MHI Internship Report: User Growth Intern at Figure 1

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Performed at:

Figure 1

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Report of Internship for the Period May 8 – August 31, 2017
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Acknowledgement and Endorsement

This report has been written by me and has not received any previous academic credit at this or any other institution.

I would like to thank Figure 1 for letting me be a part of such a great organization for the internship period. More specifically, I would like to thank Mata Kranakis for giving me the opportunity to be a part of her team and for providing excellent mentoring throughout my internship. I also want to thank Carter Grieve for his support, cooperation, and team-based attitude he displayed towards me throughout my time at Figure 1. These two individuals made the time spent during the internship period enjoyable, as well as a great learning experience.

Finally, I'd like to thank Dr. Raza Abidi and everyone in the health informatics program, including classmates, that assisted in preparing me for this internship.

Mitch Glazier

Executive Summary

The purpose of user growth is to acquire new users to use a product or service. In the case of the internship at Figure 1, user growth is acquiring health care professionals for medical collaboration. Figure 1 is a tech startup based in Toronto, Ontario that has created a free mobile app and web platform which allows healthcare professionals around the world to share medical cases and knowledge.

During the internship period, the author performed relevant health informatics work that included network analysis, analytics, database management and SQL, and product overviews. Other areas of relevance that the author explored during the period included: verification, de-identification, and machine learning.

The author was also able to identify, and analyze a problem within the current procedures of the company. Additionally, the author derived a proposed solution to this problem, using the knowledge gained during the internship as well as the courses taken in the health informatics program at Dalhousie. The solution involved automating a current manual process that would improve both the efficiency, and the overall experience within the app.

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1. Introduction

1.1 User growth

The objective of user growth is to acquire new users to use a product or service. In the case of Figure 1, user growth is acquiring health care professionals (HCPs) and enabling them to use a web and mobile application that is centered around medical collaboration. Acquiring new users can come from many different avenues. These include social media, Facebook, Twitter, Instagram, search engine marketing (SEM) and optimization (SEO), promoting a website by increasing visibility in search engine (Google) result pages through paid advertising or organic non-paid techniques [1, 2], networking campaigns, such as student ambassador programs, and email and content marketing, sending current customers or users relevant content or information.

User growth is not only about gaining new users, it is also about preserving existing users, this concept is known as retention. There are many factors that come into play when talking about retention, but it really comes down to the user's initial, and subsequent experience. If a user has a positive experience when he or she uses the product, they are much more likely to return and use the product again. Growth members can help promote this in various different ways. One particular technique that enables user growth and retention is called "deep linking". Deep linking advertising occurs when a user clicks on an ad which is alluring to them as it refers to a particular medical case. They are then subsequently brought to the app store first to download the app, but then as soon as they are done registering, the user is brought to the exact case in question. Being brought to the case they were initially exposed to increases retention, as the user is shown exactly what they wanted to see. Therefore increasing their chance of having a positive first time experience on the app.

1.2 Relevance to Health Informatics

"Health informatics is changing the practice and delivery of healthcare by providing computer technology-based solutions to bridge the knowledge and information gaps experienced within the health care system" [3]. While user growth is broad, and can pertain to many different disciplines and areas of interest, the way in which it was applied at this company and during this internship, directly correlates with the above definition of what health informatics is. As the author will explain further in an upcoming section, the more users/health care professionals using this application or "computer technology-based solution" [3], the better the medical collaboration and knowledge sharing becomes. This improved collaboration in turn helps to "bridge the knowledge and information gaps experienced within the health care system" [3] by allowing healthcare professionals across the world access to medical information that they would not have had previously. To use an example to elaborate on this, when the Zika virus started becoming more prevalent, North American doctors had never seen real cases before. However, because Figure 1 had expanded its user base to South America, North American doctors on the app had access to real cases, with real diagnoses and treatments from verified doctors dealing with the virus.

Other themes with strong connections to health informatics, which will be discussed further through the description of relevant work performed during this internship, include telemedicine, network analysis, market research, data analytics, database management and SQL, verification, and de-identification.

2. Description of the Organization

2.1 The company

Figure 1 is a tech startup based in Toronto, Ontario. Figure 1 was co-founded by chief medical officer Dr. Joshua Landy, chief executive officer Gregory Levey, and chief technology officer Richard Penner back in 2013 [4]. Approaching 50 employees, it continues to grow as a company, as well as expanding its offices to places such as the United States, United Kingdom, and Asia. Since its launch, Figure 1 has been able to raise over $20 million in investments from companies such as Samsung, John Hancock/Manulife, and Version One Ventures [5]. Figure 1 is still in the early stages of monetization, with the strategy of paid sponsor content in the app.

2.2 The product

Figure 1's product is a free mobile app and web platform that allows healthcare professionals around the world to share medical cases and knowledge. These include physicians, residents, nurses, dentists, medical students, and other healthcare professions. While the platform was launched in North America in 2013, it is now available in more than 100 countries. The app allows for instant access to medical help and professional opinions from other recognized and verified doctors or other healthcare professionals. Figure 1 also provides medical students with a platform to learn and pull knowledge from real cases. The app has over two million registered users, including 800,000 doctors in the United States, and hundreds of thousands of monthly active users [5].

2.3 The team

Being a part of the Growth department, the author was in a team of three people including the author. The team consisted of Mata Kranakis, the Growth Manager who has been with the company nearly since the beginning, and Carter Grieve, the Growth Associate who has been with the company for around a year. The team was structured in such a way that the author could gain advice from and ask questions to either member. Team meetings were a regular occurrence during the week, where members would voice their opinions on what sort of project should be tackled next, or phone calls to other companies to gain insights on new ways to obtain users. Collaboration between the three members also occurred on things such as the weekly growth meetings, where the team presented analytics and various projects to the company. As well, there were bi-weekly "one on ones" with the manager, Mata, to discuss what the author was working on, what the author was doing well, and what could be improved on.

3. Description of work performed

As the Growth intern, the author had many daily responsibilities and roles in several projects. For this report, the author will discuss the ones that were felt to be the most relevant the field of health informatics, and to the future of the author's career development.

3.1 Network Analysis

Network analysis played a major role in most things the author was doing, or trying to achieve, throughout the internship period. Trying to determine what health care professionals were talking about, what they like, their interests, what locations were popular, schools, current medical topics, was crucial in order to determine how best to acquire new users. As well, this information could further be used to determine who is valuable, in terms of both using those individuals to acquire more users, and regarding monetization through the app's advertising model. Identifying important or key users is crucial for user growth and promotion within the app. For example, understanding that a U.S. physician was worth more to the product than a physician from Brazil.

3.1.1 Cliques

Recognizing, and understanding that cliques exist as well within these groupings of health care professionals was also extremely meaningful. The growth team broke these cliques into specialties, both high and low level. For example, high level specialties included physicians, nurses, and students, while low level specialties included cardiologists, nurse practitioners, and dental students. Each clique had to be analyzed, and understood differently if the author was to effectively target these individuals and guide them in becoming a part of the Figure 1 community.

3.1.2 Degree and betweenness centrality

One strategy involving network analysis to gain additional users, was the use of "influencers". These individuals were determined to have high degree and betweenness centralities in regards to other health care professionals the team wanted to acquire as users. The strategy included identifying these individuals as influencers, setting up a structure of incentivizing these influencers to use their networks to bring people onto the app, and then finally tracking how well each influencer was doing. This strategy has proved highly effective, as one influencer in South America was bringing in a significant proportion of Figure 1's health care professional registrations. It was the author's responsibility to determine possible other influencers, and track the statistics of the current ones.

3.1.3 Ambassador program

A second growth strategy utilizing network analysis was the Figure 1 ambassador

program. The program is offered to medical students across the world, and encourages these students to share the app amongst their colleagues, teachers, friends and family. This is done by incentivizing these students with gifts to use their social networks in order to acquire users on the app. Their installs are tracked, and based off these statistics, they are rewarded with gifts. This strategy again has proved to be very effective, making up another significant proportion of the company's health care professional registration. It was the author's responsibility to keep track of these statistics, as well as monitor for any fraud.

3.1.4 Building networks inside the app

While most of the network analysis was being done on individuals who did not have the app, looking into the networks within the app itself proved to give valuable insight. The ability for users to "follow" other users and comment on cases, granted the author and growth team to use this information to build social networks. As well, users also had the ability to follow individual cases. Using this information, the author could determine what kind of cases were popular with what kind of users, and then deduce that these cases might be popular with similar individuals that did not have the app. This strategy proved quite effective in generating new content for use in acquiring new users in different cliques of professionals.

3.2 Analytics

3.2.1 Weekly Analytics

As the growth intern, the author was responsible for the weekly growth analytics. This comprised of gathering data from various sources and compiling it into one sheet. Data such as key metrics of the number of installs, registrations, locations of users registering, which platform the users were coming from, such as paid sources like Facebook, or non-paid sources referred to as organic. Extensive use of Excel and other tools such as a SQL based analytics dashboard were used to compute and collect this information. Once all the data was compiled, it was the author's responsibility to analyze the results and determine if anything looked out of pattern, trends in the data, and what the possible reasons for the resulting trends or outlier data points. This data and rationales were then put together into a presentation by the author for the growth team to present to rest of the company on a weekly basis.

3.2.2 A/B testing

A/B testing was another major responsibility of the author. A/B testing is a method used to determine if one feature is better than another by setting up an experiment wherein there is a control group compared against a group that is exactly the same as the control group, but with one variable changed. This could be applied to a wide variety of variables. Examples of tests performed by the author include: types of ad taglines, creative types (different images or videos for example), automated computer algorithmic ad optimization (making sure the money spent on ads was being used as effectively as possible) versus manual human optimization, and different target audiences. It was the author's responsibility to set up the A/B tests, monitor them, conclude on an outcome based off the data collected after a duration of time, and finally present the findings to the company at the weekly growth meetings.

3.2.3 API linking

In order to determine what kind of users were installing the app and registering, a third party API called Adjust was used. This enabled the Growth team and others to determine what kind of specialty users were registering, for example physicians, cardiologists, medical students, and from where they were coming from, for example which Facebook campaign, ad set, and even which specific ad. This allowed the author and Growth team to gain valuable insights into which campaigns were working and what kind of users were being obtained from each campaign.

3.2.4 Push notifications

Another analytics responsibility of the author was keeping track of how well our email marketing campaigns were performing. This was done using Google Analytics to determine how many individuals were opening the emails sent to them from Figure 1 and at what kind of rate. This data was pulled from Google Analytics and compiled on a Google sheet for anyone in the company to view. From there, employees had the ability to investigate how their email campaigns were performing.

3.2.5 Ambassador analytics

Keeping track of the statistics for the summer Figure 1 Ambassador program, was an additional responsibility for the author. The ambassador program is put on by the growth team each semester, to encourage medical students across the world to spread the word about the app. The program encourages these students by incentivizing each of them with visa gift cards and other gifts for each install they acquire. This is all tracked with individual links associated with each ambassador. It was the author's responsibility, on a weekly basis, to collect key data metrics on these ambassadors using the API Adjust, such as total cohort installs, health care and non-health care registrations, the specialty of the users registering and how many get verified. As well, tracking the number of gifts and their denominations given out for that week.

3.3 Database management and SQL

The author was a frequent user of SQL throughout the duration of the internship. As a company, Figure 1 deploys Redash as their SQL online client and visualizer. The Growth department and the author used queries to determine key growth and retention metrics. These metrics include daily and monthly active users, weekly retention, and monthly returning users. SQL queries were also used to determine which cases on the app to use as creatives for ads in order to target specific specialties. This is done by creating queries to determine which cases are the most popular or most talked about based on specialty category.

3.3.1 Internship Minoring

In addition to using Redash for daily analytics and database querying, the author had the privilege of "minoring" in data science during the duration of the internship. This meant, that a data science team member gave the author access to the data science team's log of requests from other departments. The data science team is responsible for organizing the company's and app's

data, as well as query the database for employees with little experience in SQL. Under the guidance of one the data science team members, the author was given assignments deemed appropriate to work on. Once the author had completed their SQL code, the code was then submitted for review by the data science team member, before being accepted and used for its purpose. Usually growth related, examples of queries written included, comparing daily active users to monthly active users, cohort retention, and monthly returning users.

3.4 Product Overviews

Another responsibility taken on by the author, was to give product overviews to short term visitors, such as job shadowers or guests. This entailed arranging a meeting, sitting down with the individual(s) and walking them through the app. The overviews included identifying features, such as case posting, commenting, following, specialty paging, optimizing feed relevance, explaining verification and medical credibility, privacy and security, and upcoming new features such as the electrocardiogram machine learning project or case collections. Finally it was the author's responsibility to answer any questions the individual might have, and discuss what the growth department's responsibility was, as well as other company departments mentioned.

4. Discussion on how the work relates to health informatics

As mentioned previously in the introduction, "health informatics is changing the practice and delivery of healthcare by providing computer technology-based solutions to bridge the knowledge and information gaps experienced within the health care system" [3], and it is in the author's opinion that their work performed at Figure 1 helped to achieve this. In this section, the author will discuss how the major aspects of the work performed in this internship relates to the courses taken thus far in the health informatics program and the field of health informatics in general.

4.1 Network analysis

The topic of network analysis made up a large portion of the material explored within HINF 6230, Healthcare Knowledge Management. Equally, it played a large role in the author's work during the internship at Figure 1. The skills and knowledge learned in this course assisted greatly in the author's ability to identify relationships between key players, cliques, inside and outside of the app. The network analysis project in particular, really helped the author develop methods in determining important relationships which were subsequently utilized for creative growth purposes within the app.

4.2 Analytics

Data analytics has a significant role within the field of health informatics in essentially all aspects. Examining patient, clinical, epidemiological, and ecological data are all instances where data analysis is used in health informatics. Relating back again to the courses taken by the author, HINF 6030 Statistics for Health Informatics, provided relevant knowledge and experience in the data analysis techniques necessary for this internship. For example, using statistics knowledge aided the author in determining whether or not an A/B test result was

significant or not.

4.3 Database management and SQL

Database management and SQL were major topics in the HINF 6220, Networks and Web course. Three out of the four assignments required the use of SQL to utilize a pre-made database to solve health informatics related problems. For example, creating a web login form that allowed patients to view their results, lab technicians to add patient results, and physicians the ability to view all their patients results. This experience with SQL proved invaluable during the duration of the internship. The author's ability to retrieve information from the company's databases allowed for the responsibilities of creating queries for growth metrics as well as the opportunity to work with the data science team in an "internship minoring" capacity.

4.4 Other topics

While the author did not have direct responsibilities or daily tasks in these areas, these health informatics related topics were part of daily discussions had during the internship period in cooperation with other teams within the company.

4.4.1 Verification

Although anyone can download the app and create an account, verification is crucial when considering using the app to its full potential. When a user creates an account, the app will inquire as to what type of user they are. Categories of users include physician, resident, nurse, student, other healthcare professionals, and non-health care professionals. Only healthcare professionals and medical students are able to post cases and make comments on cases. This preserves the app's medical integrity and allows it to function in terms of collaboration on real medical cases. To become verified, a user must fill out a form that requires the location of their license, their full name, and their institutional email address [6]. A team will then access a public database using their license. In the absence of an institutional email, the user can send a photo of him/her self with their medical license, student id, or government id [6]. Once verified, a user will receive a "checkmark badge" next to their username, along with their specialty.

4.4.2 De-identification

Patient privacy and security is taken extremely seriously within the app. All identifying details, such as faces or tattoos, related to patients must be removed before the case can be posted to the app [6]. Figure 1 itself provides a tool within the app to assist with this de-identification process. An automatic "face-blocking" feature will detect a face and block it [6]. Further manual blocking can be then be done with an easy tool to cover anything else, like tattoos or other identifying markers. Once a user begins to upload a case, a team of moderators and a medical officer will perform a review of each case to make sure that within the image, all identifying information is properly removed, before it can be displayed on Figure 1 [6]. As well, to further ensure privacy, once a case is uploaded to the app, users can report a case if they feel there is identifying information present. If this occurs, the case is automatically removed from the app, and will come under review from the medical officer and moderators [6]. Additionally, there is an option to upload a "text only" case, where a user can describe in words what the case

is about, with no images or identifying information.

4.4.3 Machine Learning

During the author's time at the company, a new feature was being developed by the data science team. This new feature uses machine learning to turn photos of electrocardiograms (ECGs) into data [7]. Electrocardiograms take the electric pulses the heart generates and turns them into line graphs, which cardiologists and other doctors can use to diagnose a patient. Images of these ECGs are common on Figure 1, but they are usually difficult to read. The data team is using machine learning to not only identify an image as an ECG, but also to make the data from the graph much more readable. This in turn makes the information much more comprehensible, therefore enhancing its capabilities as a learning tool within the app.

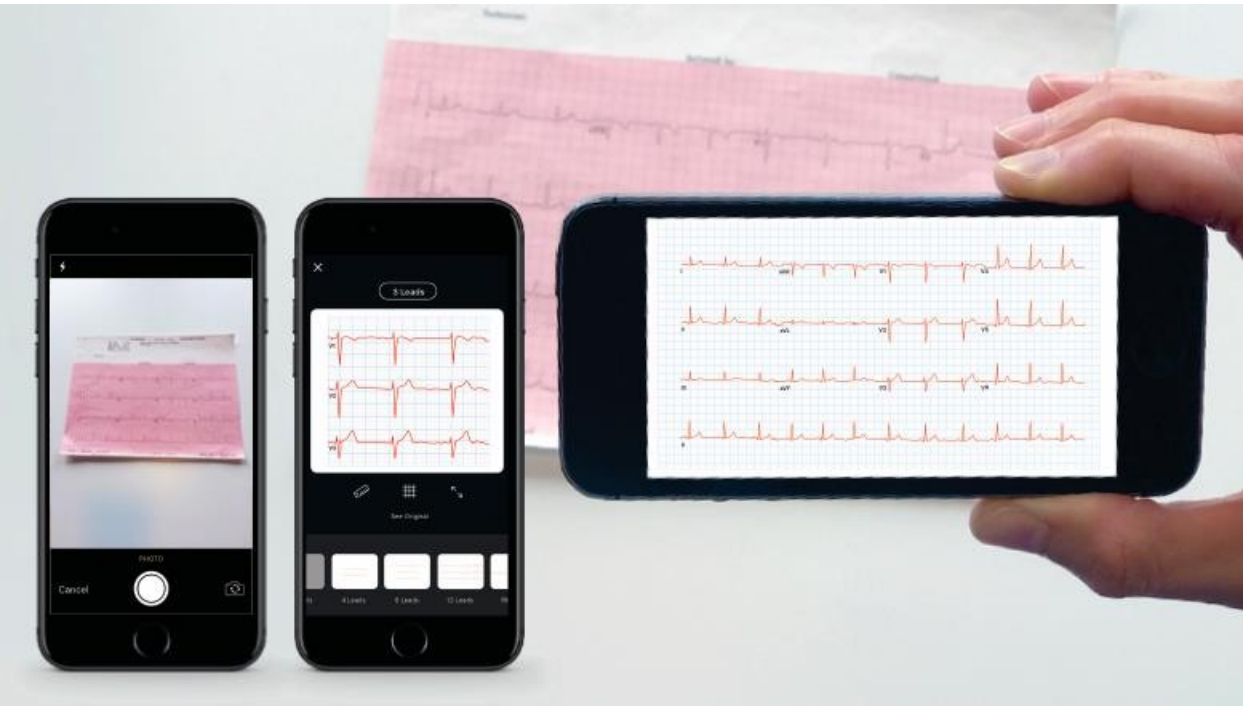

Figure 1: Machine learning electrocardiogram project at Figure 1.

5. Discussion of a problem and the corresponding solution

5.1 The problem

User verification is a very important process to both Figure 1 as a company, and to the actual users of the app themselves. For Figure 1, an increased quantity of verified healthcare professionals registered on the app results in a more valuable product. This is largely due to the fact pharmaceutical and other medical/health related companies will want to invest more in advertising within the app. Essentially, as the number of verified users increases so does the amount of valuable and relevant advertising within the app, generating more revenue for the company. For the users, the more verified health care professionals there are, the greater the medical credibility and accuracy of the comments, cases discussed, lessons learned, and collaborative efforts. This therefore increases reliability, usability and credibility of the app as a whole.

In an ideal scenario, verification of healthcare professionals would be effortless and guaranteed. However in reality, the current procedure of becoming verified takes time, a devoted team at Figure 1, and additionally requires added effort from the user trying to become verified. Due to this complex and inefficient process, a multitude of users do not become verified. As mentioned previously, to become verified on Figure 1, a user must fill out a form that requests the location of their license, their full name, and their institutional email address [6]. The verification team will then manually access a public database using the user's submitted license to verify the individual. If the user does not have an institutional email, the user then has the option of sending a photo of themselves with their medical license, student id, or government id [6]. After that is complete, and the user is verified, they will receive a "checkmark badge" next to their username and medical specialty.

5.2 Proposed solution

5.2.1 Automation

Combining knowledge from the company product and from their educational background, the author suggests an automated user verification process as a solution to this problem. Automated verification of users within the app would increase the efficiency of this process, ultimately leading to an overall increased number of verified healthcare professionals registered on the app. One of the greatest factors driving this conclusion, is the idea that requiring users to do less, with less effort, will help incentivize them to become verified. Additionally, automated verification would also put less stress on the Figure 1 verification team, and even help scale back how many team members are needed on a daily basis. So, in theory, this solution would increase the number of users becoming verified, increasing the user experience on Figure 1, and save the company time and money in terms of manual verification.

5.2.2 Database creation

This proposed solution would need to begin with the creation of a secure database of

health care professional information. Data including full names, license numbers and institutional email addresses. As the verification team currently is able to manually access this information, creating a secure database containing this data seems plausible. This database would also need to be able to automatically refresh, to account for new HCPs and students. This would be a private database controlled and protected by Figure 1, for its use only. With the data already being public however, the security measures would not need to be incredibly sophisticated or strict.

5.2.3 New procedures

The next step in the new proposed auto-verification system, would be to modify the current way a user creates a Figure 1 account. Currently, a person downloads the app, enters their email address, creates a username, chooses a specialty, and selects the content they want available on their feed. In the proposed new way, once an individual downloads the app, they will be prompted to enter their *institutional* email address. Once their institutional email is entered, they will then create a username, and select their specialty. After this information has been entered, the Figure 1 verification database mentioned earlier will be queried using their email and specialty. If a match is found, the user will be asked to confirm their license number. If it matches with the rest of the information in the database, the user will automatically be verified. If the user wishes not to confirm their license number on the sign-up, a second option using automatic verification would be to send an automatic email to their institutional email. This email would contain a link to confirm their account, and once followed, would automatically verify their account. If none of the first two options were desired or possible for the user, then the current manual verification process could occur.

This would greatly reduce the number of verification requests for the verification team, lessening their workload and allowing them to focus on other aspects of their job. This new, easier and more efficient method would ultimately increase the number of users who would become verified, subsequently increasing the overall user experience for all users on Figure 1.

6. Conclusions

Figure 1 is a fast growing, smartly lead tech startup that the author only sees getting bigger and better over time. Being a part of this relatively small team has been a great experience, both in terms of gaining valuable relevant work experience, and understanding what kind of work environment the author would hope to be a part of.

The author was able to gain knowledge and experience in the relatively new and important field of growth, while at the same time getting the opportunity to utilize and refine the skills developed through the health informatics program at Dalhousie. This was achieved by performing relevant work throughout the entire internship period.

Utilizing this new knowledge, and the previous knowledge obtained in the program thus far, the author was able to identify a problem in one of the current procedures in the company, and propose a new health informatics related solution to that problem.

7. Recommendations

In regards to this internship, the largest recommendation this author would offer to future students, is to keep an open mind in terms of what some jobs may sound like. Speaking honestly, the author was not sure what to expect when it came to the job advertised. The author had little experience and knowledge in growth previously, and was at times unsure as to how the experience would further their career goals. However, once settled in, it became apparent how much there was to gain from the time afforded to them at Figure 1. As the author was not micro-managed in any way, they were effectively allowed to explore all aspects of the company, and to investigate initiatives that had the possibility of making a company-wide impact. Whereas other positions at larger companies perhaps would not have granted this kind of opportunity.

Following in the same train of thought, the author would recommend to future students that if an opportunity presents itself to take on a project or assignment that you have no experience or knowledge in, to jump on it and say yes. There is no better way to learn then having to start from scratch and build your way up to completing a project. Additionally, as an intern, it is expected that you do not have much experience, so asking questions and getting guidance will not be a surprise or annoyance to management. If you are at the right company, superiors and coworkers will ensure sure that you stay on track and continue to grow. Thus by the end of it, you will have learned so much more than you would have working on something you had prior experience with.

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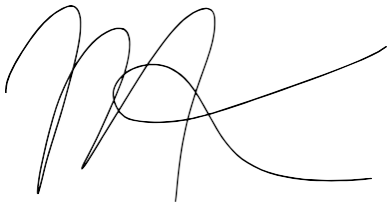
Dr. Abidi and Ms. Harvey,

I, Mata Kranakis, Growth Manager and direct supervisor of the intern, have read and approve of the content of this report. The information provided is accurate and descriptive of Mitch Glazier's time spent as an intern at Figure 1. I hereby sign-off on this report as well as the completion of the internship work term.



Mata Kranakis, Growth Manager, Figure 1 — **August 17, 2017** Date

Mitch Glazier, Intern, Dalhousie University — **Aug 17, 2017** Date