing

While the general app store business model in itself is a rather generic re-adaptation of a platform business model and follows the core competencies pro-posed by Gonçalves et al. (2010) for the most part, a few patterns stood out. First of all, as app store revenues rely on the revenue share, on top of that, platforms provided developers multiple tools for monetization, which represent the biggest source of revenue for app developers. On the other hand, platforms arranged a list of policies their partners need to follow, in order to protect the main source of the revenue and the profit. This is especially important in in-app payment systems as it may bear very distinct implications on the revenue streams. In addition to pricing, regulations and control both play a major role in app store business models. These are in line with the findings of Boudreau and Hagiu (2009).

Application Developers, in general, have 4 different business models:

Paid apps (premium apps) have a baseline price when the app is purchased. The product will be processed with the platform payment system, using a Credit Card or Click-and-Buy process. A percentage of the revenue of the app is returned to the Platform Operator. The advantage of premium apps is that they result in direct revenues and the developer is not dependent on user frequency for income from advertisements. Although

direct revenues seem to be preferable, the percentage of these revenues declined from 82% in 2011 to 77% in 2012 due to rising mobile advertising expenditure (Flurry.com 2012-07-31).

Free apps (most with advertisements) can be acquired for free in the app stores, but the consumer will be exposed to advertisements during the use of the App. This is a popular way for fast penetration into large audiences, but has the negative effect of advertisements being shown during usage of the App. Moreover, those types of apps have the highest churn rate since they also have the lowest switching cost for users.

Freemium apps can be acquired for free in the applications stores, but have restricted content and features, for which the consumer has to pay a premium. David Sacks, founder and CEO of Yammer, confirms the great opportunities that the Freemium model offers[5]. He mentions the opportunity to attract a huge audience and allow a product to go viral, which is unlikely to happen with paid products. "You give the consumer the ability to try before buying" he says. The only pitfall of this model is that the free version cannibalizes the paid offering of the product. Therefore a precise analysis is needed to distinguish the most important features from less important features, and then make them premium features.

Paied apps + premium contents The user has to pay a baseline price in order to download the app as in the first business model described. In some cases, the consumer has complete access to all app functionalities and contents after paying the upfront cost, while in others, additional premium contents are charged with a fee.

Additionally, in-app pricing can be splitted in several schemes, based on payment frequency:

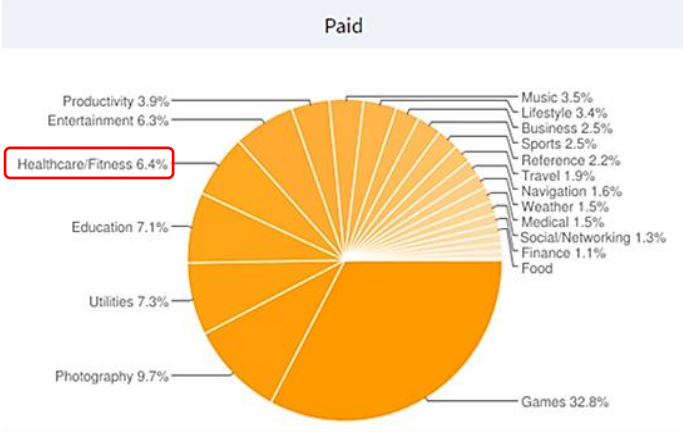
- Only one purchase made to access a range of services.
- Subscription based, usually monthly based, the user pays a fee to fully access a certain service for a certain period of time. Usually the usage in this type of contracts its unlimited.
- Usage based, the user pays a fee which is proportional to the usage made of the service offered by the app.

[5]Souce: blog.wsj.com 2013-03-01

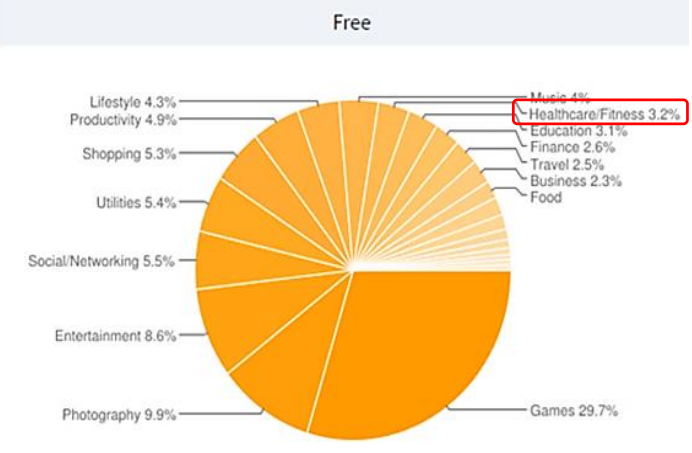
The last pricing type selected for this research, gathers: Paid and paid with in-app purchases. The reasoning behind this choice, is dictated by the nature of the market selected and consumer uncertainty at purchase time, which is the purpose revolving around this research.

The main focus of this research is to test a model able to find the best fit in terms of pricing for a certain H&F app. As demonstrated previously, the category distribution is starting to grow lately, especially among most grossing apps. The following pie charts (3-4)[6] shows how the H&F segment is expanding among Paid apps, while is suffering in the Free app market.

Graph 3



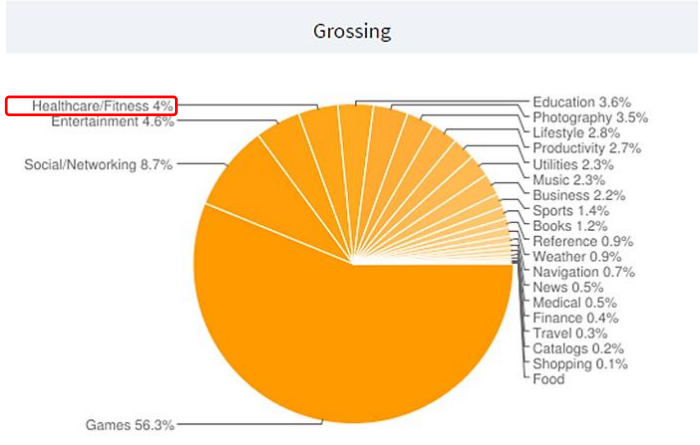
Graph 4



Moreover, the last graph (5)shows an interesting insight strongly connected to the category hold into Paid apps market. Thus, being the 4th most grossing category overall is a sign of positive customer perception towards the quality/price ratio that these type of products offer. Considering the value proposition generated, focused on Health and Wellness, a simple but highly appealing proposition is delivered.

[6]Source : applyzer.com on September 6th considering Apple Store market.

Graph 5



2.5 Quality uncertainty

According to Kalish (1985), consumers purchase of a new product is developed in two steps: awareness and adoption. Awareness is the stage of being informed about the product search attributes and adoption occurs subsequently, if the perceived risk adjusted value of the product exceeds its selling price.

Previous theories states that consumer uncertainty could be resolved in lower pricing as well as less investment risk; In mobile market, where product adoption equals app download, free and freemium apps should be the preferred pricing scheme when new apps are introduced in the market. Since no up-front investment is necessary when downloading those type of apps, the initial perceived risk is null and users can always decide to un-install the app later on, without any waste of money.

The aim of this research is to investigate how consumers deal with purchase uncertainty in mobile markets, in particular when deciding to download a H&F app according to different pricing strategies adopted by app manufacturers. Traiditional market theory, suggest that new product have more chancs to resolve consumer purchase uncertainty by focusing on aggressive entry pricing strategy in order to overcome the opportunity-risk trade-off. On the other hand, pricing strategies take also in consideration the targeted costumer and the type of product sold, chances are that Health and Fitness apps may win the benefit-cost

balance by focusing on the product value communicated as weel as the beneficial advantages and unique features delivered instead of competitive pricing strategies.

3. Conceptual Framework

The aim of this study is to address one main research question:

-Which factors among product's features, market features and developer's feature drive pricing decisions in fitness apps business?

In addition, the following sub-questions can be extracted: **a)** Does the market identify a trend in apps pricing models? **b)** If so, what is the success rate on the market for those apps? **c)** To which extend, are the significant key features represented in such trend? In the next section, the concputal model is presented in section 3.1.

3.1 Conceptual Model

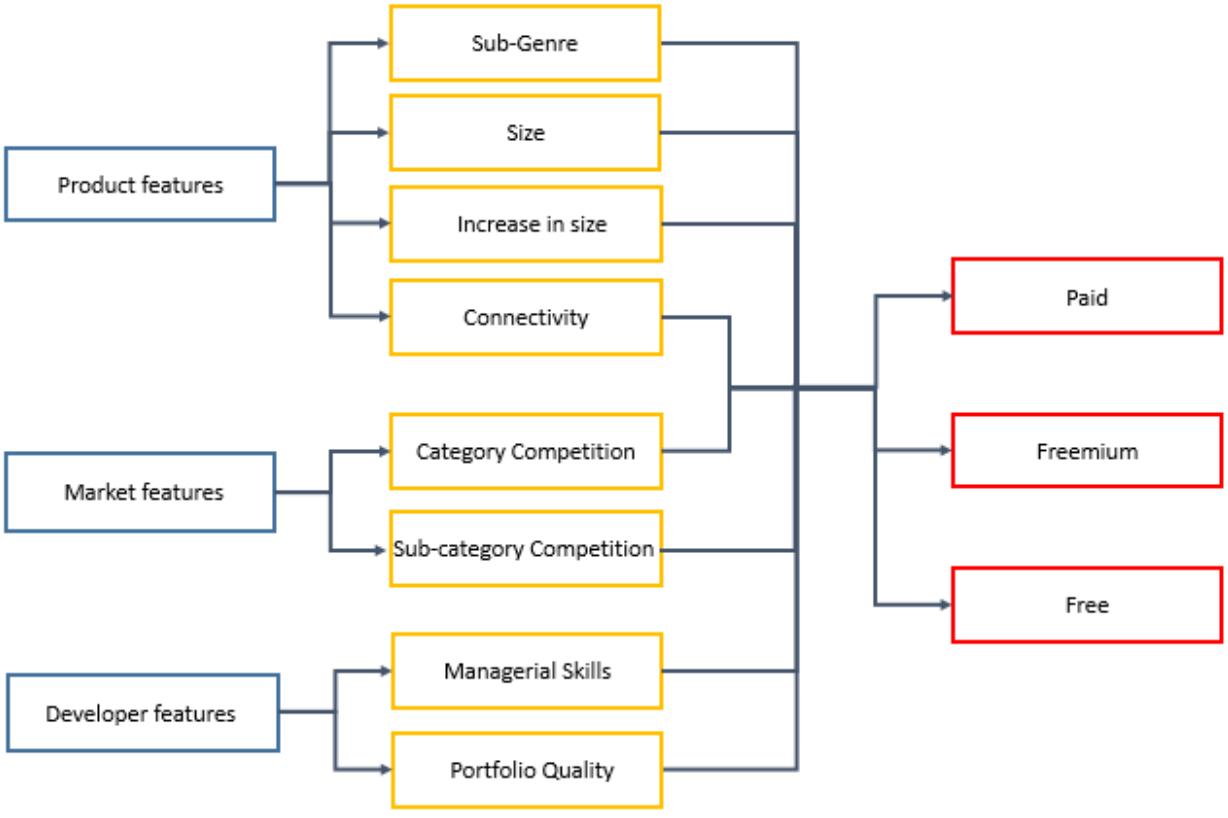


Figure 1: Conceptual Framework

Previous literature focused on which factors influence app's success in terms of revenues or ranking. Roma constructed an econometric model able to forecast developer's success based on product's features (Roma, 2013). The paper's most interesting finding highlights business model choice as the biggest revenue's driver for developers. A similar conclusion is achieved by Helbi's when measuring costumer's willingness to pay in mobile markets: Price is the most effective variables out of all the product characteristics. According to our work objective, we take one step backwards from previous analysis considering Price Choice as main focus. Thus, we decided to adopt a different perspective, where product's features, developer's features and market's features are the independent variables affecting pricing strategy, our dependent variable. In order to test which pricing scheme best matches the variables selected, a choice model will be performed on SPSS software package, as well as linear regressions to subsequently verify the results on actual market ranking lists. By evaluating ranking, we can estimate user's appreciation of the product and the amount of downloads processed. This methodology is needed since informations on downloads amount are not available for free and ranking is basically a classification based on app total cumulated downloads. Post-analysis it's a crucial step not only to test out final results validity, but also to confirm previous significant finding about pricing role towards app success and ranking position.

In addition, we can compare the findings with previous literature such as studies conducted by He (2013), where download behaviour has been analysed in application stores using different variables in a TDRFM model. Price is included among the variables and the final results identified 3 main customer segments categorized by user's value: High-value users, general-value users and loss users.

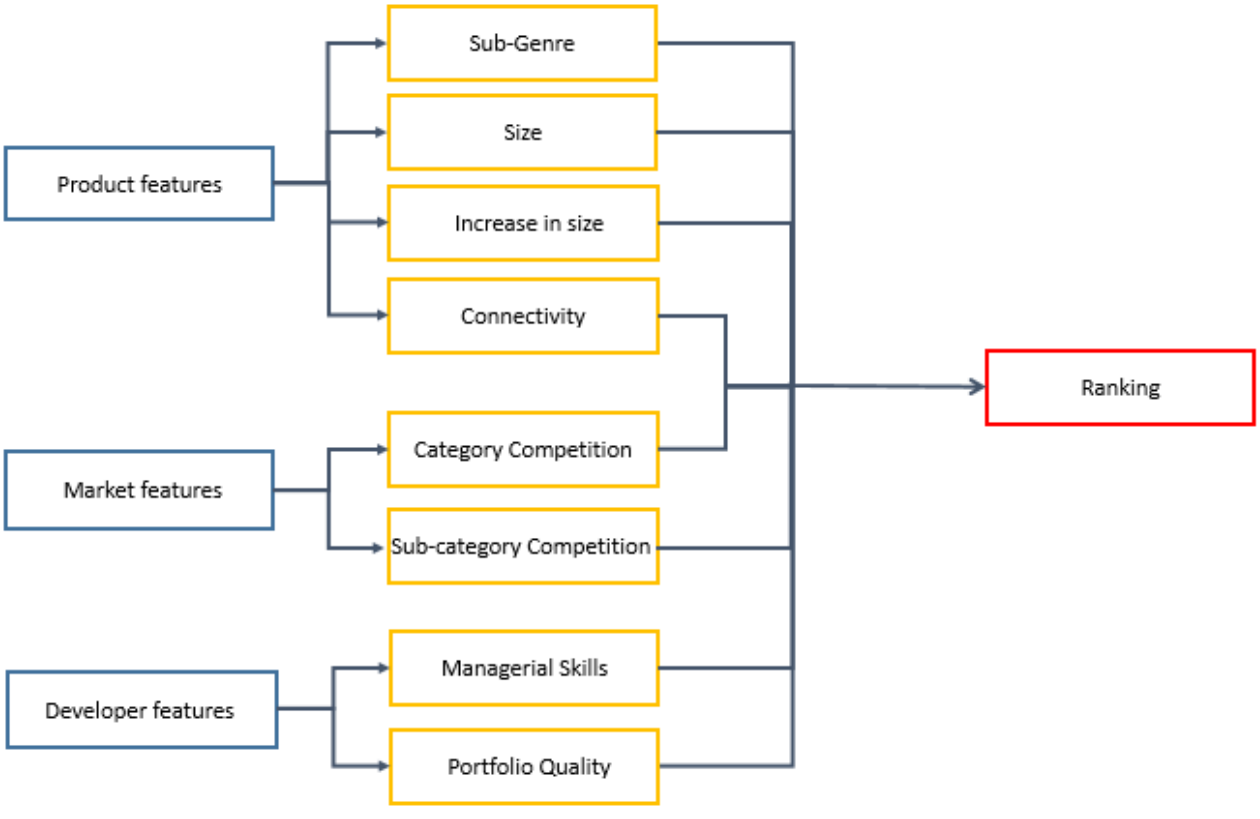


Figure 2: Conceptual Framework – Post analysis test

3.2 Dependent Variable

In this paper the dependent variable analysed is pricing model adoption, where the three possible choices are: Paid, Freemium and Free. Those are three different strategy options that app manufacturers may choose from when launching a H&F mobile service; A short summary of the analysed model is reported below:

- **Paid** apps have a baseline price when the app is purchased. This category includes all apps that requires to pay a fee in order to access download of the service. Additional in-purchases after may be possible and those cases are not differentiated as for Freemium priced apps.
- **Free** apps include all products that can be acquired for free in the app stores and all services included in the download are available without paying any additional fee.

- **Freemium** apps can be acquired for free in the applications stores, but have restricted content and features, for which the consumer has to pay an additional premium.

In order to facilitate data elaboration and results interpretation, the variable has been numerically coded[7] identifing the following legend:

- 0 = Paid
- 1 = Freemium
- 2 = Free

When investigating the antecedents of pricing decisions we aim to find the most influencing features and understand the most commonly used market approaches by app developer.

3.3 Independent Variables and their relation with the Dependent Variable

The three options chosen as possible output are most compatible with this research, given its design, novelty, and certain overlaps with previous investigations on the drivers of price strategy.

The independent variables have been categorized based on their relation to: Product, Platform and Developer. In the next section each group of variables will be described in details.

3.3.1 Product variables

All product-related characteristics, subject of our investigations are summarized in this cluster.

- App sub-genre.
- App size and increase in app size.
- Connectivity.

[7] The variable was still entered as 'nominal'in SPSS analysis as the three choices cannot be ordered or quantified.

App sub-category

The main product variable which we are interested to test is app sub-category: inside H&F app category we found various apps revolving around different topics and consequently promising different type of benefits. Hyphotetcally, H&F apps manufacturers could decide to adopt a specific pricing strategy when publishing an app belonging to a certain H&F subcategory. We aim to investigate which apps sub-categories generate correlations, if any, with one or more pricing strategy.

Hyp 1 : H&F apps pricing decision is correlated to the type of app published, in particular to the sub-category.

Previous researches investigated app category considering app type as grouped on mobile platforms such as gaming apps, communication apps, productivity apps, fitness&health apps, learning apps, kids apps.. etc. One example is provided by Heblij which measures willingness to pay in mobile environment differentiating among 4 app types: Communication, mobile gaming, mobile transactions and mobile information.

In our particular study, app sub-category is meant to differentiate products inside Fitness&Health category, thus we found six main types of apps based on the type of service offered and the benefit aimed to deliver to costumers. Those app types, will be considered as our sub-category analysed and coded in our reearch :

1. Dieting and calorie counters.
2. Trackers: Steps, distance, heart rate.
3. Exercise training and fitness.
4. Lifestyle and healthy habits informations.
5. Women cycle and pregnancy trackers.
6. Yoga, meditation and sleep cycle.

When sampling the apps to analyse, we first selected Health&Fitness category list from AppAnnie website, more detailes on sampling method used have been discussed in previous sections.

Secondly, the criteria used to allocate each app to a specific sub-categry follows the predominant benefit communicated in the public product description; Since certain apps could fit in more than one sub- category stated above, as they deliver more benefits. Therefore, the first feature communicated in the product description section, has been considered the most important to discriminate products by sub-genre.

App size and increase in app size

The second variable discussed is "app size", which stands for memory capacity used to install an app on a mobile device. Previous studies by Jung showed how size of apps is a critical factor that influences app demand especially in "free" apps where price is equal to zero. Because installing apps requires capacity memory availability, it represent a cost for the user, hence we assume that app size negatively affects app demand. Moreover, if we consider the three pricing choice analysed, we expect "free" and "freemium" choices to be strongly affected by an increase of size.

-Hyp 2: When app size decrease, utility of free/freemium priced apps is maximized.

In order to collect size informations, we looked at AppAnnie website in each app description page where size was reported. Although, among the first sample considered, some of the apps reported the following description "Size varies with device", because the same product could be available for different operating systems requiring different memory capacity as well. This was especially true for Google Play apps, where more diverse android devices converge to the same market. To overcome the issue, we removed each app with uncertain size and integrated it with the next one in the ranking list of H&F apps on AppAnnie. The procedure went on until the sample reached 100 apps in total; 50 apps from Google Play and 50 apps from iOS Store.

Since this study aims to research apps only at market launch, the app' size we see today might have changed from the initial one and we are not able to retrieve from AppAnnie which was the exact app size at launch time. Any results found about apps size could be drugged since the value might not be the same as the one communicated at launch time. Therefore, we intriduced a dummy variable able to signal eventual changes in app size during its life time

that we can eventually use to better interpret finding about app size: "1" means the app size has grown due to features and functionalities added along, "0" is used to identify those app that have recorded major changes from the initial version. Thus, when looking at the app details page on AppAnnie, we checked all product's versions and updates to confirm whether there has been an increment in size or not.

From previous findings, frequent quality updates leads to better performances in terms of product survival in top 300 rank (Lee, G., & Raghu, T. S., 2014).

Hyp 2a – In post-analysis test, apps which have increased their size owns higher ranking position in the market.

Connectivity

The last product variable considers apps intra-connections which enable to share data and benefits from other apps functionality. A popular app trend nowadays is to create synergies with different product's services, allowing them to share informations and synchronize on one single device/account. Some app developers strategically connect their own apps part of their product portfolio to create synergies, others find connections with external popular apps helpful to gain new customers. Overall, this is a win-win strategy for all players, final customer included.

Few of the most popular connections among fitness apps are with:

-Other fitness apps (es. Myfitnesspal, Apple Health)

-Social apps to share fitness results with friends (es. Facebook, Instagram)

-Music apps (es. Spootify, iTunes)

-Syncronizing, cloud and storage (es. Google account, iCloud, Facebook account)

We are interested in tracking those networks as added feature which supposedly is willing to increase utility preference choice towards a paid pricing instead of free pricing.

Hyp 3 – App intra-connections is a valuable product features that leads to a Paid pricing model adoption.

3.3.2 Market and Competition variables

- Category competition
- Sub-category competition

Category Competition

The first market variable measures mobile environment pre-launch conditions, in particular by investigating pricing adoption in relation to different competition levels among H&F apps.

In order to do so, we considered each app in our sample and every launch date. Subsequently, we looked at AppAnnies Store Status page where apps are ranked daily, then we selected the day when every app has been launched looking at competitors presence and building a numerical variable. Category competition variable counts how many HealthFitness apps where already present on the market when every app was launched: Considering the top 100 downloaded apps at each specific date and the correct pricing column (according to the pricing used by the app of the sample analysed), we counted how many of those belonged to H&F category. The higher the number of successful fitness apps, the higher is competition in the category. Interesting findings may spring if correlation between competition popularity and market entry pricing is significant. Traditional marketing theories state that highly competitive market implies higher entry barrier for competitors, therefore aggressive pricing is often the marketing leverage chosen. This variable aims to capture health&fitness competition market trend as well as to justify lower/higher manufacturers pricing strategy adopt according to different category competition level.

Hyp 4 – Higher category competition leads manufacturers to choose Free and Freemium pricing over Paid.

Sub-Category Competition

Similiarly to the previous market variable, we aim to investigate market competition among H&F apps, in this case by considering sub-categories or intra-category competition at launch

time of every app in the sample. Sub-categories have been previously divided in six groups, consistently with the classification made for product-related variable "sub-category". In order to collect informations about competition level for each app, we adopted the same methodology used to collect category competition level, the only difference is that the Store Status page has been previously filtred in order to show only H&F apps market, since we are investigating competition "inside" the category. Next, we considered app by app the appropriate pricing column to look at, the sub-category which it belong to and counted how many similar competitors were present among the top 100 apps ranked at lauch time.

The hyphotesis resembles the resoning adopt for Category competition variable:

Hyp 5 - Higher sub-category competition leads manufacturers to choose Free and Freemium pricing over Paid.

3.3.3 Developer variables

- Managerial skills

- Portfolio Quality

Before describing the next set of variables, the remarkable difference between developer and publisher needs to be addressed. Thus, the company behind each app manufacturing and business administration is called Developer, while Publisher refers to the identity used when launching products. As a matter of fact, the publisher name is a tool to implement branding strategies and implement company image towards final customers.

It is not rare to find multiple publisher identities behind the same developer's, the reasoning behind those marketing choices justifies different strategic approaches. Some companies create publisher names according to the type of product sold, since the developer's name does not always fit the category sold. Others, decide to join different platforms under strategic names, as for certain products the targeted customers may significantly change from market to market.

This research context does not involve branding or image variables, therefore publisher figure is not taken under consideration, the only subject discussed is the app developer in other words the manufacturer. Although further research might involve branding influence on app pricing decisions. For example branding afford could be tested by counting publisher accounts for each developer and by measuring the degree of publisher integration in the market.

Managerial skills

Managerial skills are meant as manufacturer's market knowledge and experience in mobile environment: Players who have been on mobile market for longer time, might have a deeper insight on the ecosystem as well as experience on their costumers behaviour.

Firstly, Economic theory typically suggests the existence of a positive relationship between firm reputation through the years and price, and thus, firm profit (Klein and Leffler 1981, Shapiro 1983).

Secondly, the advantage of having a well-known customer base, can be associated with higher loyalty behavior as it promotes trust among users, resolving in higher willingness to pay. Conversely, a new player who needs to build awareness and demand, would rather use a "free" or "freemium" pricing strategy. Freemium strategy especially, is more likely to increase demand as showed by Ghose and Han (2014).

To measure managerial skills, we took each app launch date and developer's date of market entrance: With a simple aritmetci subtraction we were able to find the total number of days developer cumulated on the market before the apps launh date considered in our sample. In case the app analyzed was the first one the developer ever launched, the data is equal to "0", since the date correspond to the first market entry ever.

By analysing this variable we want to demonstrate how developer's experience in terms of time on the market, does influence pricing decision towards a Paid model.

Hyp 5: Developer's managerial skills increases utility for a paid pricing model.

Although, research from Lim, demostrates how the developer factor, invest the least important role in consumer choice as the main driver is found to be price indeed.

Portfolio quality

The next developer-related variable evaluates current product portolio in order to estimate Portfolio Quality in terms of H&F apps presence.

By using AppAnnie, we were able to find for each app in our sample, the developer and all the apps previously published by the same company. The total number of apps published by each developer before the new app launch have been counted, next the ones cateogorized as H&F products have been counted as well. Subsequentely, H&F apps have been calculated as percentage of total app portfolio, resulting in more specialized portfolio or broader portfolios, depending on the strategy chosen by the developer.

This variable aims to test the relationship between developer's expertise in H&F apps, by evaluating the whole product portofolio, and new apps pricing adoption. Following the same reasoning of Managerial skills variable, hyphotetically manufacturers experience in terms of amount of H&F apps published, positive influence decision towards a paid pricing mode adoption over fee/freemium models.

Hyp 6 – Higher percentage of H&F apps in developers portfolio is associated with paid pricing choice.

Developer owning more H&F apps, can rely on existent customer-base and are easier to trust in terms of new product launch due to experience in the segment as well as popularity among app users. Therefore, chances are that as the developer's portofolio is more H&F apps focused rather than equally spreaded among other app cateogories, pricing choice leads to a paid app model.

3.4 Model: The Multinominal Logit Choice

For problems involving the choice among three or more categories, the multinomial logit technique is most often employed. The multinomial logit model calculates the probability of choosing an alternative as a function of the attributes among all the options available. Consider an individual, *i*, confronted with a choice from a set, S_i, of alternatives. In our setting the alternatives will be the three different pricing choices (*Free, Freemium and Paid*). Confronted by the set of alternatives, individual *i* chooses the one with the highest utility on the occasion. I.e., the probability of choosing *k* is:

$$p_{k} = P\left\{u_k \geq u_j, j \in S_i\right\}. \quad (1)$$

The ϵ_k, $k \in S_i$, are independently distributed random variables with a double exponential (Gumbel type II extreme value) distribution.

$$P\left(\epsilon_k \leq \epsilon\right) = e^{-e^{-\epsilon}}, \qquad -\infty < \epsilon < \infty. \qquad (2)$$

ϵ_k = a random component of i's utility, varying from choice occasion to choice occasion, possibly as a result of unobserved variables.

This form of the distribution appears to fix the mean and variance of c quite arbitrarily.

Given assumptions (1)-(3), it can be shown (Theil 1969, McFadden 1974) that individual i's choice probabilities have a remarkably simple form, expression known as multinomial logit.

$$p_{k} = e^{v_k} / \sum_{j \in s_i} e^{v_j} \; /. \qquad (3)$$

v_k = a deterministic component of *i* 's utility, to be calculated from observed variables.

The deterministic component of a customer's utility for alternative *k* will be expressed as a linear function of observed variables, called the attributes of *k*.

In our case, these will be attributes of the product, attributes of the market and developer's attributes that differentially favor one alternative over another for some reason.

$$v_k^i = \sum_{j \in T} b_{jk} x_{jk}^i \quad \text{where} \qquad (4)$$

x_{jk}^i= observed value of attribute *j* of alternative *k* for customer *i*,

b_{jk}= utility weight of attribute *j* of alternative *k*. We shall drop the superscript *i* when it is not required for clarity.

4. Empirical Execution

4.1 Data and Sampling

The data used to answer the research question are retrived from secondary data source: appannie.com and apptrace.com. The business intelligence companies collect, analyze and share data from the whole mobile app market on their own website.

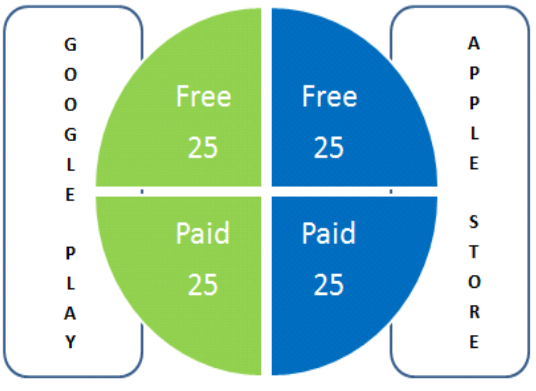
AppAnnie offers a premium subscription, which includes several analytic tools and app's restricted information such as revenues and number of downloads. Because the premium version cannot be afforded in this research, only the free tools will be used.
Hence, AppAnnie provides access to apps lists and historical ranking data without charging any fee; Daily top 100 apps are ranked across different pricing models: Top 100 Free apps and top 100 Paid apps. This website has been used as data source from previous research studies in the mobile app market, performing efficiently in studying pricing models over time (Ryshchenko, 2015). Due to the nature of the study, we must be able to download all relevant app's lists with individual app's specifications and subsequently investigate H&F developers informations over time.

Differently from AppAnnie, Apptrace is an open source tool, thus does not share as many product's details as AppAnnie, but provides overall "global" ranking of Health&Fitness apps, offering a unified ranking that gathers Free and Paid apps all in the same list. The final research purpose is to combine data from AppAnnie and Apptrace to run post-analysis market test, where pricing decision results will be independent variable in order to study the correlation between price choice and ranking position.

The main analysis output is represented by a choice on "Pricing Type" among three different pricing models, namely: Premium, Freemium and Free. The investigated relationship will be tested against a sample of the top 100 apps according to H&F ranking in AppAnnie on a specific date, 6th of September 2016. Sampling based on ranking list provides an overall picture of the amount of downloads per app, hence we decided to stuy the most downloaded products to guarantee market strategy effectiveness on results found through our analysis: Eventual pricing-features correlations could be proven in today mobile environment against competition. Subsequently the same sample will be used for post-analysis considering a new variable: Health&Fitness ranking position as dependant variable, data retrived on the same date again 6th of September 2016 from AppTrace.

In order to keep an heterogeneous database the sample have been organized as follows:

Figure 3 – Sample composition



-Top 25 apps ranked in "Free" list in Google Play.

-Top 25 apps ranked in "Free" list in Apple Store.

-Top 25 apps ranked in "Paid" list in Google Play.

-Top 25 apps ranked in "Paid" list in Apple Store.

Among the two app list – Free and Paid – are included both apps with and without in-app purchases. For the purpose of this research, only the cases of Free and Free with in-app purchase (Freemium) will be distinguished, while Paid will be considered as a whole. The

reasoning behind this choice is based on the analysys structure, focused on app pricing decision at market launch only; As discussed in section 2.5 Free and Freemium are the pricing models that better resolves customer quality uncertainty when downloading a new app. In particular, research show how Freemium model is been proved to be the best strategy to attract new customer base.

In order to validate final pricing best utility, we need to set a few requirements for the sample analysed:

1- Exclude apps that shifted in pricing scheme over time. Thus, because we are testing pricing effectiveness sampling from ranking list, we need to ensure that pricing strategy has not changed over time.
2- Exclude apps launched too long ago. When analyzing mobile environment at app's launch, rankings are not always available on AppAnnie: Google Play rank list starts from January 2012 and Apple Store starts from January 2010.
3- Exclude apps that do not provide all informations needed to be collected (Example: When product size varies with the device, app is not included in the sample).

The sample tested excludes apps which have changed in terms of pricing strategy since launch; unlike Seoungwoo Lee (2014) who considered an overall panel of top 150 free and to 150 paid apps. As a matter of fact, his research investigated changes and effects on shifts in apps commission structure. One more remarkable difference between our model and Lee, lies in the number of choices options which include a forth pricing versioning called "neither" on top of: free only, paid only and freemium.

4.2 Results

In this section test results will be discussed as well as the notion whether they support the aforementioned hypotheses. Note that a 95% confidence interval is used for the hypotheses which means that $\alpha = 0{,}05$, hence the significance level should be lower than 0,05 to support a particular hypothesis. Nevertheless, a few outputs with 90% confidence interval have been included in results comments.

4.2.1 Descriptive Statistics

All variables data have been collected from the same set of 100 apps, therefore the sample doesn't change. Another constant during the analysis is time, since all informations were retrived on a specific date (6th Septemeber 2016).

In Table 1 below, all variables are gathered in descriptive statistics.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Prici ng	100	0	2	,72	,805
Sub-genre	100	1	6	3,28	1,759
Size	100	,0	410,0	64,119	65,4758
Increase in size	100	0	1	,46	,501
Connectivity	100	0	1	,43	,498
Category competition	100	0	8	1,74	2,053
Sub-category competition	100	0	6	1,77	1,392
Manegerial skills	100	0	2593	681,77	708,150
Portfolio quality	100	0	1	,57	,459
Ranking	100	1	301	125,11	105,181
Valid N (listwise)	100				

Table 1. Descriptive Statistics

By looking at the mean value for each variable we can make a few consideration on the database; Both category comp and sub-category comp have a very low mean, therefore a few high values were present in the data as outliers. To sum up, competition among H&F category and intra-category is very low and spread equally among sub-categories. Moreover, app Size averages at 64,119MB while outliers are present peaking at 410MB as maximum value. Following the same resoning, managerial skills show outliers as well since there a few experienced players that collected up to 7 years on the market (2593 days), while the mean si about 2 years. On the other hand, all the categorical and dummy variables (Pricing, Increase in Size, Connectivity and Sub-genre) are in-line with the average tendency without any outstanding extremes. Portfolio Quality is reported as a percentage value of H&F apps among

all developer's portfolio, therefore developers in our sample had on average 57% of apps belongining to H&F category.

Lastly ranking variable, used only for post-analysis test, indicate some outliers case towards 300th, the lowest ranking position. Infact most apps, are located right between 20th and 230th place.

4.2.2 Correlation Analysis

In the next section, correlation among variables is measured using the Pearson *r.* the full output is shown in Appendix Table 2.

Considering the first set of variables used for multinomial choice model, there is a strong correlations between Connectivity and app Sub-genre (,289**) also Pricing is positively correlated to Connectivity (,203*). On the other hand, Pricing is negatively correlated to Category Competition (-,527**), meaning that apps launched in a competitive contest (category-wise) lead towards a paid pricing model and those launched in a less competitive contest adopt a free pricing. Lastly, Category Competition also influence Connectivity (-,275**), therefore lower competition at launch time is related to apps having connection features. This could be an interesting insight related to the overall H&F app market, infact when consumer awareness was still low and the category itselft was not poplar, developers tent to adopt free pricing.

Futhermore, looking at Ranking used in the post analysis test, it strongly correlates positively with Pricing (,772**) and Connectivity (,369**). Meaning that as pricing goes towards free, also ranking position is lower in the chart and connectivity among apps does exist. Ranking also correlates negatively to Category Comp (-,502**), as a result when ranking increase (less downloads) the H&F competition for that app is lower.

BothManagerial Skills and Portfolio quality doesn't show any correlation to any other variables, resulting in no particular influence of Developer's characteristics over all he other variables

Table 2 - Correlations

		Pricing	Sub-genre	Size	Increase in size	Connectivity	Category Competiton	Sub-category Competition	Manegerial skills	Portfolio Quality	Ranking
Pricing	Pearson Correlation	1	,035	-,052	,172	**,203***	**-,527****	-,013	,059	-,116	**,772****
	Sig. (2-tailed)		,733	,604	,086	,043	,000	,898	,560	,250	,000
Sub-genre	Pearson Correlation	,035	1	,104	-,171	**-,289****	,090	**-,246***	-,094	-,030	-,047
	Sig. (2-tailed)	,733		,302	,090	,004	,372	,014	,352	,770	,641
Size	Pearson Correlation	-,052	,104	1	,179	,057	,033	,189	,102	,160	-,014
	Sig. (2-tailed)	,604	,302		,075	,576	,742	,060	,311	,112	,891
Increase in size	Pearson Correlation	,172	-,171	,179	1	,171	-,089	-,006	,006	,120	,093
	Sig. (2-tailed)	,086	,090	,075		,089	,380	,952	,956	,235	,359
Connectivity	Pearson Correlation	**,203***	**-,289****	,057	,171	1	**-,275****	,144	,022	,090	**,369****
	Sig. (2-tailed)	,043	,004	,576	,089		,006	,152	,831	,371	,000
Category Competition	Pearson Correlation	**-,527****	,090	,033	-,089	**-,275****	1	,018	-,061	-,036	**-,502****
	Sig. (2-tailed)	,000	,372	,742	,380	,006		,861	,545	,723	,000
Sub-category Competition	Pearson Correlation	-,013	**-,246***	,189	-,006	,144	,018	1	-,003	,011	,064
	Sig. (2-tailed)	,898	,014	,060	,952	,152	,861		,980	,912	,525
Manegerial skills	Pearson Correlation	,059	-,094	,102	,006	,022	-,061	-,003	1	,121	-,054
	Sig. (2-tailed)	,560	,352	,311	,956	,831	,545	,980		,232	,591
Portfolio Quality	Pearson Correlation	-,116	-,030	,160	,120	,090	-,036	,011	,121	1	-,186
	Sig. (2-tailed)	,250	,770	,112	,235	,371	,723	,912	,232		,064
Ranking	Pearson Correlation	**,772****	-,047	-,014	,093	**,369****	**-,502****	,064	-,054	-,186	1
	Sig. (2-tailed)	,000	,641	,891	,359	,000	,000	,525	,591	,064	

*. Correlation is significant at the 0.05 level (2-tailed).

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

Table 2: Correlation matrix

4.2.3 Multinominial Logistic Regression

The first analysis performed is a multinomial logistic regression, tested among variables related to product, market and developer influencing pricing choices (Paid, Freemium and Free).

In **Table 3** the corresponding test is shown with the estimates and significance levels. Since the choice is among three elements, the final output is made up by two categories in comparison to the reference category, in this case Free and Freemium are compared to to Paid.

The odds ratio of a coefficient (column B) indicates how the risk of the outcome falling in the comparison group compared to the risk of the outcome falling in the referent group changes with the variable in question. An odds ratio > 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the referent group increases as the variable increases. In other words, the comparison outcome is more likely. An odds ratio < 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the referent group decreases as the variable increases.

The ratio of the probability of choosing one outcome category (no connectivity) over the probability of choosing the baseline category (connectivity presence) is often referred to as relative risk (and it is also sometimes referred to as odds as we have just used to described the regression parameters above). Thus, exponentiating the linear equations above yields relative risks. Regression coefficients represent the change in log relative risk (log odds) per unit change in the predictor. Exponentiating regression coefficients will therefore yield relative risk ratios. SPSS includes relative risk ratios in the output, under the column "Exp(B)".

Table 3 - Parameter Estimates

Price[a]		B	Sig.	Exp(B)
Free	Intercept	1,24	0,346	
	Subgenre	0,322	0,179	1,379
	Size	-0,003	0,635	0,997
	CategoryComp	**-1,14**	0	0,32
	SubcategoryComp	0,153	0,615	1,166
	ManagerialSkills	0	0,303	1
	PortfolioQuality	**-0,017**	0,029	0,983
	[Increaseinsize=0]	-1,178	0,099	0,308
	[Increaseinsize=1]	0[b]	.	.
	[Connectivity=0]	-0,807	0,267	0,446
	[Connectivity=1]	0[b]	.	.
Freemium	Intercept	1,167	0,348	
	Subgenre	0,13	0,595	1,139
	Size	0,005	0,397	1,005
	CategoryComp	**-1,571**	0	0,208
	SubcategoryComp	0,446	0,11	1,562
	ManagerialSkills	0	0,433	1
	Fitnessproductportfolio	-0,006	0,412	0,994
	[Increaseinsize=0]	-0,069	0,923	0,933
	[Increaseinsize=1]	0[b]	.	.
	[Connectivity=0]	**-1,603**	0,026	0,201
	[Connectivity=1]	0[b]	.	.

a. The reference category is: Paid.

b. This parameter is set to zero because it is redundant.

The most significant result is Category Competition which reports high significance level from both Free (0,000) and Freemium (0,000) pricing compared to Paid :

- A one unit increase in Competition among H&F category is associated with a 1,140 decrease of falling into a Free app versus Paid apps and a 1,571 decrease of falling into Freemium versus Paid.
- The relative risk ratio for a one-unit increase in the variable Category Comp is .320 for being free versus paid price.

The output meaningfully represented the relation previously found in the correlation matrix: When H&F competition increses, developers publish more paid apps versus free and freemium apps which are launched more often when fewer competitors are present.

Those findings contrast our initial hypothesis where higher competition should increase publishing in free/freemium in order to quicky gain costumer awareness and trust. Considering the quality of the product sold, related to a sensitive topic such as health and fitness, costumer could be more willing to spend if they perceive the benefit gained is worth the money spent. This logic is often applied in medical/health businesses where the perceived quality of the product/service justifies the price, one solid example is brought by health insurance cost in USA.

To sum up, the reasoning why competitive environment could lead to preference in Paid pricing is brought by upfront price as a quality-guarantee differentiation leverage.

Portofolio quality is another significant variable in Free pricing model (0,029):

- One percentage increase of H&F apps in developer's portfolio is associated with a 0,17 decrease of falling into Free pricing versus Paid.

- The relative risk ratio for a one-unit increase in the variable Portfolio Quality is .983 for being free versus paid price.

Therefore, developers specialized in H&F apps, are more willing to publish Paid apps over Free ones. On the contrary, manufacturers with fewer H&F apps among their portfolio would rather choose a Free pricing for new launches. In this case, developers behaviour might be influenced by popularity; Since experienced manufacturers have a builted costumer base on top that is more willing to spend money on a new H&F apps. Consumer uncertainty is lowered by developer's experience in H&F app category.

Among product-related variable, one of them stood out because of significant correlation towards Freemium pricing (0,026):

- The relative log odds of being in Freemium versus in Paid will decrease by 1.603 if moving from connectivity presence (= 1) to connectivity absence (= 0).

- The relative risk ratio switching from connectivty = 1 to 0 is 0.201 for being in freemium price versus paid pricing. In other words, the expected risk of staying in the freemium price is lower for apps which don't show connectivity features.

To sum up, apps with no connectivity features are less likely to be sold as Freemium, instead are more likely to adopt a paid pricing model. Apparently, connectivity is not considered an advantage able to influence overall product offer and price strategy consequently.

4.3 Post-analysis test

The second test is a post-analysis linear regression that allows us to verifiy the multinomial regression results on the market by introducing pricing choice among the independent variables. All indipendent variables are subsequently tested on the market by using apps ranking postion as estimate of costumer appreciation of the overall product offer. One premise on the following data concerns the dependent variable interpretation, as increase in ranking number means a lower and worst ranking position and viceversa when evaluating a decrease in ranking position (=better ranking performance)

In Table 4 the corresponding tests are shown with the estimates and significance levels.

Table 4 - Coefficients[a]

Model	Unstandardized Coefficients		Sig.
	B	Std. Error	
(Constant)	**77,516**	24,961	0,003
Prici ng	**89,310****	9,615	0
Sub-genre	-1,352	4,023	0,738
Size	0,082	0,104	0,429
Increase in size	-14,375	13,469	0,289
Connectivity	**45,142***	13,934	0,002
Category comp	-5,102	3,714	0,173
Sub-category comp	2,239	4,827	0,644
Manegerial skills	-0,015	0,009	0,112
Portfolio quality	**-27,205**	14,278	0,06

a. Dependent Variable: Ranking

Price has been proved to have a high significance level (,000) in determinating apps ranking as stated in the intial hypthotesis and proved by previous research in mobile environment. As results show, a one unit increase in pricing is associated with a lowered ranking position by 89 spots, price has been coded with 0,1, and 2 correspoding to Paid, Freemium and Free. Thus, Paid apps are generally occupying higher ranking position while Free apps are ranked lower in terms of total downloads amount.

Connectivity is a dummy variable and turned out to be significant with a p-value of ,002. Positive correlation has been found between presence of connectivity features and ranking position, as generally apps having connectivity characteristics are lowered by 45 spots in the ranking scale. Therefore we can assume that connectivity feaures do not increase app downloads, on the contrary the "full package" app with all features integrated might be more appreciated by users.

Porfolio quality does not fit into the confidence interval level (,06>,05) although a few words will be spent to describe the result found since the value is not too far from the significance level considered. A one unit percentage increase in H&F product presence in developer portfolio is associated with a ranking position raised by 27 spots.

5. Conclusion

5.1 General Conclusion

The aim of this thesis is to research which factors influence developers decision when selecting pricing strategy at launch time. Based on previous researches, price is the most important leverage in driving costumer purchase decision, in this case app downloads. Thus, price is a key strategical decision particularly in mobile market where product adoption is free or paid by charging an up-front cost before download. While recent studies measured costumer's willingness to pay for apps according to certain product characteristics, we decided to take a step back; Instead of focusing on price itself, firstly we investigated parameters that may influence decision in pricing strategy (whether is free, freemium or paid) and secondly we tested those same parameters as well as pricing choice on actual apps ranking performances.

5.1.1 Product Variables

Among all product variable potentially influencing price decision, none of them turned out to be significant except for app connectivity. Size does not play a strategic role since it is not view as an impactful cost for the customer when deciding wheter or not downloading a certain app. According to our hypothesis size increase was more willing to be associated with a free app in order to equilibrate the cost-benefit trade off, nevertheless H&F apps costumers are willing to sacrifice quite a lot of memory capacity in exchange of a valuable benefit, regardless of presence/absence of an up-front cost. Differently for Connectivty features, results showed that the absence if connectivity features is more likely to be associated with a paid pricing model instead of freemium, suggesting they do not add enough value to the product to the point that a manufacturer would adopt a paid pricing strategy. This finding was been later confirmed, when performing the post-analysis test, connectivity was significantly impacting ranking position negatively, lowering ranking position of those apps having connectivity features added. Lastly, connectivity features do not lead to paid pricing on the contrary, they are sold in freemium apps and are ranked lower compared to other paid apps with no connectivity features. The surprising result, could be explained by users preference in having all apps features concentrated in one single app, without having to manage multiple app feeds as H&F app differentiate as a whole new category genre.

5.1.2 Market Variables

Results showed strong evidence for Paid pricing preference in launch context where H&F apps popularity was higher, while Free and Freemium in particular are often choosen in less competitive environment. Those findings are against previous hyphothesis where new entrants were considered more willing to use competitive pricing in order to gain initial costumer awareness. Although, few important factors have been omitted during the hypothesis:

1- Time of the market and long tail effect.
2- Consumerd targeted and consumer uncertainty.

1.H&F app market is a very new business with a few successful players due to the long tail effect of mobile ecosystem. Therefore market saturation is not likely to happen soon and players are experiencing an overall low competition level, compared to more crowded mobile markets such as gaming app category. As a consequence, H&F apps manufacturers do not need to use aggressive pricing strategies in order to succeed in this market. Although some "free" versions of the most successful apps have already been published, they do not perform as well rankiwise as the newest paid apps.

According to Porter, substitute products come into play when some development increases competition in their industries and causes price reduction or performance improvement; in this case no price reduction occurred since new players are entering the market with a paid pricing model promising strong improvements in app performances. Performance improvement is very likely to happen due to the type of product sold which is relatively new and leaves good growth margin thanks to the H&F trend associated to wearables and consumer electronics development.

2.When dowloading a new fitness app, consumer uncertainity is resolved with the high benefits promised by the new effective mobile product as well as the relatively low cost considering the type of service sold. Morevoer, the costumer base interested in H&F apps purchase, values wellness and health to the point that most people targeted already own a gym subscription or a personalized diet plan. Therefore, mobile apps turn out to be more convenient as costumers see a mobile app as a good trade off between cost and benefits, resolving consumer uncertainty. To sum up, H&F apps manufacturers are aware that their products are downloaded by high spending customers who are willing to pay for a mobile service that allows them to achive a certain health goal, as a consequence paid H&F apps are most commonly launched.

On the other hand, no specific trend has been recorded when measuring intra-category competition with the variable Sub-category Competition: One possible interpretation is again linked to the new market condition, where competition inside the category is not developed enough to influence price strategically. Although, as we know mobile is a fast changing and growing market and sub-category competition in H&F apps might become a crucial variable to be considered in a few years (or less) when launching a new app. Post-analysis test

confirmed that Category Competition does only influence pricing choice and not app ranking performances.

5.1.3 Developer Variables

Analysis results showed how experienced developer, would rather use paid pricing instead of free or freemium. This statement is true when considering experience in terms of amount of H&F apps previously published, thus popularity and developer recognition in H&F business could play an important role when testing costumer purchase uncertainty. Morevoer, a low significance level in post-test linear regression confirmed that increase of H&F apps in developer portofolio influence positively new app ranking position. On the other hand, developer's total year on mobile market was not meaningful for our analysis purpose, as time on the market has also been spent in publishing other type of apps (games, informative apps,..).

5.2 Managerial Implications

This research has been conducted based on apps pre-launch data and context, therefore insights are specifically interesting for app developers who are in charge of apps publishment on mobile platforms. In particular, the investigation focused on pricing strategies decision at market launch of the mobile app, since price is the most impacting driver in costumer purchase decision enable to resolve consumer uncertainty (Helby, 2012). Despite the very recent introduction to the market, Health&Fitness app category has been analysed and surprisingly a few common strategies have been lined out: Paid pricing adoption is a common strategy adopted by new entrants in H&F mobile market, although it does not necessarily translate in positive ranking performances. For instance, new H&F apps are often published with a Paid pricing as the competition increases in the category, although this strategy does not always lead to high ranking position on the market. The trend in paid pricing model adoption suggest interesting insight on the market type, especially on the costumer targeted

by app manufacturer: They have a high product value perception and therefore they are less price sensitive. This last consideration, reasonably supports the presence of different types of costumers in mobile market, as studied by He (2014) who specifically identified three users groups based on their purchase behavior: Loss users, general-value users, high-value users. The last two costumer's type are the ones generating profits in mobile maket as they are more willing to spend on mobile platforms (high-value users more than general-value users); Chaces are that based on pricing strategies choices, H&F apps developers are targeting general-value users and high-value users.

On the other hand, a positive example has been proved to be developer's previous experience in the market: Leads to a preference towards a paid pricing strategy adoption, which consumer seems to appreciate downloading those type of apps the most. Therefore, app manufacturer should consider their current product portofolio at launch time, the more H&F apps they have previously published, the more chances they have to succed with a Paid pricing model on the market.

Finally, product features do not influence pricing decision neither apps ranking list, except for connectivity features which is most commonly found to be associated to Freemium strategy but controversly drives down apps ranking. To sum up, H&F apps developer's should not strategically consider product features when planning pricing strategy; In particular app as size, app sub-category. In addition, connectivity features is a not profitable product investment as often associated with "Freemium" and affecting negatively downloads amount.

5.3 Limitation and future researches

The research topic touched a very new environment such as mobile market in particular, a subject that has only superficially analysed before: factors driving app manufacturer's pricing decisions at first market launch.

First, our findings about preference in Paid pricing model should be tested again on other product categories in order to confirm wether the phenomenon is restricted to H&F app categories or involves other apps as well. Ghose (2014) investigated which pricing model is able to trigger costumer demand the most and Freemium apps turned out to be more appealing than Free or Paid ones, suggesting to use Freemium price as strategy to gain initial market awareness and demand at product launch. Although, mobile market hidden mechnisms change fast and pricing strategies may become verticalized depending on the product category sold as well as the consumers targeted. At this point, also a survey should effectively test who are H&F apps consumers and confirm/deny our hyphotesis based on a high spending target focused on product value perception rather than price. Lastly, paid apps category could be further researched in order to find the willingness to pay for different price ranges and any influence of in-app purchase option.

Secondly, because this a student research and was not financially supported, more detailed informations could be purchased about single apps such as revenues or downloads amount which would provide a precise insight on actual app success in terms of profits and consumer demand.

Finally, Helby (2012) willingness to pay model should be tested again only on H&F app market in order to find any other attributes able to drive consumer purchase other than price, since our latest findings suggest that H&F costumers are low price senstitve. In addition, the platform used for app publishment should also be considered in the analysis, as each market pricing policies could influence app's final selling price strategy.

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