

piggy buy

CS3216 FINAL REPORT

GROUP 8

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What is PiggyBuy?

PiggyBuy is a revolutionary social commerce platform that helps you save on shipping fees and earn rewards when you buy with others.

Ever felt the pain of having to pay for shipping fees just because you couldn't hit the free shipping minimum? Missed out on that amazing discount simply because it required you to spend \$200, and you only have enough for \$199.98? Or maybe you found a killer Prime-exclusive deal, but don't have a Prime membership...

With PiggyBuy, you'll never have to worry about paying exorbitant shipping fees or missing out on a deal ever again. PiggyBuy connects you with your friends and neighbours around you to place online orders together through a group buy. Simply browse through the group buys around you to find people that are looking to buy from the same stores. We automatically sort them by distance to ensure maximum convenience for you. All crucial information, such as the progress of the group buy, the collection location, or the deposit percentage, is displayed to you upfront. Have doubts or questions? Simply use our built-in chat feature to speak with the organiser.

Found a suitable group buy? Joining it is easy. Simply submit the links to your items, and fill in the price, quantity, and any remarks you might have for the organiser. Once you've got all the details in, we'll handle it for you - your organiser will be automatically notified to approve your order. Don't forget to send the correct deposit amount to avoid delays to your order!

When a group buy concludes, your organiser will take action and purchase all the items on behalf of the group. If there have been any updates or changes to your order status, such as an item going out of stock, or price changes, they'll notify you too. Once your item arrives, simply schedule a time to meet at the designated location to pick up your order. It's that simple!

Can't find a suitable group buy around you? Well, that's no problem - anyone can be an organiser, too! Simply head on over to the create screen, where you'll be able to select the store you'd like to purchase from, as well as specify the collection location, deposit percentages, and the end date for the group buy. Once you're done, simply hit create, and sit back, relax, and wait for others to join you to save.

Why else should you organise, you may ask? Have payment cards that offer you cash back, points, or miles as rewards? Or perhaps there's a limited time offer for a voucher or free gift card if you spend a certain amount? With PiggyBuy, the sky's the limit! Collect and keep as much cashback or reward points as you'd like, all just for helping people around you! Imagine earning \$10 for every \$100 you order, or even getting unlimited food delivery for free. Now, that's surely a reason to organise.

Currently, PiggyBuy supports Amazon.sg and ezbuy.sg, as well as any online web store. We'll be adding more supported websites soon, so do drop us a message on Instagram @piggybuy.app or on our Facebook Page to let us know which website's you'd like to see!

Market Research & Competitor Analysis

History in Brief: Group Buys in Singapore

Group buying is not a new concept within the Singaporean market. It first rose to popularity 10 years ago, after the Great Recession of 2007 - 2009. Back then, group buys primarily took place on Singaporean forums - notably on [VR-Zone](#), where members would organise them in forum threads.

These group buys served two main purposes: to help interested parties purchase items at lower markups as compared to purchasing from local distributors, and reduce the per-unit average shipping cost when purchasing items from overseas. One such example that I personally participated in, and was popular amongst the tech community, was for an [electric duster](#), back in 2013. Each order was for a group of 4 - the optimal unit count to reduce the per-unit shipping cost while avoiding GST.

Such community initiatives were supported by the presence of certain factors that made them appealing. Firstly, shipping fees typically scale in a non-linear fashion. For example, it may cost \$20 to ship one item, but just \$24 to ship two. The per-unit shipping cost thus reduces significantly with more items ordered. Secondly, some international e-commerce websites such as Amazon offered [free shipping to Singapore](#) for orders above \$125. This itself spawned its own market, with [dedicated websites](#) launched specifically to help people group buy and take advantage of such offers.

The market, Today

Much has changed since then. The rise of local e-commerce platforms such as Qoo10 and Lazada have resulted in fairer pricing amongst local distributors, and reduced incentives for parallel importing, and hence group buying. Amazon also removed its free shipping offer for orders over \$125 in 2017. Certain specific group buy niches, such as Taobao group buys, became full-fledged companies in their own right, most notably, [ezbuy.sg](#).

Despite all this, group buys have continued to persist in the local market. The HardwareZone [forum](#) replaced VR-Zone, which itself became replaced by [Carousell](#). Many of the factors that drove its inception and growth were never fully addressed, but instead evolved. While some items became cheaper and more reasonable to purchase locally, many more did not. New markets and products soon filled the void, and opened up the doors to new group buys.

Amazon re-introduced their free shipping offer under new terms, requiring a Prime membership and a minimum order of \$60 for orders from the US instead.

The deal-loving and deal-seeking nature of the *kiasu* Singaporean continues to be the driving force behind the survival and existence of the group buy, which consistent presence proves the continued existence of a market that is still insatiable despite countless innovations in the world of e-commerce.

More recently, COVID-19 has further increased the popularity of group buying as Singaporeans look for ways to save. An initiative to save on food delivery fees began in [Sengkang](#), growing to encompass a large community, and Facebook [groups](#) have spawned to help with such activity. For some, managing such group buys have even become their full-time job.

Issues with Group Buying

Group buy organisers flock to websites such as forums, online classifieds, and social media platforms due to their large user bases. These were especially important in the past, where social media was still largely niche, and online communities were hard to come by. Platforms such as Facebook offered access to large amounts of user traffic that such people, typically individuals, could never afford to come across otherwise. As such, group buy organisers flocked to wherever they could find potential customers: first forums, then to online classifieds, and eventually to Facebook.

However, the ad-hoc nature of organising a group buy on such platforms has meant that the way group buy organisers do business has not changed in the past 10 years. These platforms primarily serve as means of advertising, but do not offer specific features to coordinate and streamline the organisation of a group buy. Taking orders, arranging payments and agreeing on collection times are thus large manual processes, handled by the organiser. It is not unusual to find large Excel spreadsheets used for the purposes of tracking purchases, often leading to human error and potential financial losses for the organiser, as well as frustration for the participant.

Where PiggyBuy stands

PiggyBuy was created as a response to this issue, providing a one-stop solution for organisers and participants alike to group buy together. Participants can see group buy details at a glance, with crucial information, such as the deposit percentage, displayed upfront. The request process is also taken care of with a standardised form, reducing the chance of human error, while being flexible enough to accommodate special requests through a remarks section. Organisers can review each and every order and confirm them, ensuring that the status of each purchase is clear to both parties. All orders stay within the application,

presented in a clear fashion, removing any confusion and eliminating the need to scroll through lengthy message threads in the event of a dispute.

Organisers can quickly and easily create listings for the group buys they would like to organise, based on the websites they would like to purchase from. PiggyBuy helps them advertise their group buys to the community around them. We also make it easy for them to monitor and track their received orders, marking them as confirmed or rejecting them as needed. The ordering process is streamlined, as a summary email containing links to all the products to be ordered, along with the accompanying quantity and remarks, is sent automatically to the organiser. Finally, the organiser can broadcast messages to all participants with one click to update them in a hassle-free manner.

The Competition

Three kinds of competition exist in this sphere: Dedicated platforms, group buying applications, and the organizers of group buys themselves. Dedicated platforms serve a specific subset of the group buying customer base that is highly specific, with consistent and reliable demand. Arguably, the only companies left in this sector today are freight forwarding companies, whose group buy model is to provide access to wholesale freight rates to the end-user. The most prominent of these are those offering Taobao to Singapore freight forwarding, such as [ezbuy.sg](#).

Features that may make them comparable to traditional group buying services is their ability to purchase on behalf, although this usually comes with an associated agent fee. While many began as a group buy (for example, ezbuy began as a thread on HardwareZone), their business models have since evolved into logistics. The introduction of base charges, agent fees and even flat-rate fee structures for parcel forwarding have transformed them into the shipping companies of old, spawning its own community of users looking to group buy to save on these fees. Therefore, we do not regard them as a competitor, but instead an enabler of PiggyBuy.

A plethora of group buying [applications](#) have sprung up in recent years too, including companies such as [WeBuy](#) and [HiMart](#). These applications, however, mostly choose to focus on emulating a different group buy model, most notably that of Pinduoduo's. Pinduoduo's group buy model revolves primarily around a centralised form of group buying. Merchants list their products, which drop in price as the total number of orders increase. In this respect, they do not target the pain points of PiggyBuy's users: to organise their own group buys and save shipping fees. They are instead an evolution of traditional e-commerce, and hence, we do not regard them as competitors. Additionally, while Pinduoduo is successful in China, the potential for such a model has yet to be proven locally.

One direct competitor, [Estatelio](#), targets the same field of group buys as PiggyBuy. Their business model is similar too, intending to begin with peer-to-peer group buys while

partnering with merchants to advertise and offer their products (and hence provide a road to profitability). However, while PiggyBuy has launched a working application (with features still in development), EstateJio has yet to launch and gain traction. This puts us on equal footing, if not ahead.

Conclusion

PiggyBuy is certainly not the first in the industry, but is poised to target a segment of the group buying customer base that has yet to be addressed by competing solutions effectively. Standing on the shoulders of the giants that have come before it, it has the advantage of learning from their mistakes. We thus believe that PiggyBuy is well-positioned to acquire a substantial user base, and hence a sizable market share, especially as it continues to develop and innovate.

Timeline and Milestones

The following events utilise the NUS academic calendar week numbers.

Week	Planned Timeline	Actual Milestones
7-8	Old Idea <ol style="list-style-type: none"> Base 2D Game [map, multiplayer] Customer contact I Interview friends and event organisers from StartupWeekend, NUSSU, NUS mental wellness for event experiences 	
9	Progress Report I	
9	New Idea <ol style="list-style-type: none"> Idea proposal and team discussion Survey creation & release Development <ol style="list-style-type: none"> Application prototype <ul style="list-style-type: none"> Data models, interactions, lo-fi UI Initial application development Set up Firebase + Flutter Develop core UI elements (home page, authentication, tabs) Marketing <ol style="list-style-type: none"> Create website and social media <ul style="list-style-type: none"> Facebook, Instagram, piggybuy.app 	New Idea <ol style="list-style-type: none"> Idea proposal and team discussion Survey creation & release <ul style="list-style-type: none"> With \$10 GrabFood voucher incentive Development <ol style="list-style-type: none"> Application prototype <ul style="list-style-type: none"> Models data drafted Lo-Fi UI sketched for main screens Initial application development Home page and tabs created Marketing <ol style="list-style-type: none"> Created website and social media <ul style="list-style-type: none"> Facebook, Instagram, piggybuy.app Draft marketing material

	<p>2. Draft marketing material</p> <p>DevOps</p> <p>1. Register for development account on iOS/Android</p>	<p>DevOps</p> <p>1. Registered for development account on Android</p>
10	<p>Idea</p> <p>1. User survey analysis</p> <p>Development</p> <p>1. Develop main features (explore, create, view details, join, activity, profile, chat, reviews & ratings, price scraper, authentication)</p> <p>Marketing</p> <p>1. Post on social media to gain traction</p> <p>DevOps</p> <p>1. Publish first release to TestFlight and Google Play Beta at end of week</p>	<p>Idea</p> <p>1. User survey analysis and contact report</p> <p>Development</p> <p>1. Developed: explore, profile and authentication</p> <p>Marketing</p> <p>1. Social media posts made</p> <p>DevOps</p> <p>1. iOS developer account registered</p>
11	Progress Report II	
11	<p>Development</p> <p>1. Testing 2. Bug fixes 3. Evaluate new features</p> <p>Marketing</p> <p>1. Prepare marketing campaign</p> <ul style="list-style-type: none"> • Print posters for HDB flat notice boards • Get friends in various areas of Singapore to seed the application with group buys • Prepare messages for posting on NUS club newsletter and Telegram groups <p>In-Class Presentation</p> <p>1. Prepare for in-class presentation</p> <p>DevOps</p> <p>1. Publish first release to App Store and Google Play at end of week</p>	<p>Development</p> <p>1. Developed: create, view details, edit profile 2. Removed features for priority: activity, reviews and price scraper</p> <p>Marketing</p> <p>1. Continued posting on social media</p> <p>In-Class Presentation</p> <p>1. Created slides and rehearsed for in-class presentation</p> <p>DevOps</p> <p>1. Read up and double-check submission guidelines for App Store and Google Play</p>

In-class Presentation		
12	<p>Development</p> <ol style="list-style-type: none"> 1. Implement new features 2. Testing & bug fixes <p>Marketing</p> <ol style="list-style-type: none"> 1. Launch marketing campaign <ul style="list-style-type: none"> • Paste posters on HDB flat notice boards • Send emails on NUS clubs newsletter • Post on NUS Telegram groups 2. Think of more creative ways to market the app <p>STePS</p> <ol style="list-style-type: none"> 1. Prepare for STePS Upload poster, video and description <p>DevOps</p> <ol style="list-style-type: none"> 1. Publish update to App Store and Google Play at end of week 	<p>Development</p> <ol style="list-style-type: none"> 1. Developed: join, chat 2. Testing & bug fixing <p>Marketing</p> <ol style="list-style-type: none"> 1. Continued posting on social media <p>STePS</p> <ol style="list-style-type: none"> 1. Created STePS video and presentation <p>DevOps</p> <ol style="list-style-type: none"> 1. Submitted first release for App Store and Google Play
13	<p>Development</p> <ol style="list-style-type: none"> 1. Implement new features 2. Testing & bug fixes <p>Marketing</p> <ol style="list-style-type: none"> 1. Marketing for STePS <p>STePS</p> <ol style="list-style-type: none"> 1. Presentation and booths <p>DevOps:</p> <ol style="list-style-type: none"> 1. Publish update to App Store and Google Play at end of week 	<p>Development</p> <ol style="list-style-type: none"> 1. Testing and bug fixes <p>Marketing</p> <ol style="list-style-type: none"> 1. Updated on App Store and Google Play <p>STePS</p> <ol style="list-style-type: none"> 1. Presentation and booth session <p>DevOps</p> <ol style="list-style-type: none"> 1. Seeded application with group buy <ul style="list-style-type: none"> • Organised by Daniel and Agnes 2. Launched marketing campaign <ul style="list-style-type: none"> • 10% off orders placed for Amazon.sg • 3x \$10 GrabFood Voucher giveaway for newsletter subscribers
Reading	<p>Development</p> <ol style="list-style-type: none"> 1. Testing & bug fixes <p>Marketing</p> <ol style="list-style-type: none"> 1. Wrap up marketing campaign 	<p>Development</p> <ol style="list-style-type: none"> 1. Developed: Reviews and ratings, notifications 2. Testing and bug fixes

	<p>DevOps</p> <ol style="list-style-type: none"> 1. Publish update to App Store and Google Play at end of week <p>Final Report</p> <ol style="list-style-type: none"> 1. Write final report 	<p>Marketing:</p> <ol style="list-style-type: none"> 1. Conclude STePS giveaways and promotional offer <p>DevOps</p> <ol style="list-style-type: none"> 1. Updated on App Store and Google Play <p>Final Report</p> <ol style="list-style-type: none"> 1. Wrote final report
Exam	Final Report	

Previous Idea

We had initially embarked on an idea to create virtual experiences for booth-based events. However, after 2 weeks of development and market research (week 8-9), we could not find an audience for such a product. This was affirmed at our meeting for Progress Report I, where Prof. Ben and Uncle Soo expressed their doubts and concerns at the viability of such a product. Two weeks of our time was thus lost to this.

We then decided to pivot to our current idea, PiggyBuy, despite some disagreement within the team. Through an online survey, we were able to quickly gather market data and evaluate potential interest as well as commercial feasibility of our application. The survey turned largely in favour for us, with respondents validating almost all the pain points we had predicted. Development began in parallel. (week 10)

Development Delays

By Progress Report II (week 11), we had made up for lost time with regards to product development. However, development for our application snowballed due to a combination of factors: we were unfamiliar with Flutter, and had forecasted an overly-ambitious timeline. We had intended for all the features to be developed within the span of two weeks, which turned out to be challenging for the team, with only two of us having prior experience with iOS/Swift. Flutter also turned out to be structurally different from Swift, which further compounded our delays as we took a week to establish the base structure and layout of components within the application.

Features Removed

We also decided to remove a few features in order to launch on time for STePS: reviews and ratings, activities, and price scraper. This was a double-edged sword as the reviews and ratings, as well as the price scraper were features that were common on other similar applications, helped establish trust amongst users, and enhanced the overall user experience. Similar concerns were echoed during STePS by Prof. Ben. We concluded, however, that STePS was important for marketing PiggyBuy, and we would stand to lose out

should we not be able to deploy at this juncture. We thus deemed these features as not absolutely necessary to organise a group buy, and picked the lesser of the two evils.

STePS

STePS (week 12) marked the launch of our first release on both the App Store and Google Play. We focused more heavily on marketing this week, choosing to opt for a newsletter signup promo involving 3x GrabFood voucher giveaways, as well as 10% off all Amazon.sg orders this week. The voucher cost was split across the team, and the 10% off Amazon.sg orders came was funded by a 10% cashback offer on the CIMB Visa Signature credit card, as well as a 10% cashback from Shopback. This meant that we would be able to profit off orders while offering a discount.

Development at this stage was focused on fixing crucial bugs in the user workflow. Three updates were deployed within the span of a week to fix various issues that had been found by our new users as well as our existing beta testers.

Effects on Marketing

Because of the removed features, we did not pursue the full extent of our original marketing plan. We had initially planned to put up posters and advertise the application to the public, but did not do so. Instead, we focused on marketing at STePS and the SoC community, through the Computing Club weekly newsletter. Our justification for doing so is explained in the User Adoption section below.

Final Report

After STePS, we decided to implement the crucial features that we had cut earlier, notably, ratings and reviews. We also decided to add in notifications, which had been omitted prior to this version. Testing and bug fixes were also performed. The ETA for this development was set to coincide with the final report.

Our STePS marketing campaign was also concluded with an email sent out to all our newsletter participants thanking them for their support. Finally, the writing of the final report concluded PiggyBuy's journey in CS3216.

Individual Contribution and Roles

Team Overview

Daniel Wong	Yoke Kai Xin	Agnes Natasya	Tan Teik Jun
Team Lead Business development Marketing Backend developer DevOps	Tech Lead Backend Lead Full-stack developer	UI/UX Lead Full-stack developer Marketing	Web developer Full-stack developer Data Analytics

Daniel Wong

Daniel was Team Lead and helmed the direction of PiggyBuy throughout its development. He led the product development process, formulating survey questions and performing market research to determine the appropriate pain points and features to include in the application. He also conceived the marketing plan for the application, and ensured that the business aspect of PiggyBuy was taken care of completely. Additionally, he also took part in development implementing the authentication and profile features, and helped with testing and debugging, being the sole iOS user in the team. Lastly, he served the role of DevOps, managing the app listing and deployment to the various app stores.

Daniel also served a managerial role, deciding on the priorities of tasks and making executive decisions when necessary, especially with regards to the development timeline. He also managed conflicts between team members, and arranged in-person, bi-weekly meetings to facilitate development. Lastly, he took charge of the bulk of writing, creating both the marketing copy as well as the necessary reports.

Yoke Kai Xin

Kai Xin served as our Tech Lead, doubling up as a backend lead and full-stack developer. As tech lead, she was responsible for deciding the structure of our application and establishing good code practices throughout our application. She managed the data models, layouts, and code structure of the application from front-to-back, making up the bulk of the application's development. Additionally, she maintained issues on GitHub, coordinated merge conflicts, and provided technical assistance to the other team members.

Kai Xin also served as the primary contact point for evaluating the technical feasibility of features within our application. Without her, development would have been a messy, undirected affair. She was crucial in creating a smooth and goal-oriented development process for all.

Agnes Natasya

Agnes served as our UI/UX lead. She conceived our colour scheme, designing and implementing most of the screens within PiggyBuy. Despite focusing primarily on the front-end, she also wrote code for backend integration, and managed testing of the user interface. She also helped create the bulk of the marketing material, and managed our Instagram account.

Agnes was instrumental to most of the praise we had received regarding the pleasing aesthetic of the application. She made sure that any outward-facing material used fell within the look and feel that PiggyBuy needed to portray, supervising the design of our presentation slides and website, in addition to her own marketing material, such as the poster. Without her, PiggyBuy would not have the signature look it has today.

Tan Teik Jun

Teik Jun served as our web developer as well as a full-stack mobile developer. He built our web application (piggybuy.app) and managed the mailing list. He worked on backend and frontend development, and ensured the quality of user experience and design for our mobile application. Additionally, he handled the data analytics and visualization for our user surveys and applications.

Teik Jun helmed the development of crucial features such as chat and notifications. He ensured that all features of the application were robust and worked well even in edge cases. He integrated the various parts that make up our application, took charge of bug-squashing and ensured a delightful user experience when using our application.

External Parties

We would also like to thank Prof. Ben for tolerating our idiosyncrasies and pointing us in the right direction in a time of uncertainty for the team. He helped provide much of the confidence and assurance needed for the team to push ahead with PiggyBuy despite concerns and doubts. His constant reminder to solve the right problem became a guiding principle for the team. Without him, PiggyBuy would likely not even exist.

Uncle Soo also played an instrumental role in the team, encouraging us when we were at our low points, and affirming us when we were unsure about ourselves. He lifted our spirits and gave us confidence to do what we did, and was truly a fatherly figure to us within CS3216.

Application Design of PiggyBuy

PiggyBuy is a cross-platform native application created using Flutter and Firebase. We used a Model-View-Controller design pattern for PiggyBuy's architecture. The architecture design of PiggyBuy is shown in the following diagram.

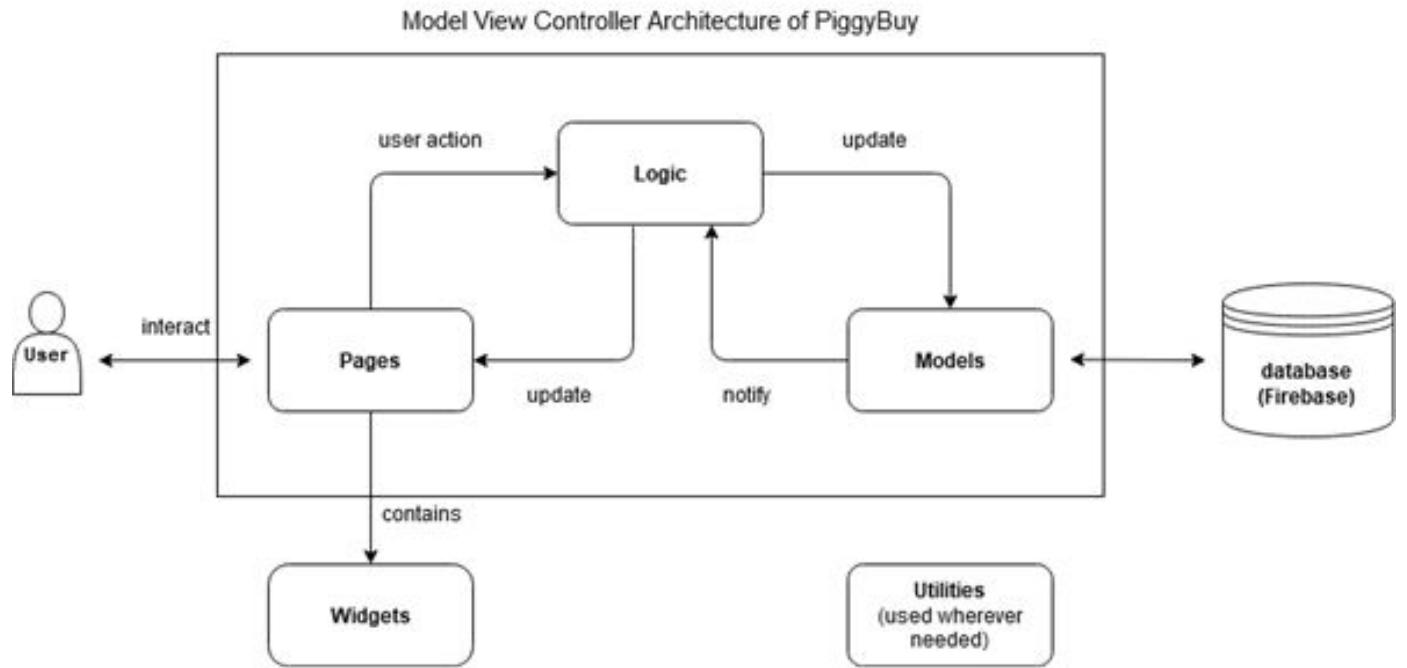


Figure 1: Architecture Design of PiggyBuy

Pages display the visual information that we can see and interact with in PiggyBuy. Each page is composed of widgets, which encapsulates specific parts of the page. Pages send actions to the Logic component for manipulating data.

The Logic layer contains services that handle complicated processes. These services include notification, authentication and storage methods that are used to access the database. The Logic layer abstracts complicated processes from Pages and provides the interface between Pages and Models.

Models define the data for the application. This includes model objects like Users, GroupBuys and Requests. When the data is updated, the Logic layer is notified and updates the Pages accordingly.

We used a Model-View-Controller architecture so that our application is more easily extensible. By separating these concerns, the model objects can be easily reusable throughout our application.

The data described by the Models are persisted in the database. We used Firebase, a noSQL database management system, for our database. The noSQL database schema is detailed in the next section.

Database Schema

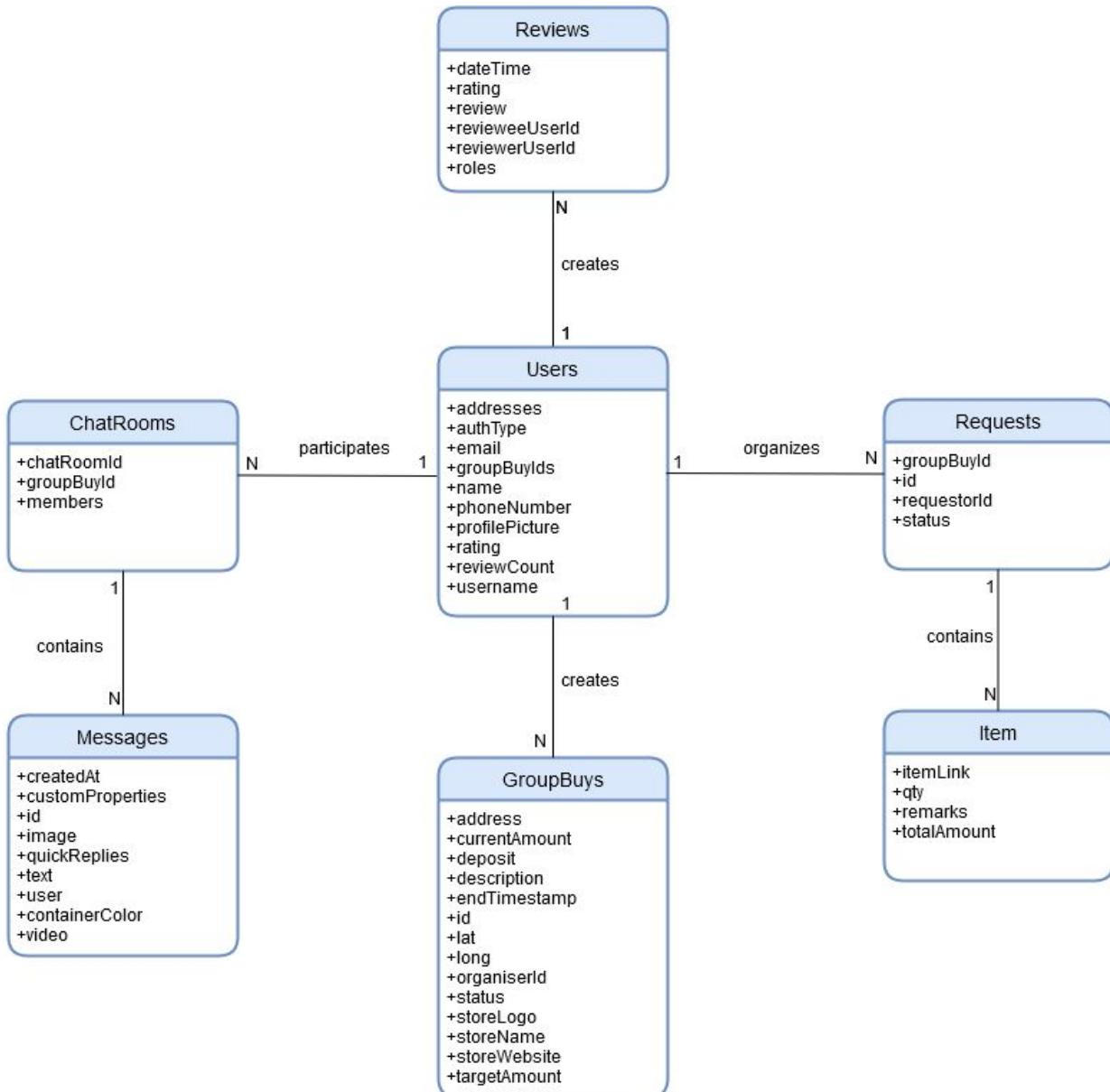


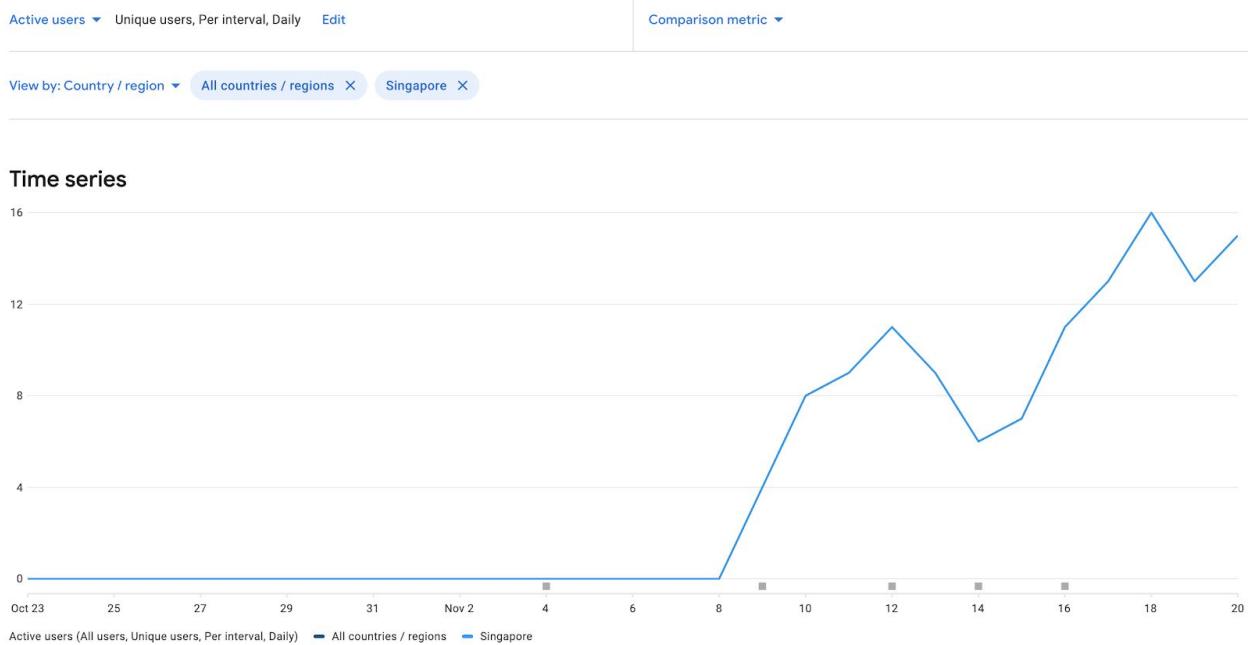
Figure 2: Database Schema of PiggyBuy

To briefly summarise the semantics of our database schema:

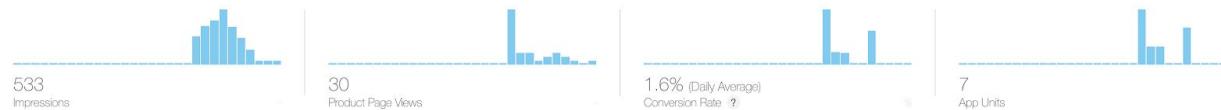
Users can create Requests to join GroupBuys, with each Request consisting of individual items. Users can also organize GroupBuys. Next, Users can participate in ChatRooms, which is composed of ChatMessages. Finally, Users can leave Reviews for other Users (both organizers and piggybackers)

User Adoption

Google Play Store Active Users



App Store Active Users



Full analytics from the App Store and Google Play are attached in the appendix.

On Google Play, we have 16 active users across 17 active devices and 33 unique impressions on our store listing, with a 65% conversion rate for app downloads.

On iOS, we have 7 units purchased, with 533 impressions on the App Store and 30 store listing views.

This places us at a total of 23 active users across both iOS and Android combined. This number comprises users who have installed our application and have continued to actively use it.

Analysis

PiggyBuy, in its current iteration, has a low user count and low install base. It does, however, maintain a decent conversion rate on the app stores, with a significant number of users who view the listing choosing to install and try the application.

When considering these numbers, the timeline in the previous section of this report must be referenced. In order to launch on time at STePS, crucial features, such as reviews and ratings,

as well as the price scraper, were cut to enable deployment on the app stores on time. We had deemed STePS important enough an event for marketing PiggyBuy to justify doing so. This turned out to be the right move, as it helped make PiggyBuy's concept known, validated its premise, and helped us win 3rd place at STePS.

Like many other e-commerce applications, PiggyBuy's success will depend heavily on the user trust and reputation it establishes and maintains, relative to its peers in the market. Without features such as reviews and ratings to help establish trust between users, we felt that it was inappropriate and unsuitable to launch a full-scale marketing campaign and onboard users en-masse. In all likelihood, doing so would harm PiggyBuy's future instead, creating a negative impression of the app in the eye of the general public, and compromising its chances of success.

Our marketing campaign was thus much more subdued than originally planned. It consisted mainly of our friends, and users from NUS Computing Club email newsletter. From these, we managed to run a total of 2 group buys, with transaction volume totalling about \$200 SGD. One of our group buy participants was an organic user, who signed up in response to the NUS computing club email.

We consider our low user count to be the most appropriate thing to do at this juncture of development. Being able to scale down the operation to just friends and family gives us the opportunity to retain control over the process, preventing any fiascos from happening, especially due to the sensitive nature of monetary transactions. Additionally, it also gave us the benefit of being able to validate our user workflow, and take feedback from each of them to ensure that the application addressed their needs sufficiently. Overall, the small-scale use of the application was timely, and turned into a platform for us to evaluate the application before launching at a larger scale.

Conclusion

We believe that PiggyBuy's short term goals and demands should not come in the way of its long-term success. Through our time at STePS, and receiving feedback from family, friends and strangers alike, we believe strongly that PiggyBuy's market is real and full of potential to tap into. Keeping the application small with a low user count enables our small team of 4 to comfortably manage the application, keeping PiggyBuy's reputation positive, while focusing on the continued development of new features.

Future Plans

Through our time in CS3216, PiggyBuy has become akin to a dear child to each member in the team, and we felt that it would be an absolute waste and pity if we did not at least try our hands on making it a success. We have therefore decided to take the following steps, starting from the upcoming winter break.

Where PiggyBuy stands

When developing PiggyBuy, one question we were often asked and faced with ourselves was our decision to use a mobile app instead of a progressive web app (PWA). In reality, this was done for the long-term good of PiggyBuy: While a PWA would have sufficed for the purposes of CS3216 alone, the limitations of not being able to receive notifications on iOS would have been a deal breaker for a public launch of the application. Writing a PWA would thus put us in a situation where we would have to re-write the application for mobile devices - and this would put a stop in our desire to continue with development.

Having chosen a mobile application, most of the groundwork has been laid for PiggyBuy to continue in development as a side-hobby. PiggyBuy being native has become a large reason behind our decision to continue with it.

Completeness of Feature Set

As mentioned above, some features we deemed crucial were removed in order to hit our deployment target at STePS. We thus plan to work on completing PiggyBuy's feature set, improving the ratings and reviews system, adding a price scraper, as well as displaying an activity log to the user. These will be the focus of development in the upcoming weeks, after CS3216 has concluded, with the goal of delivering a complete and comprehensive e-commerce experience to each of our users.

Further testing amongst friends & family

Throughout the process of development, we plan to continue testing amongst our friends and family. This will give us real-world insights with regards to the concerns and potential pain points our users may have when using PiggyBuy, enabling us to iron out kinks in our user workflow. We also hope to polish the application and iron out bugs that may impact our users.

Pitching - I&E Practicum and more

It would also be a pity if we did not put the varied skills we have learned in CS3216 to good use. We are strongly considering pitching for the I&E practicum award next April. The funds we obtain will enable us to launch a small-scale pilot test involving NUS Computing and the various residential halls, as well as pay for any related server and development costs that we have incurred thus far.

The I&E practicum will serve as a crucial opportunity to take PiggyBuy from a side project to a full-scale company, which we fully believe it has potential to become.

Profitability

At the end of the day, PiggyBuy's model of facilitating peer-to-peer group buys is not a profitable one. However, it is effective in capturing users who are interested in purchasing items in such a format. In order to attain profitability, we aim to pivot to a group buy model where stores can organise their own group buys, delivering to specific neighbourhoods. PiggyBuy will charge a commission in exchange for advertising, and an easy reach to a large customer base. To achieve this, we plan to partner with group buy organisers that already do so, such as the Groupbuysg Facebook Page. This serves to be a win-win model, as we offer them an easy way to organise group buys, while gaining the opportunity to learn inside information and form industry connections with the various merchants.

Long-Term Goals

We firmly believe that the opportunity exists for PiggyBuy to be the leading social commerce platform for Singaporeans to group buy and save. We see strong potential for this sector to grow in the next few years, with many companies and competing apps looking to enter the market. PiggyBuy adopts a user-focused, user-first approach to group buys, and we believe that this will put us ahead of our competitors and provide us the much needed differentiating factor to succeed. Just like how Pinduoduo rose to fame quickly in China, we believe that PiggyBuy can do so for the Singapore market too.

Insights from Final Project

We learned a lot through our final project journey, with many ups and downs throughout the process. The following are three of our most important lessons from our time in CS3216.

Solving the right problem vs solving the problem right

In the entirety of our formal education from young, education has revolved around learning to solve a problem right. We learn methods to approach various problems given to us, whether it be the PEEL structure to essays, or simultaneous equations to solve algebraic equations.

CS3216 took a fundamentally different approach, tasking us to find the right problem to solve while solving it right. This caught us off guard, and we spent an extensive amount of time looking for a problem to solve. This turned out to be very difficult, as many problems that need solving have already been solved, and problems that have not been solved just are simply not worth solving.

This was certainly the case for our initial idea. While on paper it sounded like it had potential, there was simply no market for it. Companies wanting to host virtual events had the budget to pay for highly customised event software that we would not come remotely close to rivalling. Smaller organisations and non-profits would choose instead to host a simple event via Zoom.

When pivoting to PiggyBuy, we were unsure of the reception we would receive from the market. Our positive user survey gave us the assurance to push forward. However, STePS was a turning point, as we received validation from many visitors with regards to the usefulness of our application. It was at that point that we realised that we had finally got it right with PiggyBuy: it was a real problem worth solving.

Democracy is bullsh*t

We had chosen to pursue our initial idea on the premise of a democratic vote. In theory, this ensured the fairest vote amongst all our members. In reality, it simply showed the lack of consideration for each idea, and reflected on the personal inclinations of each member. We quickly ran into unsolvable roadblocks and issues for the ideas we had picked, rendering it a non-starter.

What we should have done, instead, was what Prof Ben suggested. We should have had each member pitch their idea, and have all other members try their best to destroy it. This would have the consequence of leaving only the best idea standing, while addressing the various concerns each member has. This is perhaps the most crucial learning point for all of us, and one that will serve us well in the future to come.

Long-term vs Short-term

PiggyBuy is not successful yet by any stretch of the imagination. Much advice given to us thus far has been about how we should have chosen to use a Progressive Web Application (PWA) instead, and be more aggressive at marketing.

These are no doubt true. However, it takes a certain amount of courage to stand up against the trend and pick the best situation for ourselves. With regards to PWA, we had always considered a native app to be the only suitable platform for an e-commerce application, and did not want our final project to simply become a proof of concept for a future iteration of PiggyBuy. The decision to stick with native was thus one that was frequently opposed, but stuck with by the team.

With regards to our marketing and user count, our team sat down and deliberated launching a campaign for the sake of presenting numbers in the final report. However, we decided that doing so would be unwise. It would not make sense, and instead be foolish, to exchange PiggyBuy's potential for our grades. Therefore, we decided to present an honest analysis of our situation, and be grateful for what we have, putting our focus in the future instead.

Appendix A: Google Play Store Analysis

Google Play Console PiggyBuy

[All apps](#)

[Dashboard](#) 1

[Inbox](#)

[Statistics](#)

[Publishing overview](#)

Release Add filter

[Last 30 days](#)

Store analysis

Monitor your store listing performance across dimensions. [Show more](#)

Your new acquisition report features new metrics. The data you see will be different from the classic report. [Learn more](#)

Store listing acquisitions by traffic source [View conversion analysis](#)

Oct 21, 2020 - Nov 19, 2020

Traffic source

Traffic source	Store listing acquisitions	vs. previous period
All traffic sources	21	- →
Google Play search	10	- →
Third-party referrals	10	- →
Google Play explore	1	- →

Store listing performance

Store listing visitors 32

Store listing acquisitions 21

Store listing conversion rate 65.63%
 +65.63% vs. previous period

Countries / regions Explore →

Country / region	Store listing acquisitions	vs. previous period
Singapore	19	- →
United States	1	- →
Unknown Region	1	- →

Languages Explore →

Language	Store listing acquisitions	vs. previous period
English (United Kingdom)	11	- →
English (United States)	6	- →
English (Singapore)	3	- →
Chinese (China)	1	- →

Search terms Explore →

Search term	Store listing acquisitions	vs. previous period
Other	10	- →

App install states Explore →

App install state	Store listing acquisitions	vs. previous period
New users	18	- →
Returning users	3	- →

UTM sources ⓘ				UTM campaigns ⓘ			
UTM source	Store listing acquisitions	vs. previous period		UTM campaign	Store listing acquisitions	vs. previous period	
Other	10	-	→	Other	10	-	→
Explore →				Explore →			
Store listings ⓘ							
Store listing	Store listing acquisitions	vs. previous period					
Main store listing	21	-	→				
				Explore →			

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Appendix B: Google Play Active Users

Google Play Console Search Play Console PiggyBuy Profile

All apps Statistics

Dashboard Inbox 1 Statistics Publishing overview

Release Releases overview Production

Testing Open testing Closed testing Internal testing Pre-registration

Pre-launch report Overview Details Settings

Device catalog App bundle explorer

Statistics

View customisable, detailed reports about the performance of your app. [Show more](#)

You can now plot acquisition, loss, update, and ratings performance by device type

Configure report Saved reports Save this report Export report Last 30 days

Active users Unique users, Per interval, Daily Edit Comparison metric

View by: Country / region All countries / regions Singapore

Time series

Active users (All users, Unique users, Per interval, Daily) — All countries / regions — Singapore

Growth rate vs. peer group: Shopping

The % difference between one interval and the immediately preceding one

Peer group: Shopping Display: All countries / regions

Active users (All users, Unique users, Per interval, Daily)

All countries / regions — Peers' median — Peer range

Change analysis

Countries / regions with the largest change between the first interval in your selected period and the last interval with complete data

Include selected Countries / regions

Active users

Active users (All users, Unique users, Per interval, Daily)

Data table

Days	All countries / regions	Singapore
Nov 20, 2020	15	15
Percentage of total	100%	100%

+/- vs previous period vs peers median		15.38%	15.38%
Nov 19, 2020	13		13
Percentage of total	100%		100%
+/- vs previous period vs peers median	-18.75%		-18.75%
Nov 18, 2020	16		16
Percentage of total	100%		100%
+/- vs previous period vs peers median	23.08%		23.08%
Nov 17, 2020	13		13
Percentage of total	100%		100%
+/- vs previous period vs peers median	18.18%		18.18%
Nov 16, 2020	11		11
Percentage of total	100%		100%
+/- vs previous period vs peers median	57.14%		57.14%
Nov 15, 2020	7		7
Percentage of total	100%		100%
+/- vs previous period vs peers median	16.67%		16.67%
Nov 14, 2020	6		6
Percentage of total	100%		100%
+/- vs previous period vs peers median	-33.33%		-33.33%
Nov 13, 2020	9		9
Percentage of total	100%		100%
+/- vs previous period vs peers median	-18.18%		-18.18%
Nov 12, 2020	11		11
Percentage of total	100%		100%
+/- vs previous period vs peers median	22.22%		22.22%
Nov 11, 2020	9		9
Percentage of total	100%		100%
+/- vs previous period vs peers median	12.5%		12.5%

Show rows: 10 ▾ 1 - 10 of 12 | < < > >|

Appendix C: Google Play Active Devices

Google Play Console Search Play Console PiggyBuy Profile

All apps Dashboard Inbox Statistics Publishing overview

Statistics

View customisable, detailed reports about the performance of your app. [Show more](#)

You can now plot acquisition, loss, update, and ratings performance by device type

Configure report Saved reports Save this report Export report Last 30 days

Active devices ▾ Unique devices, Per interval, Daily Edit Comparison metric ▾

View by: Country / region ▾ All countries / regions X Singapore X

Time series

Active devices (All devices, Unique devices, Per interval, Daily) All countries / regions Singapore

Growth rate vs. peer group: Shopping

The % difference between one interval and the immediately preceding one

Peer group: Shopping ▾ Display: All countries / regions ▾

Active devices (All devices, Unique devices, Per interval, Daily)

Change analysis

Countries / regions with the largest change between the first interval in your selected period and the last interval with complete data

Include selected Countries / regions

Active devices

Active devices (All devices, Unique devices, Per interval, Daily)

Data table

Days	All countries / regions	Singapore
Nov 20, 2020	17	17
Percentage of total	100%	100%

+/- vs previous period vs peers median		21.43%	21.43%
Nov 19, 2020	14	14	14
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	-6.67%	-6.67%	-6.67%
Nov 18, 2020	15	15	15
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	15.38%	15.38%	15.38%
Nov 17, 2020	13	13	13
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	-	-	-
Nov 16, 2020	13	13	13
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	62.5%	62.5%	62.5%
Nov 15, 2020	8	8	8
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	-	-	-
Nov 14, 2020	8	8	8
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	-20%	-20%	-20%
Nov 13, 2020	10	10	10
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	-23.08%	-23.08%	-23.08%
Nov 12, 2020	13	13	13
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	8.33%	8.33%	8.33%
Nov 11, 2020	12	12	12
Percentage of total	100%	100%	100%
+/- vs previous period vs peers median	9.09%	9.09%	9.09%

Show rows: 10 ▾ 1 - 10 of 12 | < < > >|

Appendix D: Google Play Store Listing Conversion Analysis

Google Play Console PiggyBuy

Search Play Console

Device catalog App bundle explorer Setup App signing Internal app sharing Advanced settings

Store listing conversion analysis

Analyze your store listing visitors, acquisitions, and conversion rate. [Show more](#)

Configure report Export report [Last 30 days](#)

View by: Country / region All countries / regions + Country / region

Grow Add filter

Store presence

- Main store listing
- Custom store listings
- Store listing experiments
- Store settings
- Translation service

Store performance

- Store analysis
- Conversion analysis**

Quality

Ratings and reviews

Store listing visitors, acquisitions, and conversion rate by country [Oct 22, 2020 - Nov 20, 2020](#)

Store listing visitors

Store listing visitors — All countries / regions

Store listing acquisitions

Store listing acquisitions — All countries / regions

Store listing conversion rate [Peer group: Shopping](#) [Display: All countries / regions](#)

Store listing conversion rate — All countries / regions • Peers' median (All countries / regions) ● Peers' range (All countries / regions)

Country / region	Store listing visitors	Store listing acquisitions	Store listing conversion rate	Conversion rate vs. peers (28-day)
Selected countries / regions				
All countries / regions vs. previous period	33	22	66.67%	16.03%
Other countries / regions				
Singapore vs. previous period	28	19	67.86%	17.86%
United States vs. previous period	2	2	100%	54.78%
Hong Kong vs. previous period	1	0	0%	-42.86%
Indonesia vs. previous period	1	0	0%	-22.81%
Unknown Region vs. previous period	1	1	100%	53.85%

Show rows: 10 1 - 5 of 5 | < < > >|

Appendix E: App Store Analytics

App Store Connect App Analytics ▾

PiggyBuy ▾

Daniel Wong ▾
Daniel Wong (1) ?

Overview

Metrics

Sources

Retention

About App Analytics Data ?

Last 30 Days (Oct 22-Nov 20)

533 Impressions

30 Product Page Views

1.6% (Daily Average)
Conversion Rate ?

7 App Units

\$0 Sales

\$ (Daily Average)
Sales per Paying User ?

2.4 Sessions per Active Device
Opt-in Only

0 Crashes
Opt-in Only



App Units by Territory

Singapore 6

App Units by Source



100% (6)
App Store Search

0% (0)
App Referrer

0% (0)
App Store Browse

0% (0)
Web Referrer

⚠ Some items can't be included in this chart because there isn't enough data.

App Units by Device

Retention ?
Opt-in Only



100% (6)
iPhone

- (0)
iPad

- (0)
Desktop

- (0)
Apple TV