

University of Economics, Prague

Faculty of Informatics and Statistics



# **ANALYSIS OF GOOGLE ANALYTICS USAGE IN A PARTICULAR BUSINESS**

BACHELOR THESIS

Study programme: Applied informatics

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## **Declaration**

I hereby declare that I am the sole author of the thesis entitled “Analysis of Google Analytics usage in a particular business “. I duly marked out all quotations. The used literature and sources are stated in the attached list of references.

In Prague on 11<sup>th</sup> May 2020

Signature

Vladimir Badashkhanov

## **Acknowledgement**

I hereby wish to express my appreciation and gratitude to the supervisor of my thesis, Ing. Jiří Sedláček, Ph.D. for guidance and inspiration.

Also, I would like to express my appreciation and gratitude to my family who supported me during my studies.

## **Abstract**

The aim of this Bachelor thesis is to reflect influence of usage of Google Analytics on a product lifecycle.

Based on a professional literature and data that was generously provided from a multinational company that desired to stay anonymous, this thesis describes digital marketing and one of the major products in this field – Google Analytics. Part of this document is focused on technology behind Google Analytics. Another part is focused on analysis of usage of Google Analytics inside a company that was mentioned above and one of its products.

First part of thesis acquaints user with terms Digital Marketing and Google Analytics and reflects their importance in modern age while at the same time describing technology behind Google Analytics software. Consequently, reader will be introduced to general information about company that provided data for research purposes of this document. In the practical part will be conducted actual analysis based on gathered data and therefore reader will explore the actual influence of integrating Google Analytics inside the company's product.

As an outcome of this research, thesis reflects usage of Google Analytics inside a company and states whether it brings value or not.

## **Keywords**

Google Analytics, Digital Marketing, Web analytics, Software.

## **Abstrakt**

Cílem této bakalářské práce je demonstrovat vliv použití Google Analytics na životní cyklus produktu.

Na základě odborné literatury a dat, která byla velkoryse poskytnuta nadnárodní společností, která by chtěla zůstat anonymní, popisuje tato práce digitální marketing a jeden z hlavních produktů v této oblasti – Google Analytics. Část tohoto dokumentu je zaměřena na technologie, která je součástí Google Analytics. Další část je zaměřena na analýzu využití Google Analytics uvnitř společnosti a jejích produktu.

První část práce seznamuje uživatele s pojmem digitální marketing a Google Analytics a odráží jejich význam v moderním věku a zároveň popisuje technologii která je součástí softwaru Google Analytics. Následně bude čtenář seznámen s obecnými informacemi o společnosti, která poskytla údaje pro účely výzkumu tohoto dokumentu. V praktické části bude provedena skutečná analýza na základě shromážděných dat, a na základě toho čtenář prozkoumá skutečný vliv integrace Google Analytics do společnosti.

Výsledkem tohoto výzkumu je, že práce odrazuje využití Google Analytics uvnitř společnosti a uvádí, zda přináší hodnotu, či nikoli.

## **Klíčová slova**

Google Analytics, Digitální marketing, Webová analytika, Software.

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# Introduction

Internet is rapidly developing in modern age. It is continuously covering every aspect of modern life, while at the same time contributes a lot to other fields that are not visible for everyone. No wonder, internet is turning itself from a toy to a powerful source of information and communication for everyone.

Internet is a new highly effective communication tool. Based on everyday life experience it is not arguable that internet is as necessary part of human routine as phone, laptop or headphones. Each and every commercial organization operates in a complicated and composite environment, which may include partners, competitors, investors, certain targeted audiences, media, governmental or social structures in a scale of a particular region, a country or a whole world. Therefore, it is obvious that a commercial organization that uses internet in its everyday operations has a list of advantages against its competitors that do not do so. Currently, it is almost impossible to conduct business without modern internet communication technologies, since internet provides its users with a wide range of tools for promotion.

It is crucial for every commercial organization to attract potential customers. It is possible to do that by informing people of a capability of a product to solve certain problems and fulfil people's needs. Knowledge and awareness about product are collected by a potential customer via targeted informing about company's specialization and range of product that company has in portfolio. There are many channels to spread information about company and its products, starting from rumors ending with television. Nowadays, by reason of a high competition almost on all fields of a market, every commercial organization (especially a newly established one) is trying to express itself in internet, a modern and strong communication and information space.

Grenville Kleiser says: "Life doesn't stand still. Where there is no progress, there is disintegration." (Kleiser, 1917, p.10) Thus, certain people adapted to technology progress and integrated its potential into everyday business activities. Having said that, it is obvious that mix of technology progress and old strategies creates completely new ways and approaches to conduct business.

That rule also applies to marketing. More and more often, companies launch large marketing campaigns in internet sphere. In order to make it efficient and productive, certain companies developed tools to support digital marketing. One of these tools is Google Analytics.

Google Analytics is a powerful tool used to track users' activity, including session duration, pages per session or number of individuals visited inside a website or certain product. It provides user with a huge dataset which later can be transformed in a report that is used to help companies to adjust their products, marketing campaigns and websites for better customers' perception.

**Goal** of this bachelor thesis is to analyze how anonymous company's product was influenced by integrating Google Analytics tool. For the purpose of achieving this goal it is necessary to resolve the following tasks:

1. Identify and get insight into field of operation of Google Analytics
2. Get an insight into technology and implementation of Google Analytics
3. Discover what data is collected by the company

**Methods** used in this document is a research used in theoretical part and analysis of provided data in practical part.

**Reason** for choosing this topic for writing bachelor thesis is author's personal interest on how and how effective Google Analytics tool is used in practice. Field of internet marketing is rapidly developing in the last years, therefore professional knowledge in this area will serve well to author of this document. Another reason of choosing this topic is author's personal experience of working with sets of data that were provided and are displayed by Google Analytics tool. Unfortunately, work experience couldn't provide author with deep theoretical knowledge of all features of this powerful tool, which will be compensated by research and investigation conducted in this document.

# **1 Digital marketing**

In modern age, overwhelming majority of commercial and non-commercial organizations use modern communication technologies to conduct everyday business operations. This trend applies to almost every vital section of a company. No wonder, internet communication technologies are widely used for marketing purposes. Incorporation of new technologies lead to a creation of a new term called Digital Marketing.

This chapter is dedicated to definition of a term Digital Marketing as well as its historical evolution. Furthermore, this chapter explains main goal of digital marketing, it's differences with traditional approach and its influence on modern business.

## **1.1 Introduction to Digital Marketing**

According to global research and advisory company Gartner, definition of Digital marketing is "Digital marketing is a set of integrated techniques, technologies and information that enables marketing to create new products and services; enter new markets; improve the processes needed to engage in a dynamic conversation with people who are influencers and buyers; and ultimately target, acquire and retain customers." (Gartner, 2020)

## **1.2 History of Digital Marketing**

First evidence of existence of a term Digital Marketing appeared in 1990s. This was mainly induced by appearance of internet and development of web 1.0 platform. However, first iteration of internet platform had limited functionality. It allowed users to search for desired information, but it was limited in terms of sharing it. Nevertheless, specialists in marketing all over the world had low trust in this technology since it was not widely spread at that time. (Monnappa, 2020) Since then, internet technology was gradually spreading across society while at the same time positively contributing to people's perception.

The following 10 years of consistent development of information technologies has brought many positive aspects to digital marketing, making it more popular across professionals. According to opinions of many specialists, one of the most important events in development of digital marketing is a wide spreading of personal computers around society. This created opportunity for growth of popularity of digital marketing. According to statistical data, in 1996 the average time Americans spent every day on surfing internet was 30 minutes. (Kapost, 2015) This is a proof that personal computer was becoming a tool that was used on daily basis making it meaningful for companies to advertise themselves through internet. In addition to previous statement, in 1990s were launched some of the most currently popular search engines and companies: Yahoo search engine (1998), Google (1998), Microsoft's MSN search engine (1998). In 2006, the digital marketing world experienced the first burst of popularity thanks to search engines that were mentioned before. It was

reported that search engine traffic experienced a growth to 6.4 billion in one month. (Monnappa, 2020) Therefore, it was clear that internet space evolved from a product that was underestimated in a professional environment to a product that in the future will serve as a strong foundation for digital marketing.

## EVOLUTION OF DIGITAL MARKETING

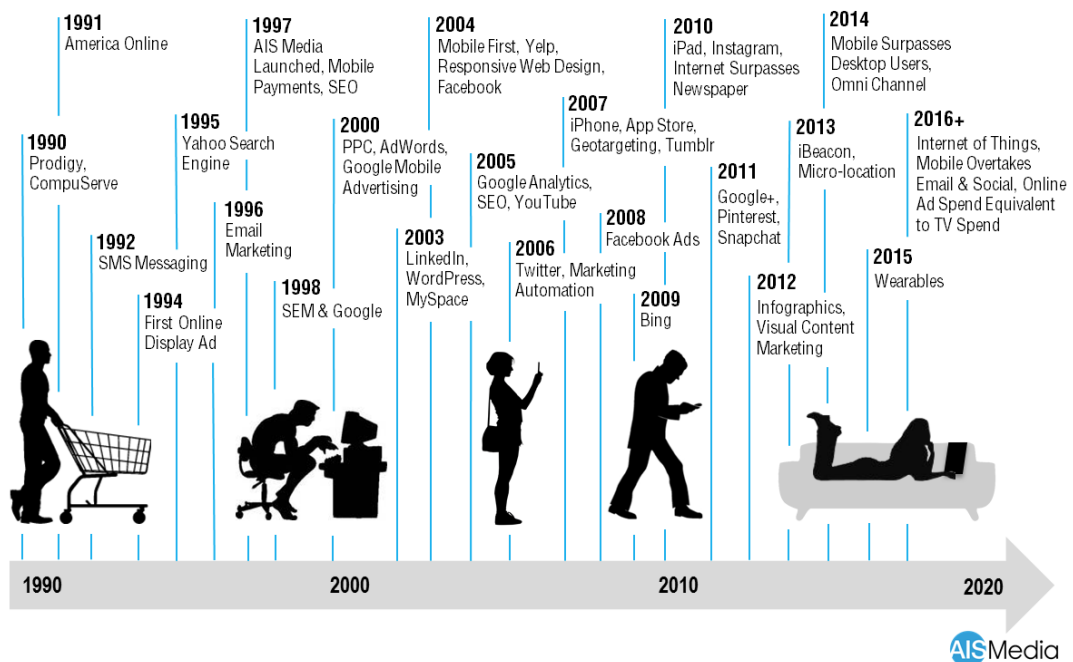


Figure 1 Evolution of digital marketing (source: Medium, 2016)

A positive contribution to development of digital marketing was also committed by growth of popularity of CRM tool in 1990s. CRM is an abbreviation which deciphers as follows: Customer Relationship Management. Part of it is a powerful software for monitoring relation with current and potential customers. CRM software provides its users with support in 4 fields: marketing, sales, customer service, and digital support. (Gartner, 2020) However, its initial version was limited only to inventory control and interaction tracking. Such a big growth was possible, because of increasing competition on CRM market. It was invoked after SAP, Oracle and Baan entered the market. Enhancement in functionality of CRM software allowed marketers to operate with large amount of data about customers in real life, making it dynamic. However, at this point marketers couldn't efficiently operate with this data. Situation was changed in 1999, with first SaaS company Salesforce entering the market. This was the first business application delivered through a website, which later established as a term called 'cloud computing'. That was a big leap forward towards establishing a marketing technology. (Tiwari, 2018)

2000s brought a new challenge to marketers all over the world. As it was mentioned before, personal computers were rapidly spreading across society. This trend completely changed consumers' behavior in mid 2000s. Customers were conducting a research on products and services before actual purchase. This phenomenon was confusing marketing specialists all over the world, since it was complicating the process of predicting and understanding of buying behavior of consumer. This challenge was partially solved by creation of marketing automation. First ones to come up with this solution were Marketo, Act and Pardot

companies. This solution allowed marketers to split market by segments, invoke multi-channel marketing campaigns and deliver targeted and personalized content. (Tiwari, 2018)

In 2010s consumers substantially changed their habits. They became truly tech dependent. According to statistical data Americans spend 11 hours online every day. Moreover, in 67% of the cases people check their phones even without notification. It was caused mainly due to merging social media into everyday life. Companies perceived this as an opportunity to effectively promote their products and services to consumers. (Tiwari, 2018) To support that matter marketers began to use technologies to collect data. One of these technologies is cookie. It was used to track common browsing behavior and consumers' online activity and later, based on collected data, create and deliver a content that was tailored personally for each consumer. (Monnappa, 2020) However, in order to operate with such a big volume of data, specialists needed a special software. Google came up with a solution by launching Google Analytics, which nowadays is one of the most popular products in this field. Google's software solution allows marketers to analyze big amount of data in real time and quickly react to changing consumer behavior trends. Furthermore, it is helpful in delivering personally tailored promotions to customers.

### **1.2.1 Main objectives of Digital Marketing**

Digital marketing as a set of techniques and strategies for promoting business, products and services persuades several objectives. Most common objectives (Bhasin, 2019):

#### **1. Direct sales increase**

Every business' main objective is to maximize revenue. Therefore, investments that are made into marketing campaign are expected to be returned as direct increase of sales, and consequently increase of revenue. It is best expressed with online stores. Online store business can run a digital marketing campaign which will attract consumers and eventually make them land on business' online page, browse offerings and perform actual purchase.

#### **2. Improvement of brand awareness**

According to essential business rules a successful operation of business contains a necessity for attracting potential customers. This is partially achieved by spreading brand awareness among society. In other words, the more people know about business, and its offerings the more sales are possible to be performed.

#### **3. Keeping customers engaged in a brand**

Keeping customer engaged in a brand is only aiming at retaining already acquired ones. Digital marketing solves this challenge by delivering targeted ads to consumers that had previously bought a product from a company or visited its website. This is a very common situation, when a certain user is browsing specific goods and later sees ads related to them in social media.

#### **4. Reduce the cost of acquiring new customers**

In most of the market segments, it is generally pricy to acquire and attract new customers. Companies conduct these operations in order to increase sales and expecting that customers will retain loyalty to brands. However, due to high competition this is usually challenging. Therefore, it is necessary to ensure that customer acquiring operations will be conducted without overspending. The perfect

way to overcome this challenge is to use digital marketing. Digital marketing allows companies to cover a considerably great amount of targeted audience relatively quicker than traditional marketing. It is achievable through running paid ads in social networks and search engines. Unlike purchasing ads in newspapers, tv, billboards et cetera, digital marketing offers a reasonably better price value ratio.

### **1.2.2 Differences between Digital Marketing and Traditional Marketing**

Digital marketing and traditional marketing are persuading the same objective: to promote business and reach to public. Nonetheless, there are clear differences between them. Main difference is in the method of delivering a message to potential customer. Among channels of operation of digital marketing are social media and search engines, while traditional marketing operates with traditional methods: billboards, magazines, newspapers, TV et cetera. Nevertheless, it is not possible to clearly define which one is better, both of them have strong sides and weak spots.

Traditional marketing strong sides:

- **Memorable**

According to basics of human psychology, in most cases real life experience is more likely to stay in long term memory than a digital one. Therefore, there is a considerably bigger chance of a person remembering an ad he saw earlier on a large billboard, than an ad on Instagram that he will likely swipe away.

- **Impactful**

A visually entertaining and informative billboard on a street, a banner in subway or a constantly displayed add on TV are parts of daily life of most people.

- **Permanent**

In certain cases, an add placed in a magazine or a newspaper might stay there for years. An example of described case might be a person who collects magazines. Therefore, an add will remain until advertising medium is recycled.

Traditional marketing weak spots:

- **Hard to measure impact**

Traditional marketing tools for measuring add impact are not as effective as the ones provided by digital marketing. For example, tracking of customer's activity on a webpage or measuring an amount of brand's search requests is much more effective way of measuring ad impact than making a survey.

- **Expensive**

Generally, it is expensive to operate with traditional marketing channels to deliver a message to a potential customer. Price of a print advertising in Forbes magazine starts at 65,000 USD as of 2020 and there is no guarantee that audience coverage will be as much as if company invested same amount in digital marketing channels (Forbes, 2020).

- **No direct iteration**

It is usually challenging to find out audience's reaction to a certain add when using traditional marketing tools. Unlike traditional marketing, digital marketing overcomes this challenge well.

Digital marketing strong sides:

- **Engagement**

Distribution channels that are used by digital marketing allow literal observation of audience's opinion about certain ads. For instance, when ad is delivered through social media, it is easy to measure it's accomplishment by the amount of 'likes', 'shares', and comments that audience leaves.

- **Measurable**

Unlike traditional marketing, capabilities of tracking provided by digital marketing are indeed effective. For instance, Google Analytics software that was mentioned in previous chapters allows to track the number of users visited, time they spent on each page, session duration and many more. This makes it possible to precisely determine the preferences of customers and on the other hand, their least-likes.

- **Targeted**

Digital marketing strategy contains tools that possess functionality to target specific audience segments. This is precise enough to display certain ads to specific age group with designated preferences in products and services.

Digital marketing weak spots:

- **Potentially annoying**

Ads displayed in a wrong place at the wrong time are generally perceived by audience as annoying. Sometimes it may create a bad image of a brand that sponsored this ad, even though this is a clever targeting approach.

- **Impermanent**

Unlike traditional marketing ads, digital ones are intangible and therefore less permanent. For instance, this ad will be gone right after user clicks on a link and navigated to a different page.

- **Difficult to follow its constant development**

Every channel of distribution operated by digital marketing requires its own specialist with a set of specific skills and knowledge. Otherwise, it will be quite challenging to achieve a good expenditure benefit ratio.

### 1.2.3 Digital Marketing's influence on business

Digital marketing's influence on business is challenging to be objectively measured. Nowadays people tend to use smart technologies more and more. This is reflected in people's everyday routine. Books are being replaced with electronical analogues, magazines make headway to operating online and newspapers experience decrease in popularity due to online news. Therefore, business adapt to ensure successful operation. As a result of that, digital marketing maneuvers gradually extrude traditional marketing approaches.

In addition to previously mentioned causes that trend was invoked by several other reasons. Unlike traditional approaches, digital marketing has several characteristics that create undeniable advantage in front of traditional maneuvers. First one is “equal opportunities for business of all sizes”. Currently, assets provided by digital marketing are easily accessible by small and medium scale business which allows them to build reputation, create brand awareness and as a result of this, compete with large established companies. Second characteristic that is applicable to digital marketing is ‘cost-effective’. Thanks to digital marketing, even small companies that operate with evidently smaller amount of financial resources than large or medium scale ones, can allow marketing campaigns that are capable of covering large number of potential customers. According to statistical data 28% of companies would redistribute their fixed budget allocated for traditional marketing campaigns to modern digital marketing campaigns (Wilson, 2020). The last characteristic, but not the least is “promising reputation building opportunities”. One of the strong sides of Digital marketing is a capability of delivering a message to a specifically targeted audience. By doing that, company is increasing its chances to get discovered by interested customers, who might be impressed enough to do actual purchase. There is a considerable chance that impressed customers will spread a word and therefore contribute to building of brand reputation (Wilson, 2020).

To summarize information that was stated above, it is clear that integration of modern technologies into people’s everyday life has led to creating new ways of conducting marketing routine. This in turn invoked a process of business adapting to new approaches. With increasing demand for digital marketing, companies support evolution of supportive digital marketing technologies and skilled people.

## **1.3 Web analytics**

Digital marketing often implies delivering a message to a potential customer by using web traffic. It contains organic traffic, paid search traffic, email traffic and others. However, in order to successfully operate with these, specialists have a necessity for tools that will collect information about customers’ engagement in these campaigns and later analyze them. This challenge is solved by web analytics.

Web analytics allows marketers to analyze user’s activities, and based on collected data, react to changes in their behavior in timely fashion. Moreover, it gives an insight about web site or marketing campaign’s performance against targeted audience. Based on that, it is evident that web analytics is vital for digital marketing operation.

### **1.3.1 Definition, importance and tools of web analytics**

Gartner: “Web analytics refers to a market of specialized analytic applications used to understand and improve online channel user experience, visitor acquisition and actions, and to optimize digital marketing and advertising campaigns. Commercial products offer reporting, segmentation, analytical and performance management, historical storage and integration with other data sources and processes. The tools are used by marketing professionals, advertisers, content developers and the website’s operations team, and

increasingly provide input to automated tools that target improved customer experience.” (Gartner, 2020)

Web analytics is a source of information about user’s behavior and their activity on internet resources. It includes information about the amount of time spent on website, the biggest referrers, number of users, conversion rates, page stickiness, visitor latency, frequency, revenue, and geographic distribution. (Clifton, 2012, p. 16-17) It allows to quickly collect, process, analyze and report vital pieces of data for digital marketing purposes.

Web analytics provide companies with information that pinpoints strong and weak spots of a product or website. Therefore, this information is especially important in taking strategically important decisions.

Web analytics tools can be separated in 2 different groups: offsite tools and onsite tools.

**Offsite tools** are used to provide following pieces of information that are not dependent on website’s existence (Clifton, 2012, p. 7):

- size of website’s potential audience – in other words, possible visitors who may become customers
- so called share of voice (visibility) – the percent of market you own compared to your competitors
- the buzz (comments/sentiment) – opinion and comments about the website

Unlike offsite, **Onsite tools** are used for following data that are strictly dependent on website’s existence (Clifton, 2012, p. 7):

- visitor’s onsite journey – how visitor ended up on the website
- drivers – what led visitor to visit the website
- website’s performance - for instance, commercial performance

Therefore, it is safe to say, that offsite tools are macro tools. They allow you to see a general picture and compare your website to others. While onsite tools are tracking a traffic arriving to a website. These tools are capable of tracking users’ interactions and engagement with a website and separate webpages. An example of offsite tool could be Hitwise or comScore, while an example of onsite tool could be Google Analytics. (Clifton, 2012, p. 7)

## 1.4 Google Analytics

### 1.4.1 Functionality

Google Analytics features are possible to be separated in 2 groups (Clifton, 2012, p. 46):

- Standard “must-have” features that can be provided by almost any web-analytical software
- Advanced features that are unique for Google Analytics and are for professional users who have a necessity for larger and more detailed metrics insight

Standard features of Google Analytics contain:

- Google Analytics is capable of tracking all website's visitors, including the path they went through to reach the website. For instance, if they clicked on paid ad or visited by nonpaid organic search. (Clifton, 2012, p. 46)
- Google Analytics can display advertising ROI (acronym for **R**eturn **O**n **I**vestment) for AdWords and AdSense. It's simplified to the point, where user just must check 2 checkboxes. Therefore, it is possible to track which ad campaign generates the biggest amount of revenue. (Clifton, 2012, p. 46)
- E-commerce reporting. (Clifton, 2012, p. 47)
- Goal conversions. In other words, Google Analytics is capable of tracking how many visitors were converted to customer's who landed on purchase-confirmation page. Nonetheless, other non-transactional goals exist. For instance, completing registration. (Clifton, 2012, p. 47)
- Google Analytics can map paths, that are called funnels, that visitors take before goal conversion. In fact, this is useful for identifying pages where potential conversions were lost. Each funnel is limited to 10 pages. (Clifton, 2012, p. 47)
- Site overlay report. Simple graphical demonstration of popularity of each link on the website. (Clifton, 2012, p. 48)
- Map overlay report. Simple graphical demonstration of geographical location of website's visitors. It is scalable up to city level and can be as accurate as 40 km radius. (Clifton, 2012, p. 48)
- Cross-comparison of different data sets. For instance, Google Analytics is capable of displaying all visitors from Prague and what keywords they used to find the website. (Clifton, 2012, p. 48-49)
- Data export in different formats and scheduling of sending data by email to up to 10 recipients. (Clifton, 2012, p. 49)
- Reports on internal site search engines. This feature is important for complicated websites that contain a large number of pages. (Clifton, 2012, p. 50)

Advanced features of Google Analytics complement the standard features with the following functionality:

- Advanced segmentation and advanced table filtering. It allows user to display and analyze subsets of visitor's traffic together with other segments. (Clifton, 2012, p. 52)
- Improved cross-comparison of data sets, which was mentioned in standard features list. Difference is that different types of data are displayed in the same table. (Clifton, 2012, p. 52)
- Motion charts. Technically, it is animated statistics that graphically display data. User can select metrics for the x-axis, y-axis, bubble size and its color and observe how these interact with each other over time. (Clifton, 2012, p. 52)
- Advanced features include API (**A**pplication **P**rogramming **I**nterface) and developer platform. It allows to integrate Google Analytics data into already existing products or create independent applications. (Clifton, 2012, p. 52)
- Analytics intelligence. This feature provides user with automatic alert for abnormal changes in data. Moreover, user can create custom alerts. (Clifton, 2012, p. 53)

- Cross-device support. Google analytics can track mobile based websites and applications even with disabled JavaScript. It is possible by server-side code snippet on a website. Spectrum of supported languages is PHP, Perl, JSP and ASPX sites. (Clifton, 2012, p. 53)
- Benchmarking reports. Google Analytics allows user to compare website's statistics to other websites that are too using Google Analytics. Each user can select a benchmark category and that data will be compared to websites of a similar size, therefore allowing user to get an insight on website's performance compared to competitors. (Clifton, 2012, p. 53)
- Advanced features allow to track all events triggered by user actions on a page. For instance, even when a visitor is clicking on Pause/Play video, it will be displayed in a separate report. (Clifton, 2012, p. 54)
- Capability of recognizing visitors from any source
- Google stores website's data for at least 25 months. Therefore, it is possible to conduct a year by year analysis. (Clifton, 2012, p. 54)
- Google Analytics supports regex (regular expressions) to customly filter data. Maximum length of an expression is 255 symbols. (Clifton, 2012, p. 55)
- User is permitted to customize a list of recognizable search engines. For instance, user can split google.cz and google.com, which originally is grouped under one search engine referrer. (Clifton, 2012, p. 56)
- Data backup. It allows users to store data even longer than Google's commitment of 25 months.

To summarize information stated above it is clear that Google Analytics is a flexible tool with a wide spectrum of features. Some might be more popular among users than others, however all of them are committing to simplifying web analytics, while providing users with valuable data about website.

### 1.4.2 Technical insight

Generally, Google Analytics integration inside a website or a product requires developer's intervention. In order to successfully operate with Google Analytics a page that is required to be tracked must contain a Google Analytics Tracking Code (GATC). (Clifton, 2012, p. 56)

Code 1.1 Example of global site tracking code (Google Analytics)

```
<!-- Global site tag (gtag.js) - Google Analytics -->
<script async src="https://www.googletagmanager.com/gtag/js?id=UA-165714258-1"></script>
<script>
  window.dataLayer = window.dataLayer || [];
  function gtag(){dataLayer.push(arguments);}
  gtag('js', new Date());

  gtag('config', 'UA-165714258-1');
</script>
```

This is a small JavaScript code snippet that must be placed on every page that is desired to be tracked. The right spot for integrating this piece of code is right after opening html <head> tag. (Google Analytics)

1. When user opens a website, a browser sends request to a server, which sends a respond with HTML, CSS, and JavaScript code. In case page contains Google Analytics Tracking Code, an automatic request for Google Analytics master file is made. This is a small JavaScript file named ga.js that is located at <http://www.google-analytics.com/ga.js> and is downloaded only once per user session. It later is saved in browser's cache and every other request for that file is retrieved from there. When ga.js file is downloaded and ready, visitor's data and data about referrer are being collected. Visitor's data might include unique identifier, screen resolution, timestamp and color depth. At the same time, first-party cookies are created in order to identify a visitor. (Clifton, 2012, p. 56)
2. For each page of a website visited, the Google Analytics Tracking Code sends collected information to Google data collection servers. Transmission of data takes less than a second, therefore not affecting user experience. (Clifton, 2012, p. 56)

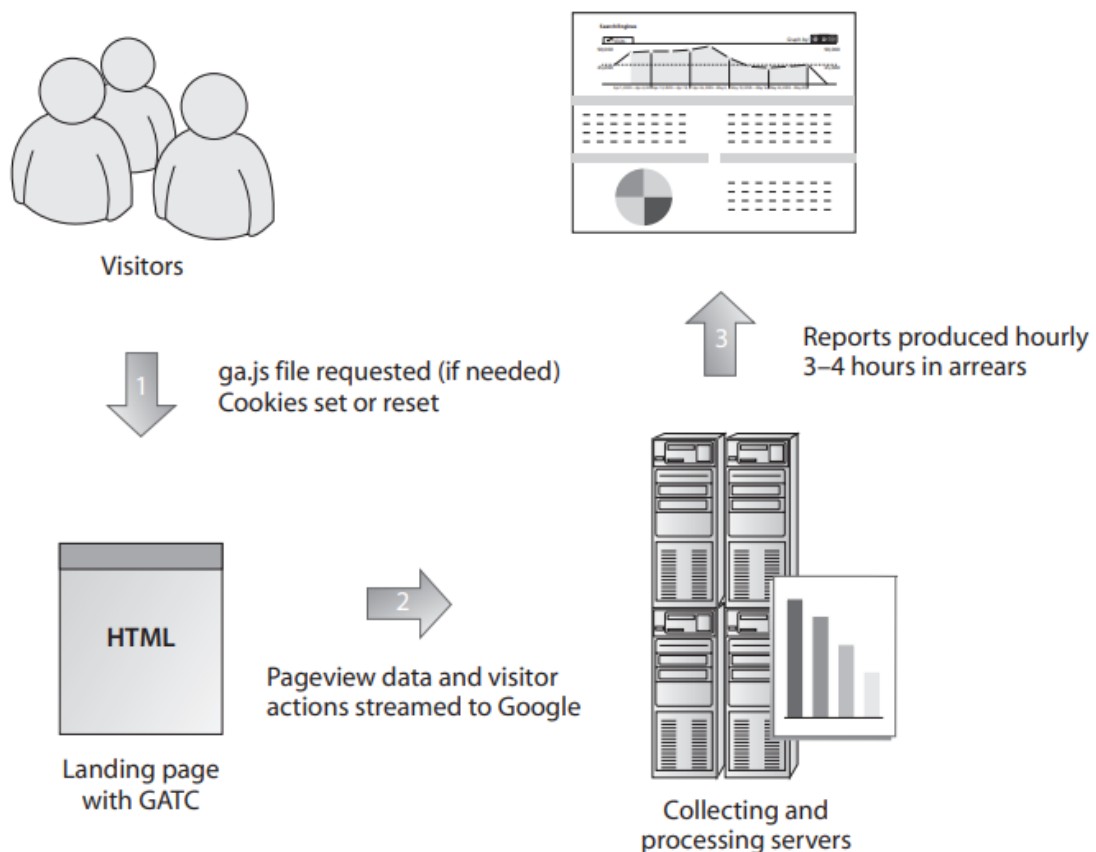


Figure 2 Scheme of how Google Analytics operates (source: Clifton, 2012, p. 57)

3. Collected data is processed every hour. However, due to the amount of data collected, sometimes it takes longer, up to 4 hours. After data is processed user's Google Analytics reports are updated. (Clifton, 2012, p. 57)

## 2 Information about company

### 2.1 General information about company and its activities

A company that provided data for the purpose of analysis in a practical part of this document desired to stay anonymous. However, they permitted to share some information about them, that will not lead to their identification.

That is a global multinational technical company that is specializing on cybersecurity software. Currently, it has above 1000 employees and over 10 offices across the world.

Founded more than 15 years ago, that company's mission remains the same. It is contributing to a world becoming a safer place where one's privacy matters.

Currently, company's portfolio consists of a wide spectrum of products: from browser extensions to cloud solutions offered to businesses that altogether help its users to increase their security and maintain privacy.

At this point, products are distributed to customers based on **freemium** model. Therefore, all the basic security features are available for free. Nevertheless, free version is supported by ads. In order to get access to advanced ones, user will have to pay for premium subscription.

The user base is monetized directly and indirectly. One of the options in direct monetization is a conversion of free users into paying customers. Moreover, average revenue generated by customer is increased by cross selling of additional security and privacy products. Indirect monetization is based on displaying targeted ads to free users as it was mentioned above. Main distribution channel of products and services is desktop (approximately 52%).

### 2.2 Organizational structure of a company

Company was found by 2 software engineers in a shape of cooperative. Later it's type of business entity was changed to a private limited company. After an IPO (Initial Public Offering), company became public, which remains the same nowadays.

Currently it is led by CEO and board of executives.

## **2.3 Information about product used for analysis purposes**

In order to conduct analytical activities for the purpose of fulfilling the document's objective one of the company's products was selected. This is a passwords manager that is distributed in a form of browser extension. Currently, this extension has more than 10 million downloads.

Password manager has a wide range of functionality:

- Saving and storing password outside of browser
- Saving and storing credit or debit card information
- Create strong passwords
- Instantly auto-fill credentials
- Auto-fill credit card or debit card information
- Monitor and notify if one of the passwords was spotted in known leaks
- Synchronize saved passwords among all platforms and devices possessed by user

Password manager is a cross platform product which is distributed on PC, Apple products, and Android. Moreover, it supports all Chromium based browsers and Mozilla Firefox.

Technologies used to implement password manager were JavaScript for user interface and C++ for windows side of the application. Information about backend used is not available for disclosure. Extension works in pair with a parent application that has a wider range of functionality which also includes password management features.

Technical implementation of this product required developers to use different technologies. In order to implement user interface, it was decided to use separate JavaScript framework. It was done due to the necessity of making user interface reactive, which is over complicated with standard JavaScript programming.

### **2.3.1 Google Analytics and password manager relation**

Company uses Google Analytics to effectively collect insensitive data about serviceability of password manager and analyze it in real time for better understanding its customers and their behavior. In addition to that, collected data allows quality assurance engineers to quickly spot malfunctions and navigate issues to developers for conducting fixes in timely fashion. This type of approach allows maintainers to quickly react to bugs in password manager and therefore enhance user experience, while at the same time not affecting user's privacy, since data that is collected is unrelated to a user, but rather to application's operability.

## 3 Usage of Google Analytics with a certain product

During development phase, management decided that it is necessary to use a tracking tool within a password manager. However, not to collect sensitive information about users, but rather monitoring application's functionality status and study audience's general characteristics. Data in following subsections will be for a period from June 1, 2019 to August 31, 2019.

### 3.1 Audience studies

For conducting audience's studies, standard Google Analytics tools were used to measure standard metrics of web analytics, including number of users, number of sessions, session duration, geographic data, customers' hardware used to operate with application, tracking of most used features of application, and tracking of application version.

#### 3.1.1 Audience tracking

Company is tracking the number of users, sessions and session durations in order to measure popularity of application in exact numbers. For instance, retrieved information evidences that in the period from June 1, 2019 to August 31, 2019, the number of active users

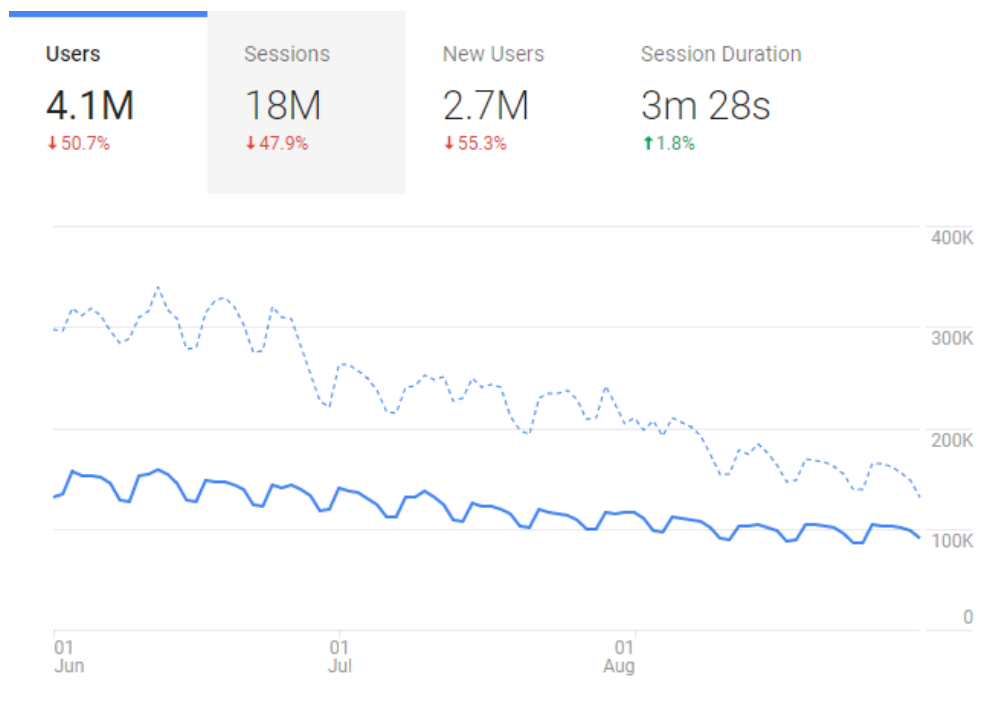


Figure 3 Graphical representation of number of users overtime (Data Google Analytics, source: anonymous company)

was 4.1 million, while the number of sessions was 18 million with an average duration of 3 minutes 28 seconds.

### 3.1.2 Geographic location and preferred language

One of the core features of Google Analytics is geolocation of a visitor. It allows objective estimation of specific markets separated by countries and cities and allows to measure users' engagement by country. In addition to that geographic research demonstrates users' preferred language of user interface. No wonder company is using this data to better understand their audience and to integrate necessary adjustments into marketing and advertising strategies.

Figure 4 is a graphical visualization of data collected by company about geographical location of password manager users. With help of this map it is effortless to find out where most users are located. According to this data, the most popularity password manager acquired in Brazil, with a number of 465.5 thousand users.

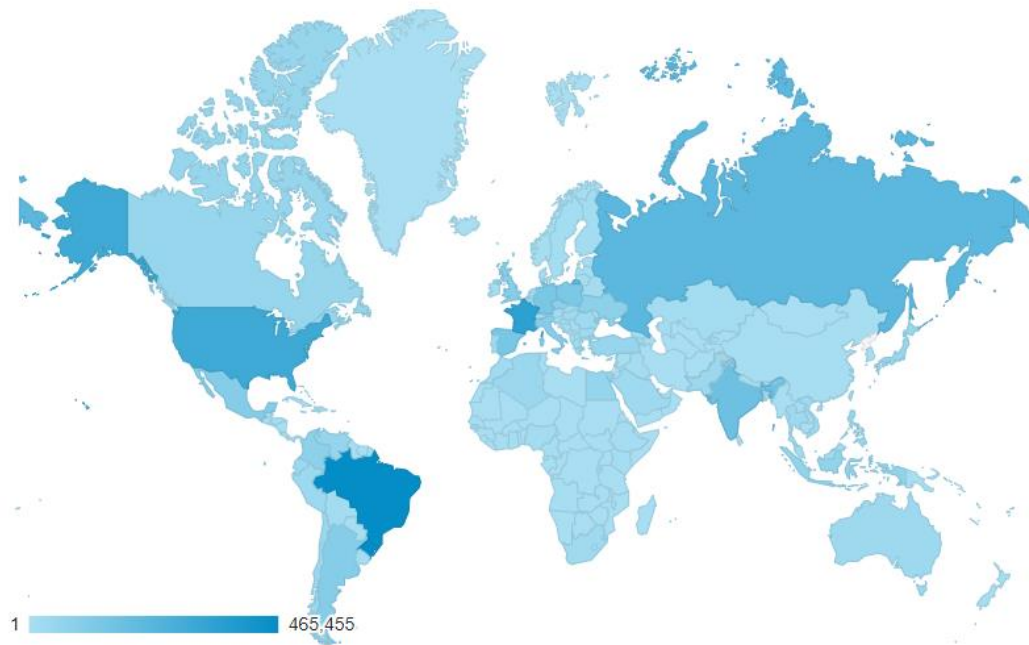


Figure 4 World map displaying most engaged countries (Data Google Analytics, source: anonymous company)

Moreover, it is effortless to monitor the most engaged regions of a country. It is as simple as one click, therefore it is easy to find out userbase's location as precise as a region level.

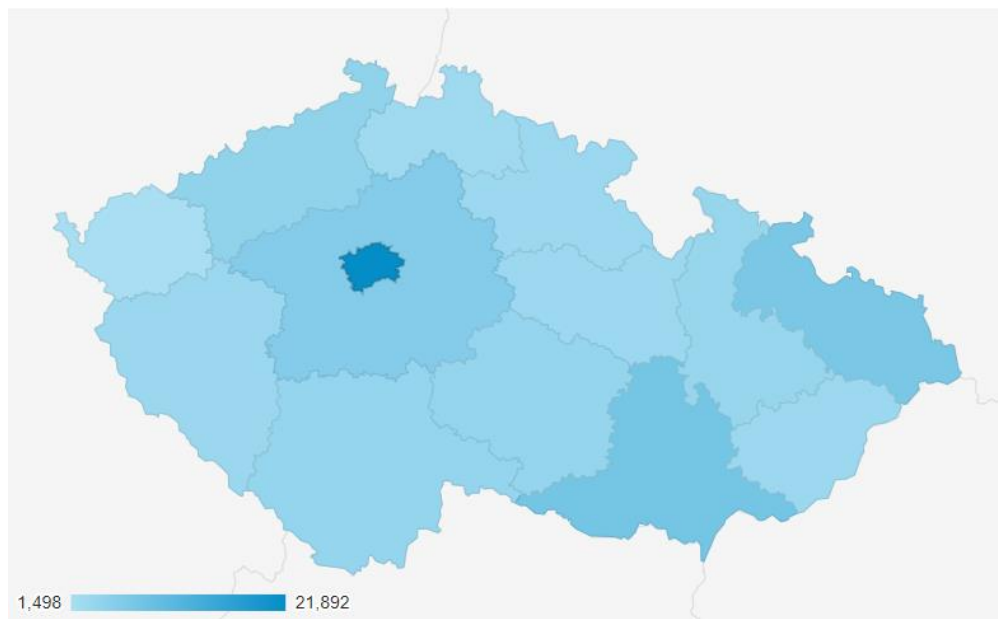


Figure 5 Map of Czech Republic displaying the most engaged regions (Data Google Analytics, source: anonymous company)

For instance, Figure 5 displays map of Czech Republic, where everything is straight forward. Prague has the biggest userbase, with a number of 22 thousand users, while Plzeň region has the least number of users, 3385.

In addition to monitoring geolocation of users, company also is tracking the most popular localization language chosen. For instance, based on data retrieved from Google Analytics

Language ?	Users ?
	4,141,489 % of Total: 100.00% (4,141,489)
1. (not set)	3,745,187 (90.92%)
2. en-us	107,572 (2.61%)
3. fr-fr	38,732 (0.94%)
4. es-es	36,899 (0.90%)
5. pt-br	36,358 (0.88%)
6. ru-ru	24,815 (0.60%)
7. en-gb	12,772 (0.31%)
8. de-de	11,597 (0.28%)
9. pl-pl	9,843 (0.24%)
10. es-419	8,714 (0.21%)

Figure 6 Table of localization options chosen by users (Data Google Analytics, source: anonymous company)

table, it is clear that the most popular localization option is the default one, which is expected, since most of the time preferred language is already predefined when user is downloading installation file from browser extension website.

### 3.1.3 Audience's behavior research

Every customer-oriented company is required to be acquainted with customer behavior in order to meet their needs and make necessary adjustments to improve their experience. For this purpose, anonymous company is constantly studying customers' behavior within password manager.

Figure 3, Session duration table is showing information about customers' session duration on using password manager application. Duration is separated by ranges, starting with 0-10 seconds and ending with 1801 and more seconds. According to information listed in table below, almost 12 million sessions are 0 to 10 seconds long, which is expected since most of the features of password manager take a fraction of a second to be processed.








Session Duration ?	Sessions ?
0-10 seconds	11,993,708 
11-30 seconds	1,187,987 
31-60 seconds	522,132 
61-180 seconds	634,396 
181-600 seconds	1,622,878 
601-1800 seconds	1,284,093 
1801+ seconds	468,975 

Figure 7 Session duration table (Data Google Analytics, source: anonymous company)

The following table is displaying another important set of data acquired by company about password manager users. Figure 6 demonstrates customers' loyalty measured in number of sessions per customer. According to data criteriums listed in table, the least loyal customers used application only once and the most loyal ones used it more than 201 times. For instance, approximately 8 million are extremely loyal to using password manager.
























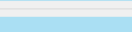


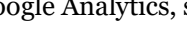

Session Instances ?	Sessions ?	Avg. Session Duration ?
1	2,660,702 	00:00:39 
2	1,247,811 	00:00:30 
3	782,408 	00:00:32 
4	390,741 	00:00:45 
5	286,477 	00:00:51 
6	231,019 	00:00:54 
7	190,443 	00:00:59 
8	164,994 	00:01:02 
9-14	688,881 	00:01:11 
15-25	659,268 	00:01:40 
26-50	670,074 	00:02:46 
51-100	693,048 	00:04:13 
101-200	1,023,643 	00:04:46 
201+	8,024,660 	00:05:45 

Figure 8 Customers loyalty table (Data Google Analytics, source: anonymous company)

Another criterium used for studying user behavior that is tracked by company with help of Google Analytics is a number of new users versus a number of returning users (the ones that had application installed previously). In that specific time range, there were approximately 2.7 million of new users, and 2.3 million returning users.

User Type	Users
	4,141,489 % of Total: 100.00% (4,141,489)
1. ■ New Visitor	2,669,593
2. ■ Returning Visitor	2,280,321

Figure 9 New users versus returning users table (Data Google Analytics, source: anonymous company)

Lastly, for the purpose of analyzing customers' behavior Google Analytics measures a number of days between sessions. In other words, the number of days between the close of one session and the opening of another. Google Analytics refers to this metric as recency.

Table below demonstrates that sessions are grouped by recency. First row is a group of sessions with no time between the close and the opening, while last one is between 121 days and 364 days between the close and the opening. In this certain case, the biggest group is less than one day, with almost 9 million sessions.

Days between Sessions ?	Sessions ?	Avg. Session Duration ?
None (First Session)	2,660,702	00:00:39
< 1 day	8,957,609	00:05:32
1	1,519,864	00:02:48
2	653,343	00:02:32
3	411,921	00:02:06
4	298,367	00:01:50
5	236,543	00:01:39
6	202,666	00:01:31
7	166,392	00:01:17
8-14	683,199	00:01:06
15-30	682,502	00:00:48
31-60	531,185	00:00:37
61-120	463,157	00:00:33
121-364	246,719	00:00:35

Figure 10 Recency table (Data Google Analytics, source: anonymous company)

### 3.1.4 Tracking of customer's hardware

Company is also gathering data about devices that customers use to operate with an application. This vital piece of data not only allows to analyze popularity of application among different markets for different platforms and operation systems but helps to optimize future development process of updates. Data that is being collected about devices is:

- Operation system
- Screen resolution
- Mobile input type
- Device brand
- Device model

Figure 11 demonstrates popularity of operation system versions among password manager users. Based on displayed information, the most popular operation system is windows 10, which means that most of the time users access password manager via PC, windows tablet or windows phone.

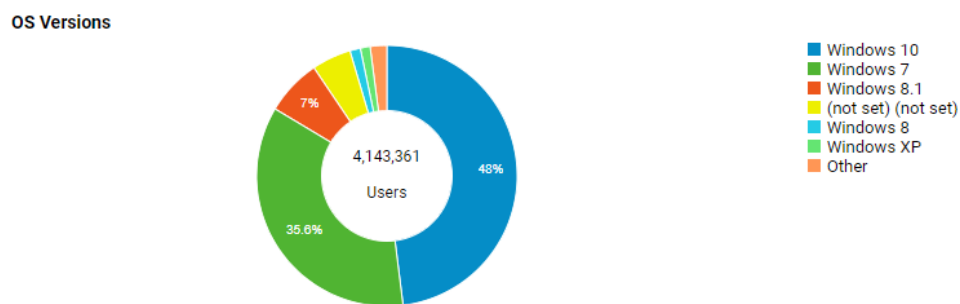


Figure 11 Representation of operation systems of users' devices in a donut chart (Data Google Analytics, source: anonymous company)

Figure 12 demonstrates collection of data about devices resolutions. This data is vital for optimizing development process, particularly UI, since application must be adjusted at least for most popular resolution options. Nevertheless, this is not the only requirement. Since password manager's functionality capturing and autofill credentials and credit card information, application must be able to find the exact form on a web page withing a viewport. According to a table in Figure 12, the most popular detected screen resolution is 1366 by 768 pixels, which is likely to be laptops made before 2013.

Screen Resolution ?	Users ?
	<b>4,141,489</b> % of Total: 100.00% (4,141,489)
1. (not set)	<b>3,745,187</b> (90.91%)
2. 1366x768	<b>156,904</b> (3.81%)
3. 1920x1080	<b>47,870</b> (1.16%)
4. 1536x864	<b>25,011</b> (0.61%)
5. 1600x900	<b>24,624</b> (0.60%)
6. 1280x720	<b>15,464</b> (0.38%)
7. 1024x768	<b>14,708</b> (0.36%)
8. 1280x1024	<b>13,535</b> (0.33%)
9. 1440x900	<b>13,367</b> (0.32%)
10. 1280x800	<b>12,762</b> (0.31%)

Figure 12 Table with data about screen resolution of users' devices (Data Google Analytics, source: anonymous company)

Another piece of information collected specifically about users' mobile devices is a type of input. Based on products functionality and devices and platforms it supports, it was decided to leave only 3 options for that metric. These are touchscreen, mouse and undefined. Figure 13 demonstrates that touchscreen was most popular followed by undefined and mouse in a given time period.

Mobile Input Selector ?	Users ?
	<b>732</b> % of Total: 0.02% (4,141,489)
1. touchscreen	<b>437</b> (59.46%)
2. (not set)	<b>297</b> (40.41%)
3. mouse	<b>1</b> (0.14%)

Figure 13 Table of mobile input selectors (Data Google Analytics, source: anonymous company)

Last piece of data collected about user's hardware is mobile device's brand. Figure 14 demonstrates users' mobile device brands. According to collected data, the most popular detected mobile device brand is Apple with 297 users, followed by Samsung with 97 users. 297 device's brands remained undetected.

Mobile Device Branding ?	Users ? ↓
	<b>732</b> % of Total: 0.02% (4,141,489)
1. (not set)	<b>297</b> (40.41%)
2. Apple	<b>121</b> (16.46%)
3. Samsung	<b>97</b> (13.20%)
4. Google	<b>89</b> (12.11%)
5. Huawei	<b>20</b> (2.72%)
6. Motorola	<b>18</b> (2.45%)
7. Xiaomi	<b>14</b> (1.90%)
8. Lenovo	<b>7</b> (0.95%)
9. Nokia	<b>7</b> (0.95%)
10. Asus	<b>5</b> (0.68%)

Figure 14 Table of mobile devices' brands used by users to access password manager (Data Google Analytics, source: anonymous company)

### 3.1.5 Tracking of the most frequently used features

For analytical purposes of user and application behavior company tracked and measured extension's most frequent events. Events were planned to be displayed as follows:

- Start up
- Capture credentials
- Autofill credentials
- Cancel save of credentials
- Capture card information
- Autofill card information
- Cancel save of card information

Event Action ?	Total Events ?
	16,245,416 % of Total: 34.15% (47,567,971)
1. Startup	8,440,605 (51.96%)
2. Autofill	5,441,837 (33.50%)
3. Capture credentials	1,428,046 (8.79%)
4. Cancel save	893,339 (5.50%)
5. Cancel Card save	29,549 (0.18%)
6. Fill Card	4,999 (0.03%)
7. Capture Card	3,613 (0.02%)
8. Capture	3,428 (0.02%)

Figure 15 Table of feature occurrences during application sessions (Data Google Analytics, source: anonymous company)

Figure 15 demonstrates that the most common event that occurs during application exploitation is startup, which based on extension's characteristics is a successful pairing with parent windows application. A number of startup event is equal to approximately 8.4 million, which is roughly 52% of all events happened in a given time range. Second most frequent event is autofill of credentials, which is one of the main features of extensions. In a given time range, approximately 5.5 million events of this type happened, which is roughly 34%.

### 3.1.6 Tracking of application version

As a part of data collection process, company as well tracks application's version. This is done for the purpose of detecting the most popular versions of app as well as the most successful ones among users.

App Version ?	Users ? ↓
	<b>3,739,891</b> % of Total: 90.30% (4,141,489)
1. (not set)	<b>3,236,539</b> (86.21%)
2. 0.1.2419	<b>90,713</b> (2.42%)
3. 0.1.2146	<b>56,533</b> (1.51%)
4. 2.0.4438	<b>52,109</b> (1.39%)
5. 1.1.3434	<b>49,811</b> (1.33%)
6. 2.0.4340	<b>31,756</b> (0.85%)
7. 1.1.4347	<b>30,692</b> (0.82%)
8. 0.1.1611	<b>27,090</b> (0.72%)
9. 1.1.3799	<b>22,607</b> (0.60%)
10. 2.0.4285	<b>17,670</b> (0.47%)

Figure 16 Table of application's version and number of users exploiting it (Data Google Analytics, source: anonymous company)

In fact, data displayed in Figure 16 is not full, there are 144 different application versions listed in full Google Analytics report. However, most of these versions were used internally for testing, developing and debugging purposes, which doesn't make them suitable for adding into this document.

Figure 16 demonstrates that in case of 3.2 million users, 86% of the cases, it was not possible to detect application's version. Nonetheless, the most popular detected one is 0.1.2419 with 90 thousand downloads in a given time range.

## 3.2 Quality assurance purposes

For the purposes of simplifying quality assurance process and making it more efficient, it was decided, that extension's operability will be tracked with help of Google Analytics tracking tools. Therefore, 2 systematic approaches of notifying Google Analytics system were created. First approach was custom requests sent to GA, which cannot be disclosed due to obvious reasons. Second approach was standard HTTP codes, which were mainly used for consecutively repeating errors. Figure 17 demonstrates basic principles of HTTP status codes groups. For the purposes of detecting application's issues are used HTTP status codes group 4 (Client error) and group 5 (Server error).

### HTTP Status Codes



Figure 17 HTTP status codes (HTTP ERROR, 2019)

Upon data receipt from extension, detailed reports, graphs and charts in Google Analytics dashboard are created. Based on information from these sources it is possible to track abnormal changes in operability of password manager browser extension and it is possible to narrow down a potential list of causes based on received timestamp. Situations that happened earlier, where Google Analytics helped in exploring origin of issues:

- Google Analytics report help to search for a problem causing commit in git version control system by displaying date of malfunction. Therefore, search is narrowed down, and user must not investigate every code change in git system.
- In certain cases, malfunctions of extension are related to changes in external sources. For instance, an update in Ractive.js framework might cause incompatibilities by making some functions in code redundant, which eventually will cause issues to appear. Google Analytics reports help to find these problems by cross comparison of dates of issues and update dates of external development sources used in a project.

- Since password manager is a browser extension that is obligated to work with parent application, some issues might be caused by updates or bugs in parent application.

### 3.2.1 Constant monitoring and evaluation of applications operability

As it was mentioned above, Google Analytics software assists in monitoring and evaluation of applications operability. With help of Google Analytics company tracks 2 types of events which are straightly related to quality of an application:

- Non-consecutive errors
- Consecutive errors

First type of event is non-consecutive error, which is displayed in a readable format predesigned by company's developers and which cannot be disclosed to public due to obvious reasons.

Event Action ?	Total Events ? ↓
	10,223,821 % of Total: 21.49% (47,567,971)
1. [REDACTED]	5,303,628 (51.88%)
2. [REDACTED]	2,563,274 (25.07%)
3. [REDACTED]	1,304,376 (12.76%)
4. [REDACTED]/www.google.com	126,695 (1.24%)
5. [REDACTED]	77,830 (0.76%)
6. [REDACTED]/www.youtube.com	71,584 (0.70%)
7. [REDACTED]/www.facebook.com	61,122 (0.60%)
8. [REDACTED]	30,931 (0.30%)
9. [REDACTED]/mail.google.com	30,826 (0.30%)
10. [REDACTED]/clients5.google.com	19,074 (0.19%)

Figure 18 Table of non-consecutive errors collected by Google Analytics (Data Google Analytics, source: anonymous company)

According to claimed Google Analytics software characteristics, Quality Assurance engineers are always getting relatively fresh data, with a delay of up to 4 hours and therefore are able to quickly react to any abnormal large malfunctions or regular small ones. Due to field of operation of application, sometimes issues are not related to application's operability. In a relatively big number of cases, problems are related to how website was developed. For instance, sometimes application had a challenge finding an input form located in shadowroot document object model (DOM), since it is rendered separately from

main DOM. In these cases, Google Analytics helped to quickly find what exactly caused a problem, because it displays a link to a page where non-consecutive error happens.

Second type of event is consecutively repeating errors. As it was mentioned before, for collecting of consecutive errors are used standard HTTP codes, starting with 4 (Client error) and 5 (Server error). Based on the description, it is clear that these errors are repeating a number of times in a row, therefore blocking any user interaction with an application. Unlike non-consecutive errors, there is a high probability that consecutive ones cannot be fixed with a simple workaround, as for example browser or computer restart. Therefore, these errors are usually considered as severe and are reported as high priority ones, which must be dealt with as soon as possible and released as a hot fix.

Event Action ?	Total Events ?
	1,747,885 % of Total: 3.67% (47,567,971)
1. extension_not_active/inactive/507	361,362 (20.67%)
2. undefined/0/0	344,959 (19.74%)
3. error_no_app/0/0	249,814 (14.29%)
4. error_no_app/undefined/undefined	239,083 (13.68%)
5. undefined/403/403	156,691 (8.96%)
6. extension_not_active/inactive/500	80,464 (4.60%)
7. undefined/521/521	71,735 (4.10%)
8. error_common/500/500	70,906 (4.06%)
9. error_502/0/0	26,716 (1.53%)
10. undefined/507/507	25,577 (1.46%)

Figure 19 Table of consecutive errors collected by Google Analytics (Data Google Analytics, source: anonymous company)

Figure 19 demonstrates that the greatest frequency of consecutive errors appears on a server side. It is visible by effortless observation of an HTTP code at the of the line. For instance, there are 361 thousand errors with code 507, which states that vault (place where encrypted passwords are stored) wasn't detected or doesn't exist.

### 3.2.2 Assistance in issues investigation

As it was mentioned before, Google Analytics is capable of assisting in issue investigation process. This is possible by analyzing received timestamps and graphical visualization of received data in a graph. Therefore, when user sets the number of errors for y-axis and follows the curve on the graph, it will be a matter of seconds to explore a rapid growth or decrease of the number of errors for a certain date. Given, that Google Analytics is supposed

to provide whoever it may concern with relatively fresh data, quality assurance engineers are able to narrow down a potential list of causes to a specific date period, and later search for a problem in internal or external sources. This specific approach is generally suitable for situations when problem is caused externally. For instance, in cases when library used in a project releases an update and makes some methods or piece of code redundant, which consequently affects operability of application. In case of occurrence of internal issues, generally standard debugging tools serve well enough to find an issue.

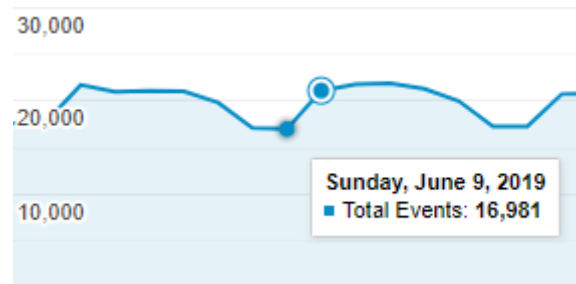


Figure 20 Total number of consecutive errors vs. time (Data Google Analytics, source: anonymous company)

Figure 20 is a perfect example of abnormal change in application's operability. In that specific situation, number of consecutive errors in 24 hours increased from 17 thousand cases to 21 thousand cases, which demonstrates a growth of almost 25%. After observing this issue, engineer can segregate time range in which error occurred and therefore narrow down potential list of origins of the issue.

### 3.3 Analysis of usage of Google Analytics within a product

Google Analytics is a powerful and flexible software which is capable of operating with macro metrics and at the same time is capable of being a scalpel in experienced hands. Google Analytics is used for collecting, measuring and analyzing of internet traffic for digital marketing and other purposes. Based on conducted research, it is clear, that company which provided data and access to its internal resources for the research and analysis purposes of this document approaches to the usage of Google Analytics with traditional ways and at the same time more customized, original ones.

Traditional approach that company used for exploiting of Google Analytics includes collecting, measuring and analyzing data about product's users. Metrics that were collected are:

- Number of users and sessions (Section 3.1.1)
- Geolocation data and preferred language (Section 3.1.2)
- Customer's loyalty, recency and length of their sessions (Section 3.1.3)
- Data about customer's hardware used to access application (Section 3.1.4)
  - Screen resolution
  - Input type
  - Device's brand and operation system

- Tracking of the most frequently used features (Section 3.1.5)
- Estimation of popularity of application version (Section 3.1.6)

All collected data is used to better understand company's customers, analyze markets and marketing campaigns and conduct necessary adjustments to product's marketing and advertisement's strategy. Moreover, this data is vital for optimizing development process, since it allows to estimate what devices and their characteristics are possessed by targeted groups. For instance, future product's updates deadlines are possible to be postponed for android, while personal computer version must be prioritized in case there is a significantly smaller number of users with android operation system.

Custom approach that company used for exploitation of Google Analytics software includes issues and malfunctions tracking, while at the same time monitoring abnormal changes in application's operability. This is done for the purposes of simplifying and making more efficient a quality assurance and issue fixing process. Metrics that were collected specifically for contributing to that cause are:

- Consecutively repeating errors (Section 3.2.1)
- Non-consecutive errors (Section 3.2.1)

During development phase programmers have faced a challenge to properly and simply identify an issue. In case of consecutively repeating errors, this challenge was overcome by inserting standard HTTP codes in requests that are sent by application to Google Analytics. However, same approach was not possible to apply to tracking of non-consecutive errors. This was caused by error's uniqueness, which made it impossible to systematically group errors by their types. Therefore, developers designed original way of tracking that type of issues. They created a separate request that was sent from application and inserted a link of a web page where error occurred. Nonetheless, different users sometimes were facing same issue on the same page, therefore, some web pages were causing problems with a higher frequency than others, which is reflected in Google Analytics report.

As part of its functionality, Google Analytics indirectly provides company with information about application's operability. This is possible by collecting data about error type, and timestamp of a request. Therefore, Google Analytics is capable of displaying a graph where y-axis is errors and x-axis is time. With help of this approach, Google analytics user can effortlessly observe any abnormal changes in applications operability by analyzing the steepness of a curve on a graph. For instance, given example in section 3.2.2 perfectly describes a situation with abnormal change in operability. Previously mentioned example demonstrates a case of growing issues by approximately 25% in 24 hours. In this certain situation, Google Analytics allow its users to conveniently observe the date of abnormal change and therefore decrease "search-area".

Based on conducted research of internal resources of the company which desired to not disclose its name for the purpose of remaining anonymous, document evidences how Google Analytics is used within a scale of a password manager product. By using standard features of Google Analytics software, company was able to track, collect and analyze data about password manager users. This data served as an opportunity to better understand and analyze customers behavior and characteristics, which allows company to make

necessary adjustments to marketing and advertising strategies. With help of Google Analytics, company was able to optimize development and maintenance process of a product. Google software provided engineers with data that allowed to quickly react on occurring issues. Moreover, based on received data, product lifecycle was optimized to the point that individual updates releases were prioritized based on popularity of a product on specific platforms. Therefore, it is safe to claim that company was able to cover its needs in gathering, measuring and analyzing data with help of Google Analytics solution.

### **3.4 Evaluation of objectives achievement**

Main objective persuaded in this bachelor thesis was to **reflect influence of usage of Google Analytics with a certain product**. For the purpose of achieving this goal, following fractional objectives were fulfilled:

1. Identify and get an insight into field of operation of Google Analytics
2. Get an insight into technology and implementation of Google Analytics
3. Discover what data is collected by the company

**Identification and acquiring an insight into field of operation of Google Analytics** objective was fulfilled by conducting a research based on studies of list of literature about digital marketing in sections 1.1 and 1.2. Consecutively was conducted a research about web analytics techniques by using same method in section 1.3. Thus, was gathered information about Google Analytics field of operation.

**Acquiring an insight into technology and implementation of Google Analytics** objective was accomplished by investigation on how software proceeds with gathered information. This was implemented in section 1.4.2.

**Discovery of what data is collected by the company** goal was accomplished by acquiring access rights to company's internal resources and conducting a detailed analysis of what exact data is collected. Type of data that is being gathered is listed in sections 3.1 and 3.2.

Main analysis of how Google Analytics influences product's lifecycle was conducted in section 3.3. Based on the outcome of that part of the document, it is evident that company uses Google Analytics to collect all sorts of data about customers. For instance, session duration, geographic data including language preferences et cetera. Consecutively, collected data is processed and analyzed for better understanding of the customers and their needs. Based on that company is capable of implementing necessary adjustments to product's marketing and advertising strategies.

Additionally, company is gathering information about customers' devices that are used for accessing and exploitation of password manager. This information includes device's brand, operation system and screen resolution. This data supports primary objective of engineering division of a company in using Google tracking tools for optimizing development and maintenance process. Therefore, application sends information about every single issue occurred. Every request that is sent contains information about error type,

code of error, location of error occurrence (URL), and a duration of a session during which error took place. Later this information forms informative reports and visual graphs where it is easy to observe abnormal curve fluctuations and therefore explore improvements or deterioration of product's operability.

Due to the specifics of the analysis and characteristics of the data received from the company, it was impossible to express the results of achieving the goal in numerical values, however it was possible to compose important deductions about usage of Google Analytics software within a product.

# Conclusions

Main objective of this part of the document is to summarize and state vital information about usage of Google Analytics in certain company mentioned in this thesis. Another objective of this part of the document is to summarize whether a goal stated in an introduction part was achieved or not. Besides that, conclusion part briefly describes conducted analysis of data that was provided by the company.

Information technologies field experienced rapid growth and development in the last 20 years. At the moment, information technologies and particularly internet is used everywhere, starting from everyday routine ending with all kinds of business operations. No wonder, modern communication technologies were combined with marketing techniques, which led to creating of a completely new approaches in studying and satisfying customers' needs. For the purpose of studying customer's needs, certain companies developed supportive tools for tracking, gathering and analyzing data about customer's behavior. One of these tools is Google Analytics. Google Analytics is a powerful asset in experienced hands. It provides user with a huge data set about his customers, which is possible to be graphically visualized. A great number of companies around the world are using this tool for better understanding customer's behavior and their products' performance, which with a high probability leads to improvement in user experience and revenue increase.

This bachelor thesis has one main objective and three fractional ones as it was previously mentioned in the document. Main objective of this document was to analyze Google Analytics influence on a company's product. This goal was achieved by analyzing data provided by the company and assessing how Google Analytics tool was used within a product as described in section 3. First fractional objective was to identify and get insight into field of operation of Google Analytics. This was done by conducting research about digital marketing and web analytics in sections 1.1, 1.2 and 1.3. Second fractional objective was to get an insight into technology and implementation of Google Analytics. This goal was achieved by conducting research on technical side of this tool, which is done in section 1.4.2. Third and last fractional goal is to discover what data is collected by the company. With help of acquiring access rights to internal company's resources, information about what type of data is collected was gathered and described in sections 3.1 and 3.2

Primary analysis of how Google Analytics influences company's product was conducted in section 3.3. Based on collected data, that part of the document describes company's approach to exploitation of Google Analytics software. Particularly, it is clear, that available and collected data are used not only for traditional digital marketing purposes, but also for optimizing development and maintenance of a product.

Based on previously mentioned information it is evident, that company is effectively using Google Analytics software for achieving set objectives, since every vital aspect of a password manager product is covered with tools that gather useful information and allow company to better understand its customers. Moreover, with help of Google Analytics company understands how well the application functions outside of the company walls. This

evidences the fact that Google Analytics integration in company's business and development routine assists well in achieving corporate objectives.

In conclusion, it is possible to claim that integration of Google Analytics tool is sure an asset for any product or company. In order to use its maximum potential, this asset must be integrated in a product from the beginning of its lifecycle, so that reports provided by this tool will give a more detailed insight overtime. However, in order to successfully operate with this software, usually will be required an advanced user with a needed set of skills and experience, since Google Analytics software functionality spectrum is wide and requires time to get acquainted with.

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