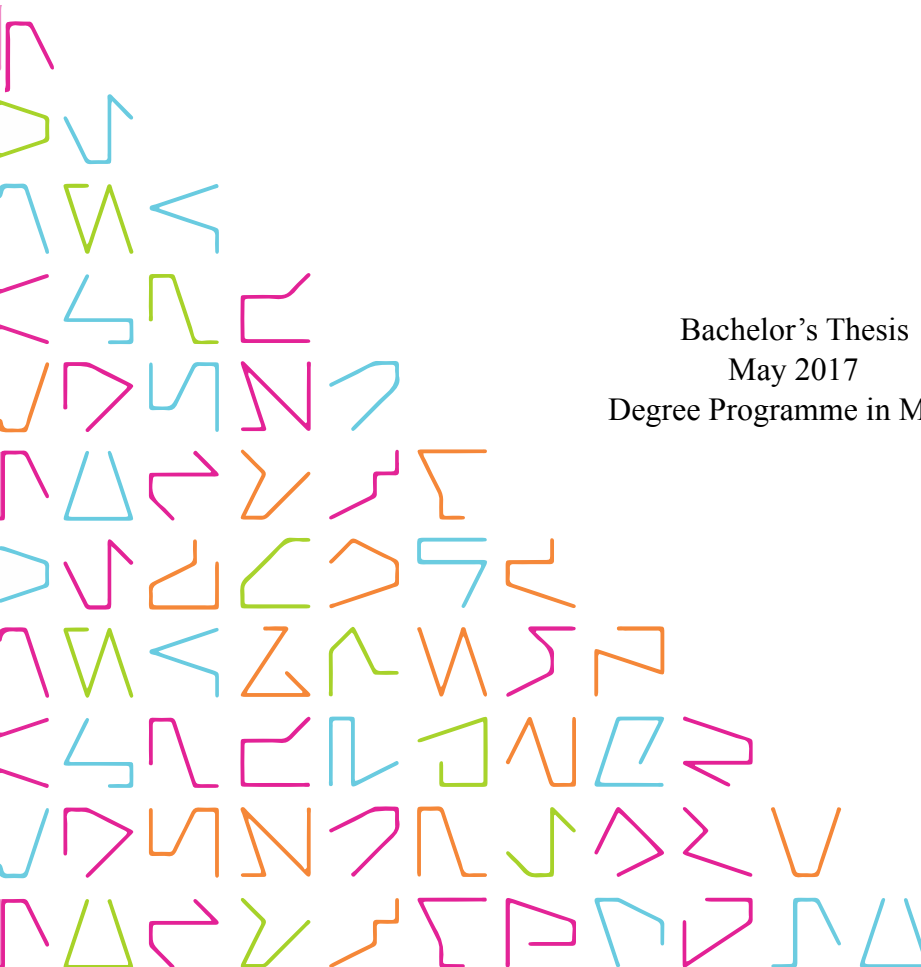


HOW TO MOTIVATE COLOURING APP USERS

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ABSTRACT

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One of the more challenging aspects of app development is retaining one's existing users or retention rate. Human attention is a scarce commodity and requires refining the app's user experience to be as habit-forming as possible. Competition is fierce, and endless new trends result in a rather bleak industry retention average, in which a typical app loses 90% of its active users within 30 days.

The immediate objective of this study was to recognise the existing retention pitfalls of a popular colouring app through a quantitative analysis of its user base. Subsequent to this, assumptions for the likely causes were backed up by data and improvements inspired by gamification concepts tested and confirmed with individual A/B tests. In this study, small changes to the experience in the problem areas identified by the quantitative analysis resulted in almost a double user retention. The results indicate the great benefit of this approach, and which would be hard to find only using only a qualitative analysis. Further analysing other areas with this method, which is not within the scope of this study, may provide further insights for this and future projects.

Keywords: retention, gamification, mobile development, user experience

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GLOSSARY

Retention	Retaining or keeping something. In a mobile development context, this means the act of keeping new user using an application.
Churn	A measure of the number of users leaving the collective group over a given period.
Gamification	The application of typical elements of game playing (such as point scoring and competition) to other areas of activity.
Templates	Black and white line drawings consisting of individual cells which users can tap to fill with their chosen color.
A/B testing	A/B test is a method of comparing multiple variants of an app against each other. In an A/B experiment, different variants of a design are shown to users at random, and statistical analysis is used to determine which performs better for a given goal.
Freemium	An app is offered free-of-charge, but only with limited functionality.

1. INTRODUCTION

What attracts us to use certain applications, games, and websites or even some brand products hours on end day after day; without any obvious tangible reward or reason. How a few bits of code displayed on the screen can seemingly control our minds at times and why do we get such pleasure from it? Are we just looking to spend some free time, like we often say, or is there more behind it. Why during these times, we reach for these popular games, applications and services and more importantly why these same ones.

In the United States, nearly half of the population play some game, men and women in equal proportions (PewResearchCenter 2015). With similar research results in most countries ranging from all age groups to all demographics. When including social media, Youtube and so forth, the whole world with a capable device, are equally happy with these habits reaching their phones astounding 150 times a day (Hooked 2014). Call it procrastination or a kind of escapism, these technologies we use have turned into compulsions. So it must be evident there is something deeper. The question remains, how exactly some of the most successful apps and services tap so firmly in these behaviours of ours.

This thesis is about most mobile developers toughest problem; Retention (Pocketphilosopher 2016). Often this does not imply necessarily a lack of some core feature, better ease of use or any polish, but of lost motivation. In fact, “Our product is great! Users can do this; users can do that, and they can even do these things!” is the pitfall many companies fall into while ignoring the “why” (Actionable Gamification 2014). Why being the difference between plain efficiency and ease of use as opposed to fun and excitement - human focused app development. Why also being the difference with a popular app or a service and one that is not. Throughout this thesis, the author will be studying to understand the human-focused side of this better. Speculate how to motivate users through these basic human factors with Gamification principles, the preeminent field studying these as later explained. And furthermore, share his findings using a fairly popular iOS Colouring Application as his testing platform.

2. FROM COLOURING BOOKS TO RECOLOR

Colouring books found their way to the stressed out adult population as a tension reliever some years ago. As different mindfulness and de-stress movements had begun trending one after another, this popular kid's pastime began helping busy grownups unwind and ease symptoms such as anxiety. Studies had shown colouring books work similar to meditation and help colorists block out negative thoughts. Encouraging a focus on the moment. (Medicaldaily 2015)

Bringing this to the wider audience, with the addition of the word adult, separating it from the kid's relationship and along with the mentioned marketing terms mindfulness and de-stress borrowed from the lifestyle side. One of the first adult colouring books “Secret Garden” and “Enchanted Forest” from Johanna Basford launched its way to the number one best-selling books in 2015 (National Post 2015). Quickly pursued by countless of other authors. Following this ever growing adult colouring book trend from early 2015. We at the company I work for Sumoing Oy started building Recolor, a digital adult colouring book for iOS application later that year. Sumoing as a company has a strong history inside the creative applications space already (camera, photo editing, etc.), and to our surprise Appstore at the time did not have many such apps. We had the expertise and know-how to create something great for the colouring book lovers out there.

Recolor works on iOS touch devices, iPad and iPhones, by tapping and filling the empty areas of a selected colouring picture. Colouring pictures can be chosen from Recolor's growing library of over 700 templates (June 2016) — with new pictures added daily in the dailies category. Each template is categorised by different themes from mandalas to animals to fantasy and more, and users can also scan their drawings by using the phone's camera. In addition to the basic 2D colouring templates, Recolor also features 3D colouring objects that work similarly but on 3D surfaces in 3D space. Additionally, as an option to the basic flat colours, Recolor has an extensive list of gradients and moving live colours, and can be exported with different canvas textures, metal, pencil, and other finalising effects.

3. WHAT IS RETENTION

Nothing is more important than keeping applications users, and one of the most important metrics when measuring user loyalty is retention graphs (Pocketphilosopher 2016). In standard terms when we speak of retention, we are interested in Day 1, Day 7 and Day 28 retentions. With retention graph, a retention for Day X is the percentage of users who have been active at least once in the last X days. For example, Day 7 means seven days after the start date of the retention graph.

As an example below using from Recolor's Fabric Analytics measurements (Figure 1). Out of the roughly 90 000 people who installed Recolor on March 23rd (2016), about 26 000 or 28% were active the next day March 24th. Meaning for that particular day, Recolor's Day 1 Retention was 28%. On that same day, users who installed Recolor 14 days ago, roughly 45% were active during the last 14 days resulting in Day 14 retention being 12%. A note, however, this does not mean the user has uninstalled said application. Holidays, events and updates can also influence significantly as later explained and as such, should not be interpreted within a short time frame.

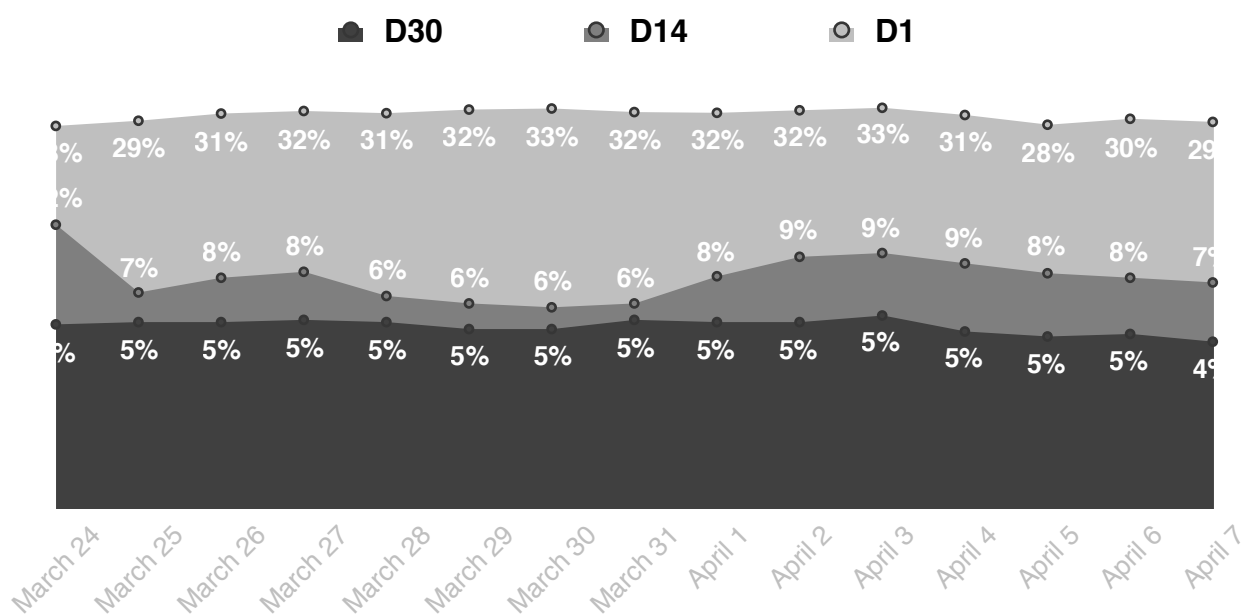


Figure 1. Recolor Retention March 24 - April 7 (Fabric)

3.1 The Reality and Viable Retention

Andrew Chen, a Silicon Valley-based investor, and blogger, estimates in a 2015 published article on his blog that the average app loses 77% of its DAUs (Daily Active Users) within the first three days after installation (Chen 2015).

In his study, Chen analysed five months worth of install and usage statistics gathered from over 125 million devices worldwide in partnership with mobile intelligence startup Quetra. Using only Android apps from the Google play store (excluding Google's apps and other commonly pre-installed apps) that had over 10,000 installs worldwide as his base study, the average app loses 90% of its active users within 30 days of initial install, with 95% of users discarding it outright after 90 days (Chen 2015).

Ankit Jain, collaborate on the same study, theorised that users try a lot of different apps but decide on which ones they want to keep within the first three to seven days, and the key to not only success but retained user engagement is during this period (Chan 2015). By another measurement, borrowed from a talk by Ben Holmes from Index Ventures: For an application to be viable retention should be as follows (Figure 2). However, with both of these studies, these are somewhat subjective as apps are naturally different and for different purposes.

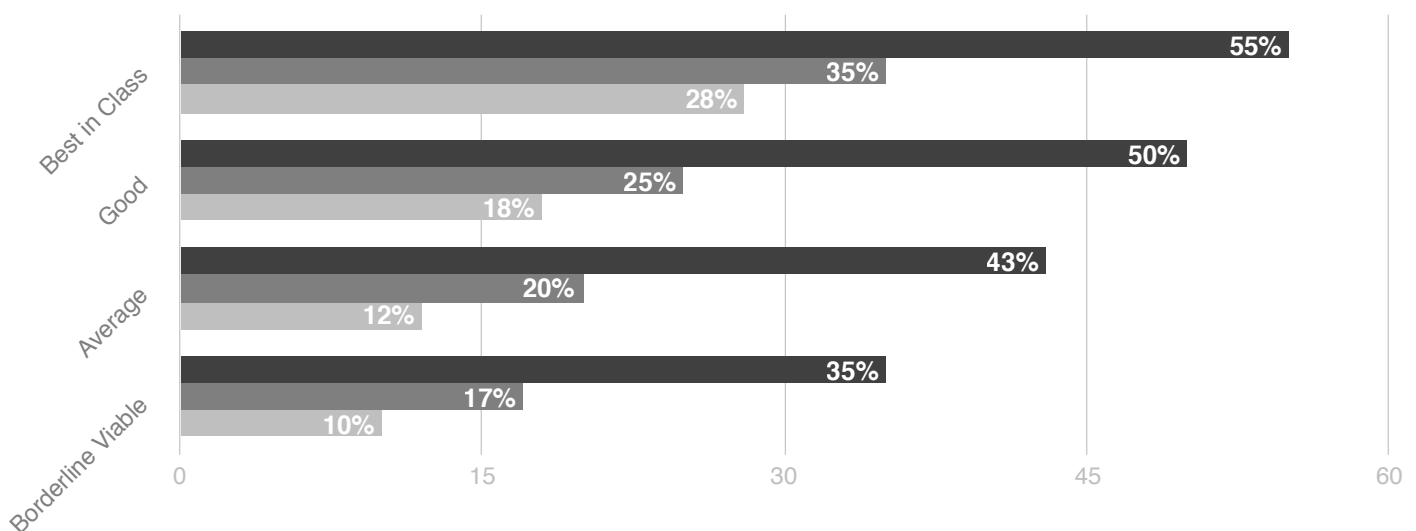


Figure 2. Viable Retention Curves (Holmes 2015)

3.2 Retention and Marketing

As an additional key point worth mentioning although not directly related to this thesis topic, is marketing. As there are tens of millions of applications in the Apple and Google app stores, having any application noticed and at the end of the day profitable is no small feat. There are no signs for this ever slowing down, and due to this, each year the marketing investment for each install is only expected to go up. This trend is especially alarming for small developers lacking in funds. After researching, running a few marketing trials, and carefully setting up a reasonable cost campaigns on Facebook, Twitter and others, marketing focus tend to shift back to the previously mentioned retention curves. Retention, in this case, is one's return on investment (ROI) and undoubtedly important. Paying for people to come in while lacking in retention results in a bad investment and can be costly (Reichheld & Shefter 2000).

3.2.1 Acquisition and Monetisation

Acquisition regarding mobile apps means one's advertisement channels and the act of acquiring or gaining users. App's advertisement channels can be traditional TV, radio or magazines, but most often these days social networks namely Facebook, as Facebook's targeted ads and 1 billion users (Techcrunch 2016) are tough to beat. Targeted ads are based on bids, and these bids are based on many factors such as the size of one's target audience, the type of bid and most importantly the level of interest this target audience has on a particular advertisement. The bid being the cost of one's acquisition model (impression, installation or click). Installation or Cost-Per-Install (CPI) being the most attractive for mobile developers looking for people to install (Facebook Ads Guide). More detailed revenue measurements tend come into to play with higher monthly figures and are measured as average revenue per daily active user (ARDDAU). Together, retention, acquisition and monetization are applications key performance indicators and found on most analytics platforms such as Fabric Analytics (Fabric Docs).

3.2.2 Pirate Metrics

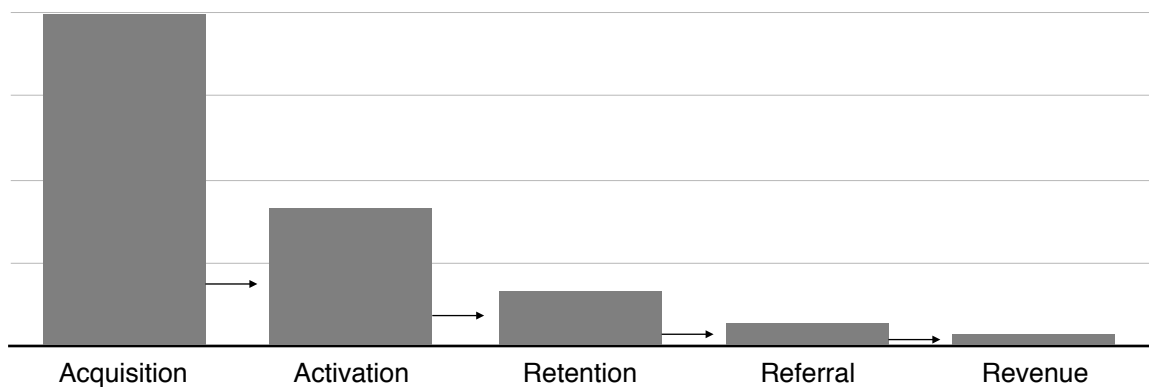


Figure 3. AARRR Funnel (McClure 2007)

Generating data from user events has grown immensely in the past few years, yet building meaningful insights from this vast amount of information can be tough. In terms of product adoption, what are the factors one should be looking for? For this, companies often refer to Pirate Metrics (AARRR). According to AARRR, these five metrics are Acquisition, Activation, Retention, Referral and Revenue.

Pirate Metrics help shed insights into this problem by illustrating each stage of a product adoption process and breaking down the user life cycle. Each step forms a funnel towards revenue and is collectively called Pirate Metrics, a term coined by Dave McClure in his talk: Startup Metrics for Pirates (McClure 2007). Each stage is used to develop strategies for engagement throughout (Figure 3).

Acquisition: Acquiring users from different channels inorganically by marketing, search optimisation etc., or organically through social media. **Activation:** Convincing the user of the value of an application, and what makes it unique and worth keeping. **Retention:** To find a strategy for users to keep using the app. **Referral:** Encouraging users to be your advocates, organically referring friends to try too, reducing installation friction. **Revenue:** Strategy to monetize on your loyal users and grow the company. (McClure 2007.)

3.2.3 Formatting Retention

As mentioned before, of all the data one can gather from a user and their lifecycle, retention is the most important metric, in freemium apps and premium apps alike (Pocketphilosopher 2016). Retention is indeed a direct calculation of the lifetime customer value of a user or group of users. It is the underlying measurement that one uses in conjunction with other data, such as how well users have grasped some idea, feature or campaign, and possible correlations to their retention.

As an example, for acquisition campaigns, day-three early retention metrics can serve as proxies for measuring the quality of the Return on Investment (ROI) on said campaigns. Needless to say, retention is also a reliable indicator of the overall quality of the game or application and its user experience (Pocketphilosopher 2016).

However, while retention is what app development blogs are talking about, and the subject that this thesis mostly focuses on, there appears to be no definitive consensus on what it means, nor how it should be measured. The aforementioned becomes very apparent, after using multiple analytics tools, which all tend to show slightly different results. For example, Facebook's user retention takes the days that the cohort's events occurred (ex: install and launch), and all of the days in between (Facebook Docs), while Fabric takes a percentage of unique users who were daily active users on a specific day (Fabric Docs). The truth is, there are several ways to calculate usage statistics, all of which point to ostensibly different results that can often end up comparing apples with oranges. This is important to take into account.

Understanding how these services calculate their retention numbers is as important as the answers a developer is looking to achieve. They should format their datasets to maximise the ability to analyse, or to understand the weakness of each method, before drawing any conclusions. (Appboy 2016.)

3.2.4 Classic Retention

Classic Retention is used by Fabric analytics (Fabric Docs) among others and works in the following way. Picture someone having ten users who install an app on the first Monday of some month. Out of those ten, five re-open that application the next day on Tuesday 2nd and three the following Wednesday 3rd.

Their Day 1 retention would be five users divided by the original ten users or 50%. Their Day 2 three users divided by the original ten users or 30%. Also, if nine out of those original ten users came back 29 days later, their Day 30 would be 90%.

Benefits of this method are granularity; each day is its separate day, making it easy to explain and easy to measure. On the flipside, however, whatever may be happening on each day can make this sensitive to noise. If they are running an installation campaign, classic retention can be useful in measuring the stickiness of newly acquired users but falls short on measuring the actual health of their user base. In which case, they should average several days together. For example, last ten Monday's would give them the average user's behaviour on Mondays. Alternatively, averaging each week into a weekly cohort would show a stacked overview of each week's average retention. (Appboy 2016.)

3.2.5 Range Retention

For Range Retention any time interval can be used, but the most popular and intuitive tend to be 7-day weekly or 30-day monthly ranges and are what one will find in analytics tools such as Google Analytics (Google Docs).

As an example on a given week, imagine someone having ten users who install their app each day for five consecutive days. On Sunday ten of those 50 re-open the app. The following week, nine of those original 50 open the app, six on Monday and three on Thursday. Continuing to the third week, five of those original 50 come back, all of them on Wednesday. Their first-week retention in this example would be ten users divided by

the original 50 or 20% and the 2nd-week retention five users divided by the original 50 or 10%.

The activity on the first Sunday from the original 50 does not count as all the activity during this week is lumped together as the baseline for the following weeks. For the same reason, we do not add multiple re-opens on a given day on classic retention, recurring re-opens on successive days do not fall under a weekly range. This concept is identical in a 30-day monthly range where only the first event from a given user in a given month is calculated.

Benefits of this compared to the classic retention is it is less receptive to day-to-day noise, still relatively easy to follow, and shows overall trends and patterns over a longer period. However, any changes they have done and would wish to measure won't be noticeable until a week or two has passed. Ideal for measuring the overall behaviours and the general health of an application's retention. Furthermore, to measure any patterns they may know, such as weekly or monthly subscriptions. (Appboy 2016.)

3.2.6 Rolling Retention

Rolling or Return Retention can provide a quick answer to how many users one has successfully built a long-term retention with (Appboy 2016). Used by Facebook Analytics (Facebook Docs) among others, rather than merging each visit into months, weeks or day's, Rolling retention only measures when the user first installed, and the day they last re-opened or returned. This, of course, is rather vague but does provide one simple answer.

For instance, using the previous Classic Retention example, where ten users installed an application the first day of a given month. Let's imagine one of them re-opens on the 7th day the following week. Another two re-opens a few days later on 10th and one more on the 14th. Their 7-day retention, in this case, would be three users divided by the original 10 or 30% because all three users returned on the Day 7 or after. Similarly, because only one user re-opened on 14th-day or after, their 14-day retention would be 10%.

It makes no difference if a user re-opens one time or 100 times after the given day they have selected nor it does not matter if a user returns on Day-7 or Day-100. Due to the open-ended nature of this, the numbers can vary significantly, and a user who only returns once is treated the same as a daily active one. Nevertheless, with only two data points it is very fast to calculate and can reflect the stickiness of one's application in one simple metric. Being mindful about the time frames used and together with other measurements such as user sessions, one may find insight if their application grabs the users engagement at first but struggles to hold on to after a few weeks of use. (Appboy 2016.)

3.2.7 Cohorts

In simple terms, a cohort is a group of people sharing a common characteristic and a common way to visualise user events and range retention. In a talk by Phil Libin (the CEO of Evernote), on retention and cohorts, he used this example: "Think of a cohort as a graduating class, except you are assigned to the cohort when you first join.". In the talk, he followed with examples about the importance of visualising this (Libin 2010).

To illustrate the problem and why cohorts are necessary, let's imagine someone has launched a new application that's relatively successful and has tracked the value users were getting from this app over time (Figure 4).

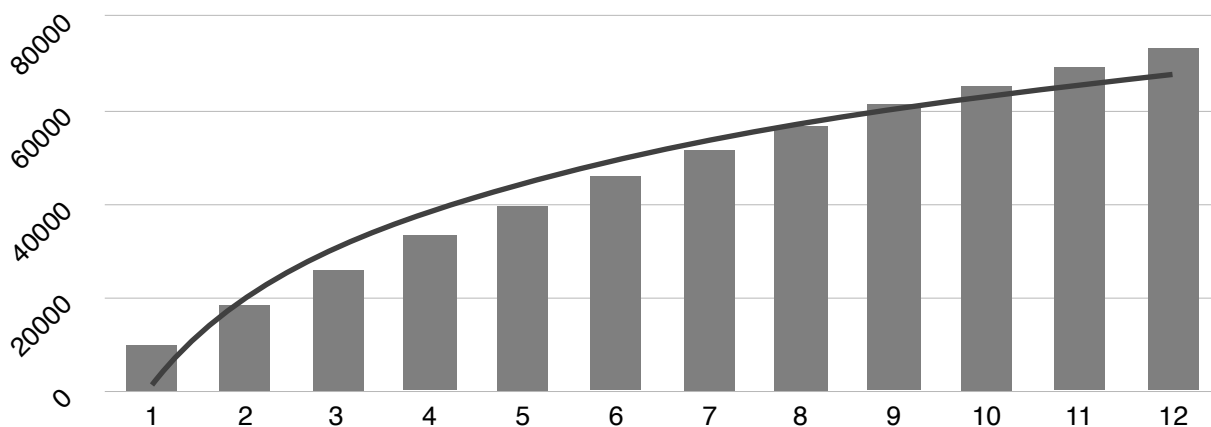


Figure 4. Growth overall

This application started with 10,000 users, and had grown to more than 70,000 monthly active users by the end of the year. Growth is slowing somewhat, but they should not be too worried; that is, 660% in 2016. If you look at this graph in a slightly different way (Figure 5), however (by the cohorts of people who started using the application each month), assuming 10,000 new people install the app each month, some of them stop using the app over time. Whatever the reason, it was not what they were looking for, or they did not find it fun enough. (Thinkgrowth 2016.)

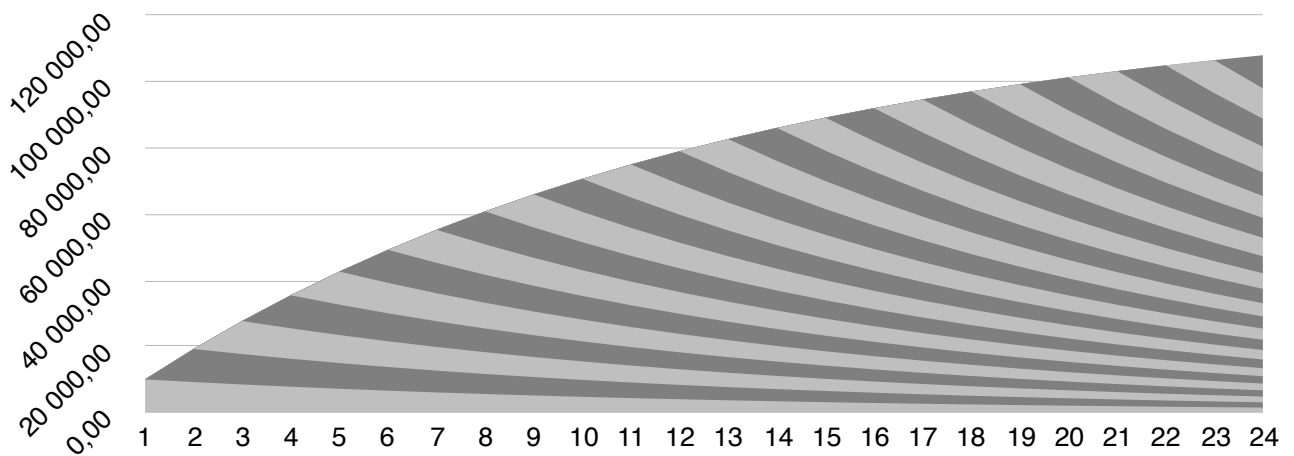


Figure 5. Retention Cohort Example

In the rough graph above (Figure 5), the bottom shape represents the 10,000 users who installed the application in January, and how many of them are still using it throughout the year. By the end of the year, only 3,600 are still around. Stacking each cohort on top of one another gives the total active users in a given month. Now, following this trend, by the end of 2018, this app will have 100,900 users using their application, growing only 9.8%. This rate can be seen visually on the bottom right, where each new user acquired each month is barely replacing the users who quit this app. (Thinkgrowth 2016.) The most successful applications in the world retain a significant percentage of cohorts over time, and following these trends is paramount in maintaining decent retention and revenue.

4. BLUEPRINTS FOR MOTIVATION

To find ways and methods that could increase customer loyalty and retention has to do with motivation or lack thereof. Motivation, meaning the continued interest and commitment to a subject, and retention as one's motivation measurement. Granted many things can cause lesser retention. An app that has no real purpose or plain poor user experience will not have any downloads, let alone hold retention for a single day users leaving out of frustration. Motivation, however, is about feelings an application invokes, excitement. As pointed by Yu-Kai Chou, the main problem is great technology and functionalities, but no traction. We have feelings, ambitions, insecurities, and reasons for whether or not we want to do certain things. (Actionable Gamification 2014.)

The term for designing with core human drives in mind is still slightly vague between human-focused and human-centered among others, but the preeminent design principle behind this is Gamification. The reason we call this design discipline “Gamification” is because the gaming industry was the first to master Human-Focused Design. (Actionable Gamification 2014.) Games have decades worth of innovation in what makes us motivated and it makes sense to draw inspiration from those. After all, every application’s motivational standing is the same. No one has to play a game, nor do he or she have to use any other application (Actionable Gamification 2014).

4.1 Psychology

Gamification includes many psychological concepts, especially regarding motivation, behaviour, and personality. Deep fluency and understanding of these concepts are one of the most important keys to proper gamification implementation (Actionable Gamification 2014).

We all hold the fundamental beliefs that we form our decisions rationally. Whether we are acting as everyday consumers, policy makers or business people, we believe we are capable of making the right choices for ourselves and that our reasoning abilities are in some way perfect. In other words: We think we compute the value of each option and

follow a best possible path of action. (Predictably Irrational 2015.) These assumption of our decision-making processes are far from accurate. As studied by Dan Ariely, a professor of Psychology at Duke University: “Observation is that we are not only irrational but predictably irrational — that our irrationality happens the same way, again and again.” (Predictably Irrational 2015.) Predictably predictable in this case fittingly for we can take advantage of how certain irrational patterns are wired in our minds.

Cognitive Psychologists describe this relatively new study of decision-making processes behind behaviours, Behavioural Economics (Predictably Irrational 2015). Concepts behind Behavioural Economics often blends and overlaps with gamification's and can offer explanations as to why some gamification principles work (Actionable Gamification 2014). For instance, social norms, why do we care more about losing than gaining, or loss aversion (Epic Meaning), why are we more happy to do things for a greater cause. The interplay between these disciplines capture the core principles that contribute to good gamification design (Actionable Gamification 2014).

4.2 Short Introduction to Gamification

Making mundane more fun through play is something we have done since the dawn of humans. Records of marketers experimenting with ways to inspire loyalty in their customers can be traced back to over 100 years ago (Technology Advice 2014). With examples of elementary school incentivising their students with stickers in the 50's (BMDG 2015). Term Gamification though is still relatively new and evolving. The earliest example of gamification are Frequent Flyer Programmes that airline companies offer as a part of their customer loyalty programmes, yet it was not until 2003 that British consultant Nick Pelling coined the actual term. (Gamify 2014).

What was then 2002 and deliberately an ugly word to define: “Applying game-like accelerated user interface design to make electronic transactions both enjoyable and fast.” as mention in Nick Pelling's blog. It is these days more commonly defined by Oxford Dictionary as “the application of typical elements of game playing (such as point scoring and competition) to other areas of activity” (Oxford Dictionary).

4.3 Octalysis Framework

Gamification is beyond points, badges and leaderboards. It is human-focused design. It is about building an application from the core human drives outwards to create habit-forming products around our behaviours. These behaviours contain many basic psychological concepts which if neglected, will result in an application that does not excite us and will very likely fail to attract retained use. On the other hand, if some of these are carefully acknowledged even a little, chances are their users will not only enjoy using their application more but will keep using it. (Actionable Gamification 2014.)

To help to understand what these core drives are, Yu-Kai Chou, a leading gamification expert and author of ‘Actionable Gamification’ and whom this thesis loans heavily throughout, has made his life work to a Framework called Octalysis. An octagonal shape with each side representing one core drive with its definition, and can also work as a foundation to examine certain areas and drives a developer might need to pay attention. These eight core drives are (Figure 6): Epic Meaning & Calling, Development & Accomplishment, Empowerment of Creativity & Feedback, Ownership & Possession, Social Influence & Relatedness, Scarcity & Impatience, Unpredictability & Curiosity, and Loss & Avoidance. (Actionable Gamification 2014.)

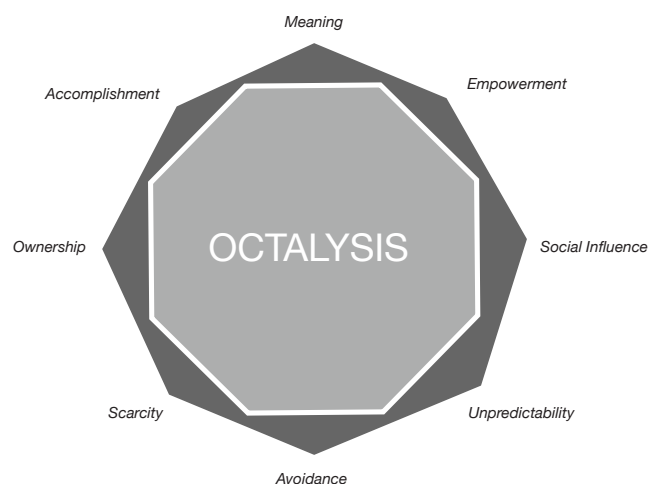


Figure 6. Octalysis Octagon (yukaichou.com)

4.3.1 Epic Meaning & Calling

This core drive stems from the players, or users believe in that he or she is part of something greater than themselves or that they were "chosen" to do something. This can be seen in users devoting a lot of their time in maintaining a community or helping others out non-self-interest (Predictably Irrational 2015). Think of Wikipedia or other Open Source Projects. Another effect of this is what Yukai Chou call's "Beginner's Luck" - where people believe they have some ability that others do not have, or believe they were "lucky" to get that amazing gift at the very start of the app or a game (Actionable Gamification 2014). This paradox can also be seen in social norms where we will do some things for free but not if we are paid, and how these can often be more important than money (Predictably Irrational 2015).

4.3.2 Development & Accomplishment

Having significant challenges, eventually overcoming them and the feeling of accomplishment in doing so is the internal drive of making progress and developing skills. This one of the easiest to design and coincidentally is where most of the points, badges and leaderboards mostly focus on in games. (Actionable Gamification 2014.) However, arguably slightly more challenging if the app or service has no apparent progress. In which case, the very least there usually is a tutorial or onboarding of some sort than can take advantage of this and be made more fun - even a little.

4.3.3 Empowerment of Creativity & Feedback

People are creative and not only need ways to show their creativity but need to see the results of their creativity. Being engaged in a creative process can be incredibly rewarding and repeatedly trying to figure things out, new perspectives, and trying different combinations are fun in-and-of themselves. Whether it is playing with Legos or painting, these have a tendency of becoming "Evergreen Mechanics" where a developer no longer needs to continuously add more content to keep the activity fresh

and engaging. (Actionable Gamification 2014.) One example of these is sandbox games such as Minecraft which incredible success is proof of this drive's potential.

4.3.4 Ownership & Possession

Having the ability to personalise user's experience and to accumulate kind of virtual wealth of some sort makes users attached to their creation and feel ownership. Besides being the primary reason behind virtual goods and virtual currencies within games and apps, having the ability to own something innately makes what the user owns a thing to make even better and own even more. (Actionable Gamification 2014.) Spending a lot of time customising something, in turn, brings users back to use the app or a game adding value to itself and possibly showing his or her work to others. Examples of this in the real world would be someone's hard earned collections of stamps or butterflies which they are proud of and furthermore had fun while gathering.

4.3.5 Social Influence & Relatedness

All the social norms and situations driving people's interactions, such as approval, social acknowledgements, friends, as well as competitiveness and jealousy, are included by this core drive (Actionable Gamification 2014). Having a friend or seeing someone that is great at something, better than themselves, or someone that owns something that they wish they had too, can become a drive to reach that same level. Alternatively, having something to relate to, people, places and events. (Actionable Gamification 2014.) Having the sense of nostalgia can increase the likelihood of someone buying the same product they remember from their childhood fondly. These are relatively well-studied too, as many advertisers use these emotions in powerful marketing campaigns and online strategies (Actionable Gamification 2014). As well as trends that come back with a new spin, such as the adult colouring books mentioned in this thesis.

4.3.6 Scarcity & Impatience

When one cannot have something can make them desperately want it - we all know this. Exclusivity of some group or service evoke intrigue and is utilised by many invitation-only services and often to drive products launches. Unintentionally or not, many have gone viral and seen on the news only to enhance the type of fear of missing out. Facebook did this when it first launched just for Harvard until finally opening for others and Spotify resulting in a surge of masses who previously couldn't get in it, only to name a few. Appointment dynamics (come back in a few hours to collect your reward) relies on this and utilised by many games - the fact alone that you cannot get something right now motivates users to think about it all day (Actionable Gamification 2014).

4.3.7 Unpredictability & Curiosity

The need to see what may happen next and after that, in a book or a game, for example, makes one's brain inherently fixed on knowing the plot or the result. We are innately curious creatures wanting to explore, which in turn can be used to motivate us. This harmless drive is also controversially the primary factor behind gambling and addiction. (Actionable Gamification 2014.) Curiosity and unpredictability often confused Development & Accomplishment, is, however, simply the motivation behind needing to know and avoiding recognisable patterns which we tend to zone out of. Feeding unexpected and irregular information to keep users engaged (Pitch Anything 2011).

4.3.8 Loss & Avoidance

The fear of losing something that has taken a considerable amount of time and effort, or other setbacks resulting in undesirable often irrational consequences of missing out, is the motivator behind not giving up or losing the chance to act. In games, this could be lives or the amount of virtual currency they have but also opportunities that are fading away such limited offers. (Actionable Gamification 2014.) Coupons and special deals take advantage of this irrationality where we might buy into a deal regardless we care about the offer - just because losing the opportunity may suck later on. (Predictably

Irrational 2015.) Games such as Farmville requires players to manage their crops, or they will otherwise wither away. In other words, having something with the need maintain inside an app can significantly increase the motivation and retention.

4.4 User Interface

4.4.1 Comfortability

Before any usability issues, the very first point users notice are the aesthetics of an app: the visible user experience.

In a study of online health websites, first impressions were 94% design related (colours, the amount of text, corporate look and feel) with only 6% of the feedback being about the actual content (Sillence, Briggs, Lesley & Harris 2004). Similarly, no matter how useful an app may be, if it is not attractive and pleasing to the eye, many people will simply leave it there and seek a better-looking one.

As studied by Google, users also tend to form these impressions in a fraction of a second, with the majority of users having fixed ideas about how a particular type of website should look (Tuch, Presslauer, Stoecklin, Opwis, Bargas-Avila 2012). These same conventions apply to mobile applications as well. While user interface can use some creativity as to how it is laid out, the underlying design conventions ought to play by the rules. Breaking from device conventions or interactions patterns otherwise familiarised over the years by other popular applications will no doubt lead to confusion. Great user interface design is comfortable while looking fresh and attractive – and in that order (Apple Human Interface Guidelines).

4.4.2 Feedback

While creating an app, it is always a good idea to learn as much as one can about the target group for which their application is intended. Many analytics tools such as Facebook or Google -analytics can help with this as long as the developer gathers the

necessary user events to make their behavioural exploration practical. Fortunately, collecting these events is made easy with several software development kits (SDK) provided by these analytics tools that by default gather essential details such as age, gender, and even interests along with basic information about each user session, such as session length (Google).

Collecting as many user events as possible, aids in the process of discovering the areas where their users spend most of their time, at which point they leave, and where most of the issues might be within their app. All of this helps their app be as appealing as possible feature-wise and improves the usability overall.

To further gain information, integrating user feedback early on can give more personal insight into areas that they might not find analysing the data alone. Moreover, data you have gathered together with user feedback helps determine the right approaches in implementing users' wishes, if they are worth implementing at all, and how to allocate the development time so that it might have the most impact.

Ultimately, one's users will determine whether or not the application is successful. This is why it is crucial to build any app with the user feedback and data in mind from the very beginning, and to avoid issues or time wasted in constantly revising the user interface and experience after the fact.

5. PROJECT RECOLOR

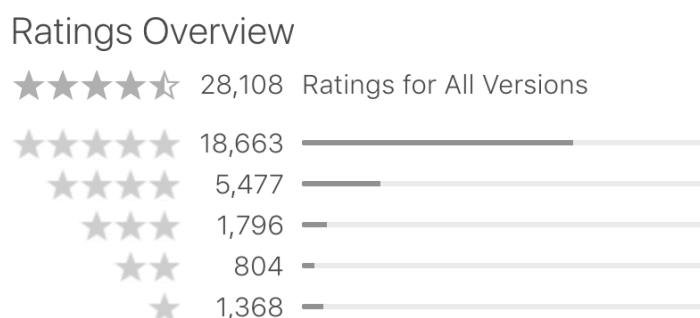


Figure 7. Rating Overview (Apple iTunes Connect 2016)

Recolor's reviews (Figure 7) are and have been good and are consistently at 4 to 5 stars on stable builds (versions that haven't had any obvious running issues or crashes). Based also on a substantial amount of feedback during the past six months (January-June 2016) from the App Store and Facebook, there is little that our users are reporting as missing or finding otherwise cumbersome. The only exceptions being that there aren't enough free colouring templates and colour palettes, both of which we have increased on each release with a modest increase in positive reviews. However, even with these changes and with continued user experience improvements making the colouring experience better and more fun, our retention rates are far from viable with Day 7 averaging around 6-7% as of June 2016. There are simply not enough triggers or long term value in colouring itself, regardless of how much our customers enjoy the experience. Therefore, as of June 2016, the app is non-viable but has potential.

With the large initial burst of growth we had, we too fell into the trap mentioned earlier in this thesis (Cohorts) in which the problem lies in the details. Advertising on Facebook and elsewhere channels large sums of money or growth hacking as it is called, can make all the activity numbers seem high, but they are ultimately irrelevant. Most successful applications and companies have figured this out. Their goal is not explosive growth but rather focusing on customers and retention (Pocketphilosopher 2016). Everything else follows naturally (Pirate Metrics). Still, it is very easy to make this mistake since acquisition can be seen as a quick way to revenue. While they may see immediate

returns, the reality is that acquisition will cost way more in the long run than retaining existing customers. Increasing custom retention by as little as 5% can lead to profit increases ranging from 25% to 95% (Reichheld & Shefter 2000).

As for causes, outlining the strengths of the current app build against the eight core drives mentioned in the Gamification part, the app severely lacks on several key motivators. Based on the mentioned feedback, relying solely on the nostalgia of colouring books and on the rather shallow intrinsic motivators of merely colouring them all were not adequate. Furthermore, where the app provides the least, if at all, is clearly on the Social and Ownership side. There is no platform for our users to share their creations, and as such, it provides little reward for continued use. So while there remain some improvements to be made outside the scope of this project on other motivators, the most potential and noticeable increase in retention should lay in this, a community of some sorts.

5.1 Prioritising onboarding

Having a wide variety of hooks and immersive elements inside an app is what holds on to users, as explained in the Gamification part of this thesis, but all these are of little use if the users do not stick around long enough to find them. There is always a solid chance that if an app cannot effectively communicate its value and features, the very first time a new user opens said application, they'll likely just glance it quickly and never open it again. Many users can feel lost, overwhelmed, and confused about what they're supposed to be doing there. This process of helping users get started is called onboarding. (Designing Social Interfaces 2016.) Making the first session engaging with a compelling walk-through, showing a helping hand when needed and highlighting the primary functions that application has and provides. If done right, the benefits of this walk-through will not stop at pushing new users to log another session. When a new user knows how the application works and how it can serve them, they are more likely presented with the more subtle aspect of that application. Subtleties which make this application addictive, driving up retention weeks after they complete the onboarding process.

5.1.1 Re-engaging through push notifications

Push notifications are a useful tool to encourage re-engagement and works in support with the overall onboarding experience. With each leading day from the initial install, the fact of the matter is, the majority of new users fall dormant fairly quickly, and if you are not taking any efforts to reactivate these, you're losing revenue - and retention. After all, a successful onboarding is only effective if your new users experience all of it.

There's a lot of mixed research and stigma towards push notifications, whether it does more harm in the way of annoyance, but it is reasonably accepted that personalised and meaningful notifications do tend to help significantly. Some research, going as far as to say there is no evidence to suggest that push notifications cause app uninstalls at all and are only positive (Leanplum 2016). However, the author would still add an emphasis on the word meaningful. Meaningful as in responding to behaviours and times of the day users are likely to engage with relevant content. Which in our case would be the daily content and the actions done and received by the user in the community.

5.1.2 Leverage multiple channels

Taking advantage of multiple channels in re-engaging users improves the chance to reach a user through means or channel they might prefer. In doing so, improve the overall effectiveness of application's outreach. For Recolor Community, push notifications are self-evident, but for example, email newsletters of weekly gallery highlights could also work.

In an Appboy research applications that practice sending push notifications along with at least one other messaging channel in re-engaging onboarding users, saw 80% higher following day retention and even more impressively up to 130% higher two-month retention than applications that did not (Appboy 2015). Which is definitely something to consider. Again, when considering how much acquiring a single user cost and a loyal one at that, managing multiple re-engagement channels is not only smart but cheaper.

5.1.4 Complete plan

Creating a platform for our users to share, interact, and see what others are creating should be tested and is something we could do quite quickly. Long-term retention potential of this is tremendous, and furthermore, it lets us send meaningful personal notifications from community actions, such as likes and comments. Increasing content related notifications, such as new daily pictures, would fast become excessive and irritating, but personal push notifications do not suffer from this to the same degree. For example, receiving a notification that a user's picture received a like is something the user is hoping to receive.

Multiple acquisition channels could be considered in the future, with an online profile similar to Instagram's where users can share their creations with their friends without the need of installing the app first. Often this can be too much to ask, especially considering the relatively older age of the user base. Depending on how successful this is, creating a simplified browser version of our app is not out of the question.

Importantly, the onboarding experience can be improved to help our first-day retention churn by going through the main features of the app. Additionally, the pain of paying can be reduced with more free options. This is something our users wish for endlessly and what we have been unwilling to increase in fear of losing revenue. However, while researching for this thesis, there is some evidence and case studies suggesting that this fear is false. For instance, the later a user starts paying for an app, the more they will end up spending (Gameanalytics 2015). But more importantly, one should try to retain every user even if they will never convert into a paying one. A free user is a free ad for the app. A walking, talking evangelist with a network of friends to influence. (Pocketphilosopher 2016.)

Based on research up to this point, focusing on the three areas of onboarding, re-engaging, and social and ownership (a community feature) should show improvements in overall retention in both the short-term and long-term. Moreover, these three areas

create a type of bootstrap, a starting point, with which to continue with other ideas we have been throwing around, such as colouring events and challenges.

6. IMPLEMENTATION

6.1 AB -testing free content

One of our most requested wishes had been the amount of free content. Our team had increased this over time, a little here and there, but a throughout test determining exactly what this would do was missing. Certainly more things for free helps with retention, but the question remained as to how much would it impact our revenue in relation to retention gained. Small changes we had done to increase our free content had increased our retention slightly with no measurable impact on our revenue; although, these were inconclusive, since we had made those together with other feature releases (releases that had improvements all around). From experience though, the problem with testing this in practice is more complicated, as taking steps back can be difficult. Revenue and the cost of things are somewhat sensitive. One should try to avoid negative reviews, and potential backlash followed after playing with pricing.

To gain better insight into whether there is a substantial positive impact on retention and how much, we set out to implement a simple A/B testing block inside the app around our daily pictures. These daily pictures were normally free for a day and the next day onward were locked and available only to our premium users. For a lucky 0-10% subset of our user base, these same daily pictures once opened, would be unlocked forever with a unique tracking property to our analytics back end. Every event these two groups did was divided into separate audience insights, with free forever users in effect never having to pay for anything, as long they remained active and collected their daily pictures.

After a few weeks to a month, once we had enough data from a sample size of 50,000 lucky users with free forever daily content and users who had only the 24-hour free content, rather strange results emerged. More for free had, in fact, increased our average revenue of paid users (ARPPU). Drawing a conclusion: users who were met less often with our premium barriers (subscribe to unlock) saw more value in our subscription, somewhat counterintuitively (Picture 8).

Average revenue [?]		Average revenue [?]	
ARPU	ARPPU	ARPU	ARPPU
Monthly	Monthly	Monthly	Monthly
\$0.46 +68.5%	\$8.41 +6.3%	\$0.40 +49.9%	\$9.97 +21.1%
Weekly	Weekly	Weekly	Weekly
\$0.21 -4.4%	\$6.02 -1%	\$0.17 -2.9%	\$6.30 +2.1%
Daily	Daily	Daily	Daily
\$0.07 +6.6%	\$6.13 +4.6%	\$0.08 +95.2%	\$6.44 +34.1%

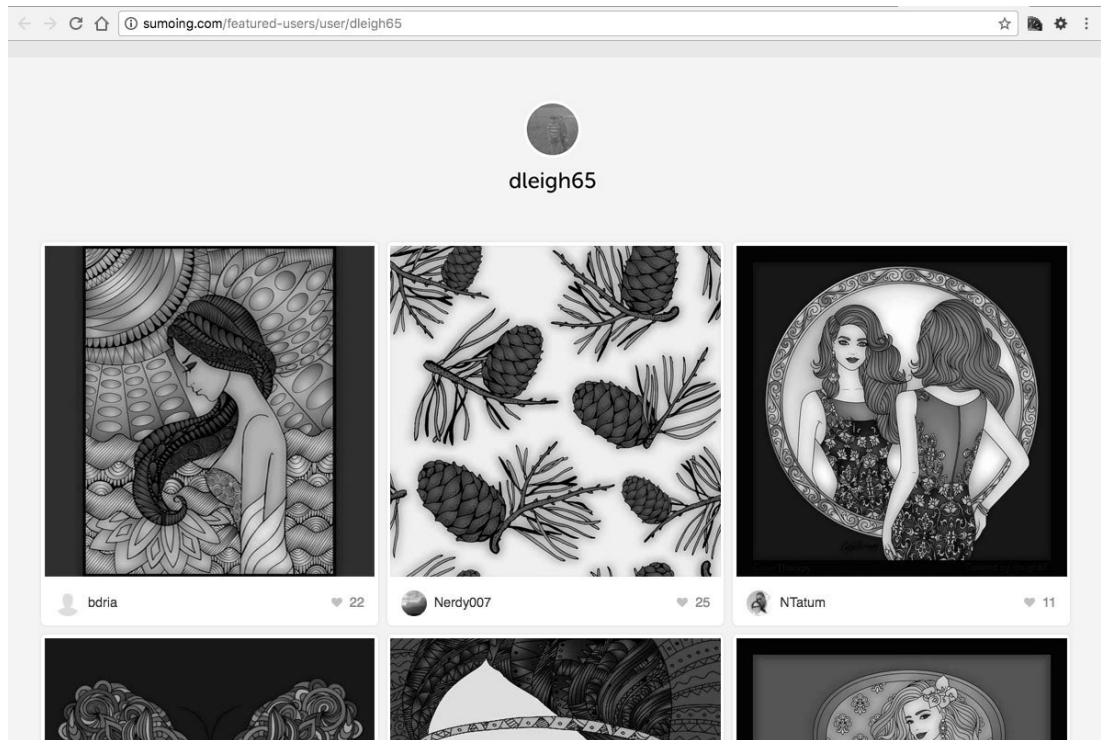
Picture 8. Revenue A & B (Google Analytics)

This result seems to go well with the pocket philosopher's reasoning in which there should be no strick premium barriers, and that one should target users who are hooked later down the line. A user who initially is hard set on not ever paying for anything might eventually loosen their standpoint if they have enjoyed the app long enough. Some studies suggesting the later the user starts enjoying the app or a game, the more they will end up spending (Gameanalytics 2015).

6.2 Testing Recolor Community

For long-term retention our assumption was, in order for our app to retain its more seasoned users over the span of many more months, required them to have something to do outside the main colouring routine. Main problem being, simply colouring our daily pictures to their ever-growing coloured collection alone, with no platform for recognition or appreciation, remained only so much fun while many slowly lost their interest altogether.

To increase the stickiness of these users, we set out to test a very simple community and see how interactions between these people would work. Would they publish and would they add likes to pictures published by others, and would this type of community take root in the first place (Picture 9).



Picture 9. First simple web based gallery

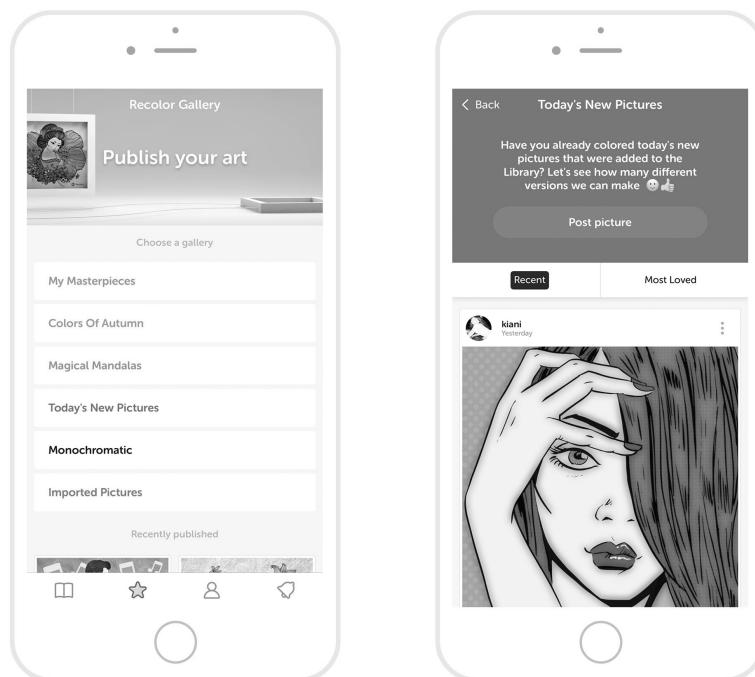
We advertised this prototype community in one of our banner slots inside the app as very much a secondary thing. Very basic and crude, with a goal only to determine how would a proper built-in community play out later in our release cycles. If most of our users wouldn't do some action, let's say, like the pictures of others, it wouldn't be a good idea to spend time implementing if we set out to build our built-in community later on, and so on. Web-based, we could also more rapidly add features and create simple tests without the need to push new builds which can often take days (iTunes app release queue).

Our motive was heavily gamification inspired. Where the application stood before, implementing meaningful gamification elements seemed a tall order and forceful. With the new community, we could incorporate these gamification elements mentioned earlier with more familiar actions such as liking. Furthermore, if implemented successfully, the core community itself could fuel Epic Meaning and Calling (Octalysis framework). Meaning that everyone would take part in creating this new home for all

colouring enthusiasts which prior did not exist to our knowledge, excluding few Facebook groups.

Feedback during our testing phase was all around promising and after a few months of testing data, this simple web-based testing Gallery received 64 000 entries, finally coming to a halt with difficulties handling the traffic. Having a place to showcase your artwork, and to inspire others with what they had made, was clearly something our users wished for. And with these results, it was clear this was something we needed to implement natively and with a full focus during the following few months.

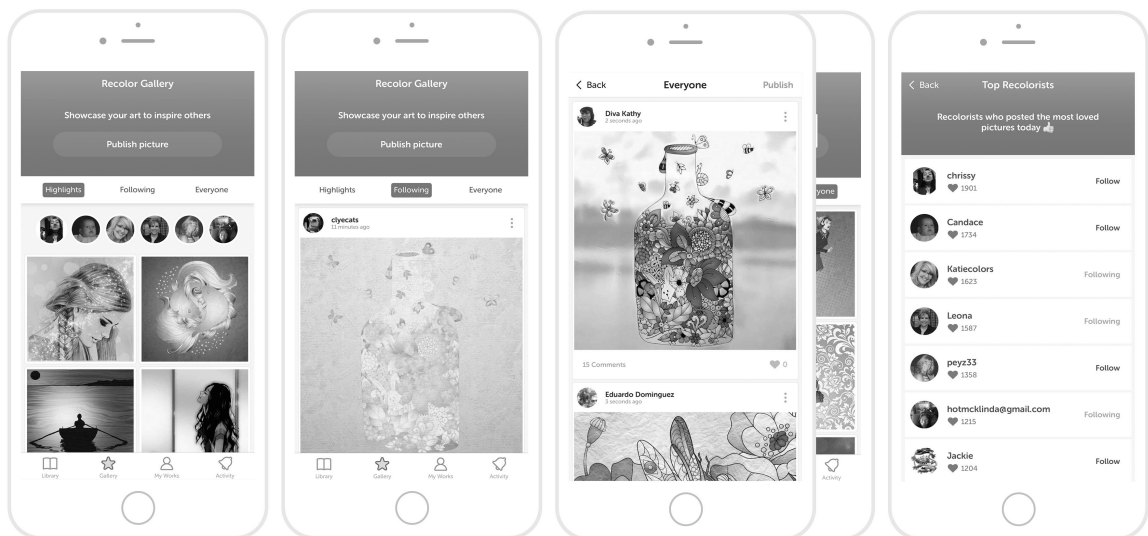
6.3 Implementing Recolor Community



Picture 10. Community version 1

Having established that our more seasoned users would like our community idea and that our assumptions were correct regarding the need for more Social Influence and Relatedness, we set out to build the community prototype natively.

While implementing the community natively, we also set out to implement a simple category-based challenge and trending leaderboards, showcasing the most loved pictures yesterday and last week (Picture 10) in support of Accomplishment & Development. And in the hopes of added Ownership & Possession, we included public user gallery profiles displaying their total accumulated likes and number of published pictures.



Picture 11. Community version 2

With these realised and after few weeks of launch data, the first native build turned out to be very encouraging with 100 000 published pictures and 2 million likes in the first month alone. Our category challenge idea, however, caused confusion and the inability for users to find and follow others that they had liked, turned out to be a major problem.

With our second, slightly more refined community experience, we addressed these issues with the added Follow/Following system and discarded the challenge idea, for now, in-place of a new trending users view. These changes resulted in even faster growth. Users follower feeds were more personalised and made possible types of friendships, and the accumulation of followers yet another Ownership & Possession, “I have this many followers”.

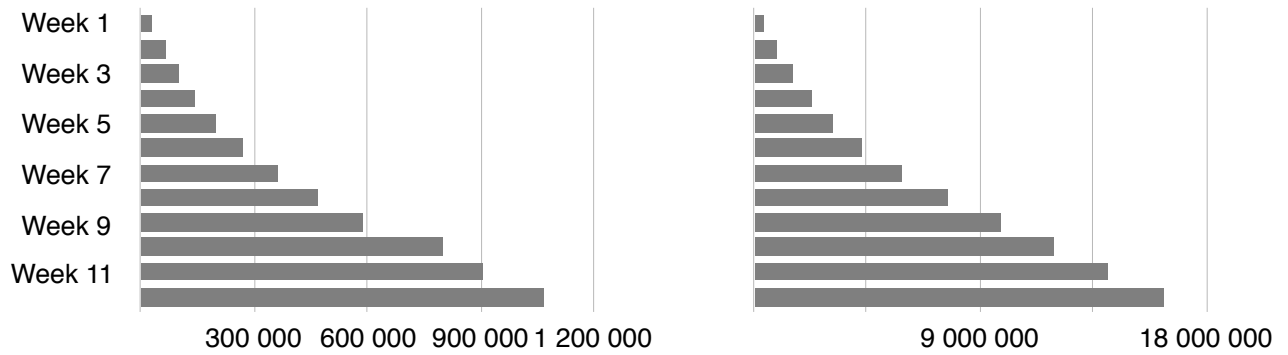


Figure 12. Number of Published Pictures and Likes (December 2016)

	Week 1	Week 2	Weel 3	Week 4	Week 5	Week 6	Week 7	Week 8
Day 1	66,78 %	68,27 %	68,44 %	66,68 %	66,70 %	65,06 %	64,38 %	66,25 %
Day 2	62,87 %	64,12 %	63,83 %	61,33 %	61,30 %	58,48 %	58,81 %	60,43 %
Day 3	60,15 %	61,57 %	60,71 %	57,59 %	57,49 %	54,17 %	55,05 %	56,52 %
Day 4	58,12 %	59,24 %	58,38 %	54,56 %	54,10 %	50,90 %	51,89 %	53,32 %
Day 5	56,40 %	57,68 %	56,56 %	52,22 %	51,37 %	48,31 %	48,46 %	50,54 %
Day 6	54,60 %	56,26 %	54,79 %	50,10 %	48,97 %	46,14 %	46,42 %	47,63 %
Day 7	53,22 %	54,70 %	52,97 %	47,95 %	46,62 %	43,97 %	44,37 %	45,50 %
Day 8	52,15 %	53,04 %	51,26 %	46,38 %	44,73 %	42,31 %	42,35 %	42,98 %
Day 9	51,19 %	51,71 %	49,64 %	44,98 %	43,28 %	40,86 %	40,99 %	41,23 %

Figure 13. Starting week stickiness of community users (December 2016)

Measuring the stickiness of our Community users reveal these users are well within the best in class retention metrics. With a rolling retention algorithm using the raw data from our Community Database, day one retention is peaking at almost 70% with little dispersion through the different week cohorts and their following days (Figure 13). Note decreasing bottom right trend is due to our increased advertising and the open-ended nature of this calculation (new data feeds in from the bottom right).

Our back-end managed this unexpected influx of activity well, but did present a pleasant problem in which pictures posted by newer users were quickly lost in the flood of everyone else's colouring. With their difficulties in gathering likes and followers and, for everyone to have a fair chance, we had to set a daily post limit of 10 and have now decreased it to a further 5, which helped a little bit. Despite this, discoverability remains a major puzzle to which we need to find solutions soon or otherwise, as the community keeps growing, our newer users will not stick around long if no one likes their entries.

6.4 Onboarding

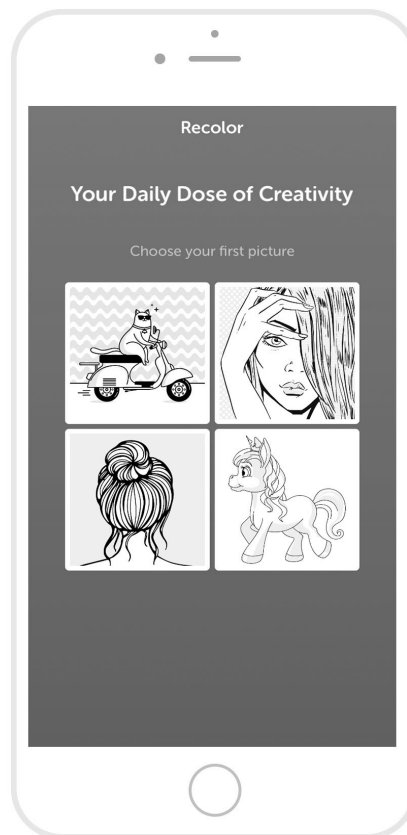
Another potential retention pitfall we had, was related to our editor onboarding although our colouring editor was already very simple in how it worked and followed all device user interface conventions, gestures, pinching, tapping and so on as intended. Based on feedback, some and especially the elderly, still had some issues with learning. For this, we included on-screen tutorials which step-by-step displayed each gesture and each function on the editor (Picture 14) visually.



Picture 14. Step-by-step tutorials

Furthermore, based on our analytics data, our successful first-day retention event thresholds, how many events Day 2 users had done to log Day 2 and where Day 1 users

dropped, seemed to indicate users who had at least finished one or two pictures the first day, was retained for another day. With a large number of lost Day 1 users not even opening their first picture. Whether this bounce rate (users without any events) was due to landing to the possibly overwhelming 1000+ templates we had on our library screen, or just part of the normal bounce rate that is expected required another A/B test. With this A/B test, we created a simplified landing screen which forced the user to open at least one picture (Picture 15).



Picture 15. Simplified onboarding screen

Also, finally, as part of final onboarding tweaks, we moved our landing Library tab from our constantly changing daily pictures tab to our newly created recommended tab. On the very first launch, new users would be presented with our most popular free and highest conversion templates.

7. RETENTION RESULTS

7.1 Later retention (Community)

Off the baseline of non-viable retention metrics, before the project started, we had managed to increase our retention by 5-10% all across the board. With little to no changes to our colouring experience itself, but through our new community feature alone and its separate components, inspired by the Octalysis Framework. With added long-term value and with human factors such as Social Influence & Relatedness, we also saw a significant increase in our monthly revenue as our users enjoyed, related and used the application longer, in general. In conjunction, although this researcher has yet to measure this funnel with actual data, it seems very possible that our free users were more inclined to subscribe when constantly exposed to our more premium templates and effects in our community.

	Week 0	Week 1	Week 2	Week 3
	100%	38.9%	25%	19.4%
Nov 6 - Nov 12 207,459 Users	100%	40.4%	26.9%	19.3%
Nov 13 - Nov 19 210,439 Users	100%	39.2%	24%	18.7%
Nov 20 - Nov 26 220,284 Users	100%	38%	24.1%	19.4%
Nov 27 - Dec 3 164,178 Users	100%	38.1%	24.9%	20.5%

Figure 16. Latest range retention metrics (Google Analytics)

With these results, we moved to the area of okay to good and even excellent retention, when measuring the loyalty of our community users, which is 20-30% above the baseline. However, here lies a clue, when the relative increase in each D1, D7 and D30 retention are factored in, our now much increased long-term retention values mitigates our first-day statistics, which had increased the least in proportion. Meaning our new users did not get as excited about the community features right at the beginning - the

usefulness of which is arguably more towards our heavy users. With this exercise, we had managed to plug a few retention leaks at the very end of our retention metrics but hadn't solved the very first big drops right at the beginning. With these in mind, our focus then shifted toward onboarding and the first days, to try to bridge the gap between our new users very first sessions, to the time they are likely to join the community.

7.2 Early retention (Onboarding)

While the Community feature had solved our retention problems, long-term and also helped somewhat with the short term, it also pointed our more immediate retention pain points more clearly; our short-term retention, from Day 1 to few days onwards remained an issue. These first days had relied too heavily on our community, which wasn't something our new users would ever adopt fully in the very first session, nor should we have ever expected them to.

With our onboarding ideas, new tutorials and simplified landing screen, we hoped to plug these early retention difficulties with an A/B test to determine whether launching with the simplified onboarding screen and onboarding tutorials (Picture 14 and 15) would help. This test consisted of group B receiving basic tutorials and new landing screen and Group A's client left as it were, no tutorials and landing to the library.

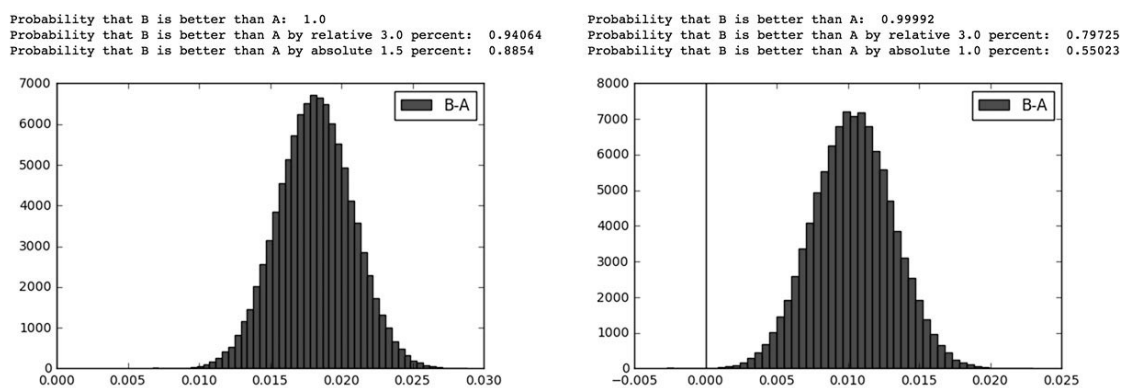


Figure 17. Onboarding A/B retention

After a while, results showed a modest relative increase of up to 3% with 94% probability in Day 1 to Day 3 retentions for group B (Figure 17). Surprisingly, however, the bounce rate for the simplified landing screen remained roughly the same, but discerning its influence required another A/B test. For this second A/B test, we set both groups to receive the same tutorials, with Group B's differentiating factor being only the landing screen itself. These additional results on top of the tutorials indicated a very slight edge for the simplified landing screen with around 90% probability.

7.3 Combined Retention

	Week 0	Week 1	Week 2	Week 3
	100%	47.1%	31.2%	24.8%
Feb 26 - Mar 4 341,222 Users	100%	47.1%	31.3%	24.7%
Mar 5 - Mar 11 278,008 Users	100%	48.3%	31.8%	25.8%
Mar 12 - Mar 18 276,227 Users	100%	45.7%	30.1%	24.2%
Mar 19 - Mar 25 305,044 Users	100%	47.4%	31.4%	24.8%

Figure 18. Final range retention metrics (Google Analytics)

Community features' high retention stickiness results, together with the changes to the onboarding flow (first-time tutorials and the free amount adjustments) resulted in an almost 100% relative retention increase in both early and later retention (Figure 18). With Ben Holmes' retention models, early retention now peaking best in class high 50-60% and later retention around average to good 20%.

The effectiveness of our community in terms of our retention took us by surprise. None of the experiments we had done before, nor the very first part of this project's A/B testing on how much we offer for free, had quite the same results. In fact, while our ARPDAU went slightly up in our A/B test, it did not affect our retention in any measurable way for drawing any conclusions. However, having more for free can and

has helped with organic installs and better reviews. If there's no harm, and better yet slightly increased average revenue, of course this is desirable. Furthermore, an exciting area to test more. As an example, while we did unlock everything in our second group, we did not make this an actionable thing to do in any way - collect your free daily images. They just remained unlocked. What effect the action would have is something to consider and to test with another A/B test at a later date.

Onboarding tutorials had clearly increased our retention, but the simplified landing screen's weak performance was unexpected. It would seem that the overwhelming options of our library, which we presumed would be an issue, wasn't quite as much. This assumption requires further testing with time, as our library keeps growing. Still, even small benefits add up and this was, in total, a successful exercise.

8. CONCLUSIONS

What makes an app great may sound simple, but to create an app that users continue using is incredibly hard. Recognising which elements will retain users tends to rely on developers gut feeling during development, and while they may be broadly correct, it is painfully easy to weight them incorrectly or to miss out on something completely. A simple button placement or landing screen can have more impact than adding new and/or unnecessary features.

In practice, a single core feature is probably what the app is all about, and where most development happens, but often it is the smallest details that glue it all together or breaks it all apart. Furthermore, when jumping to conclusions, an otherwise good app can be doomed to failure, or a decently performing one that never reach its full potential (as was the case with the app in this thesis before the research). It is undoubtedly necessary to find and recognise what these are.

Fortunately, gathering user's behavioural data turned out to be very easy, with the many analytics frameworks, research material and best practices provided as a starting point. The easiest plug-n-play type of analytical graphs were provided by default, and from there, more advanced methods and frameworks are available as one progresses. In fact, this is exactly how this thesis evolved: starting with Google Analytics, and eventually, Raw Data or Big Data at the very end, using Google BigQuery. Interestingly, through learning all of these steps, starting with the easiest analytics tools and moving to the more advanced ones, one also tends to grasp the math discrepancies between most analytics measurements and what causes them. Surprisingly these are not quite standardised, a question that has bothered for many years.

Whereas analysing the problems was easy, finding solutions to these problems was quite another. Simply understanding all of the possible reasons behind certain problems, for one, but more importantly, how to attack these problems with the best possible approach moving forward. Basic human biases, emotions and the behaviour related to marketing and app motivation, for which there are countless examples in behavioural psychology

and gamification books, is slightly trickier to turn into actual features inside an app. These are all critical concepts to work out. For instance, how does one turn the concepts of social influence and relatedness into an actual feature? Arriving at results that can sound simple or obvious in the end was anything but. The ideas themselves and how to implement them took months and months of debate and careful research, testing and continuously validating each choice with actual data. And while incredibly tedious, the benefits were immense and well worth it, as can be seen in the final retention results, which had almost doubled.

In my work, while technical and qualitative testing has always been important for making sure that the application worked on all devices, and that all of the rough edges and usability problems were smoothed out, quantitative testing was never any serious priority until now. Having seen the tremendous benefit of this approach has, in many ways, changed the way that I think about retention and I hope that this example will inspire others to explore and discover the same.

9. DISCUSSION

The field of this study, retention, is growing at a rather erratic pace alongside the ever evolving mobile development front. Finding useful information and approaches on where to begin and what should work regarding retention can be at times misleading, with old ideas fast discarded and the most up-to-date knowledge scattered online on numerous development blogs and forums. While there are some books and research available and academia is eager to catch up, learning to navigate this online community is necessary at least for now. Luckily, this predicament is reflected in this community, which is very active in sharing their findings and pulling together their revenue, failures, and success stories in an entirely transparent matter. Keeping yourself informed about these stories helps form a rough generalised understanding of the currently accepted best practices that live until the next better idea comes along, which may often be in just a few months.

Personally, one of the most significant findings from this community was the importance of quantitative analysis in parts of decision making during development. Quantitative analysis means measuring the result by the quantity of something, given you have a decent sized audience with which to test. On the other hand, qualitative analysis would be the personal feedback received directly or indirectly from a user in some way during mobile development. For example, this would include questions during user testing sessions. As it turns out, people often don't know what they want, or they put emphasis on things that might not be that significant at the end if the developer were to implement said feature or change. Furthermore, from personal experiences of observing a few user testing sessions, these notes from users tend to be critiqued from the current context and the current state of the app. In other words, users play with ideas using the existing elements and lack imagination in terms of what the app does not have but could have. This narrow scope makes sense since these users don't necessarily have the experience of app building, and they stay away from what they don't know.

Quantitative analysis adds another layer of reassurance to this. It works together with qualitative results and with approaches drawn from your ideas or those of others from

the blogs and forums mentioned earlier. In essence, every big or small change and hypothesis needs confirmation from actual statistics. For example, A/B testing the retention effectiveness of some feature or optimising the revenue flow of a purchase dialogue using multiple variations of some design. With this, small changes in, for example, colour or copy text can have significant differences in whatever your goals are. Continuous reaffirmation using the sheer size of your audience on your behalf to find what works best gives an exhaustive result of what works the best with no further questions. In doing so, you avoid potentially harmful alternatives when jumping to conclusions from qualitative results alone.

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