Providing Trust in Affiliate Marketing through Blockchain Technology

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Abstract

Affiliate Marketing is a promotional model that allows independent publishers to promote products for merchants, who sell the products in exchange for a small commission fee. This model has not changed since its origin and is therefore susceptible to fraud. There is a significant lack of trust between the publisher and the merchant, which results in a decrease in performance. This thesis studies the affiliate marketing model, its advantages and disadvantages, and the potential for improvements. A list of pain points is created, which include a lack of transparency, a lack of trust, fraud issues and an inefficient payment cycle. Interviews with affiliate marketing experts are conducted to validate the pain points and look at the feasibility of a blockchain system. Blockchain technology is a new and upcoming technology, however the potential of this technology applied to the affiliate marketing industry remains unknown. This thesis studies the potential impact that blockchain technology has on the affiliate marketing industry, the limitations of such a solution and the adoption requirements. A list of blockchain opportunities is found, and a design for an affiliate marketing blockchain system is created. The results indicate that there is room for blockchain technology to improve transparency between the publisher and the merchant within the affiliate marketing model.

Contents

Chapter 1

Introduction

Researchers and scientists hypothesize how blockchain technology has the potential to disrupt the traditional industries from finance to retail to even healthcare. At first the technology looked fit for just the finance industry, but there have been an increasing number of blockchain-based applications created that have realised a profound change in the structure and architecture of organizations of different industries. Blockchain technology is gaining momentum with more and more diverse applications, as well as increasing numbers of actors involved in its applications (Nowiński & Kozma, 2017). It is a novel technology rooted in cryptography which has been popularised by the seminal work of Nakamoto (2008). It can be defined as *"a distributed database comprising records of transactions that are shared among participating parties"* (Zhao et al., 2016) or *"just another type of database for recording transactions – one that is copied to all computers in a participating network"* (Deloitte, 2016). One of the advantages is that it enables a database to be directly shared without a central administrator; it is a so-called decentralized entity (Wright & De Filippi, 2015). It enables digital trust between two parties, without the need for a third-party organization, or middle-men (Beck et al., 2016). It allows for decentralized groups to work together, from anywhere in the world, in a secure, trusted and verifiable way – with as much security as if they were working side-by-side (Atzori, 2015). With digital trust and security comes the potential to automate many more processes. Algorithmic systems can verify and automate payments, foreign exchange trades, tax return filing – almost any task that involves clear results and repetitive tasks. This thesis explores the potential of blockchain technology in another industry: affiliate marketing.

"Affiliate marketing" is a promotional model that allows independent publishers to promote products for merchants, who sell the products, in exchange for a small commission fee (Duffy, 2005). It is the practice of using one website to promote another website with compensation being provided to the referring website. A publisher (or: affiliate) is an individual website owner or business entity that earns commissions for referring sales, leads, and traffic to a merchant (or: advertiser) by placing affiliate marketing advertisements such as links and banners on their websites (Miller, 2010). They create online income through affiliate marketing by promoting affiliate programs on their websites or blogs and earning commissions for converting their own traffic into referrals for advertisers. Affiliate programs are one of the most dominant tools for online marketing, and have emerged as

one of the fastest growing methods to acquire customers and enhance sales on the web (Gregori et al., 2014). A merchant is a business owner that wants to increase sales, traffic and brand awareness through online advertising using affiliate programs. Because of the increasing complexity in managing multiple programs almost all of the merchants are connected to an affiliate network (Edelman & Brandi, 2015). An affiliate network controls tracking, payments and facilitates the relationships between publisher and advertiser. They act as intermediaries and allows websites offering affiliate programs to reach a larger audience by promoting their programs to all of the publishers participating in the network. The network provides them with a platform for executing and measuring their programs. Affiliate networks play an important role in the affiliate marketing industry. Because all the crucial information (e.g. affiliate programs, tracking links, payments) flow through the network, there is a lack of trust between the publisher and the merchant (Benediktova & Nevosad, 2008). The lack of transparency also makes them vulnerable to all kinds of fraud (Snyder & Kanich, 2015) (e.g. cookie-stuffing, rejected transactions, dishonest merchants).

This thesis explores the possibility of using blockchain to increase trust between publisher and merchant by increasing transparency. In the first section, the theoretical background for this thesis is described, explaining how value is added between stakeholders and to identify the current level of transparency in the industry. Semi-structured interviews with experienced publishers and merchants are conducted to find out if trust is still an issue in the industry. Next, a technical background is provided, describing how blockchain technology can be applied to the business model, and the advantages it yields. This data will be analyzed and results in a Functional Architecture Model (Brinkkemper & Pachidi, 2010) an iStar 2.0 model (Dalpiaz et al., 2016). These findings are discussed by interviewing blockchain experts.

Chapter 2

Research Approach

2.1 Problem statement

Affiliate marketing relies on a third-party organization, the network, to mediate between the two important stakeholders (Snyder & Kanich, 2015). This means that all the information flows through this third-party organization and they control which data the other stakeholders (the publisher and the merchant) receive. Even though the industry has been around for some years, the way the industry operates has never changed, and is outdated (Edelman & Brandi, 2015). Research has indicated that there is a lack of trust between the publisher and the merchant (Benediktova & Nevosad, 2008). Being able to establish trust between the publisher and merchant is crucial for the industry to operate. This leads to the following problem statement:

The Affiliate Marketing industry struggle with a lack of trust between the publisher and the merchant, limiting their performances. Blockchain technology could potentially solve this problem, but it is unknown how a blockchain platform could improve transparency.

2.2 Research questions

RQ How can blockchain technology be applied to increase transparency in affiliate marketing?
SQ1 What is the current state of, and are the problems in, the affiliate marketing industry?
SQ2 How can blockchain technology increase transparency in affiliate marketing?
SQ3 What are the features of a feasible blockchain solution?
SQ4 What are the limitations of a blockchain solution?
SQ5 How should a blockchain solution be introduced to gain traction and adoption?

2.3 Research methods

This research project studies an artifact in its current context. The artifact in this case is the software application that affiliate marketing uses to operates. Also a new artifact is designed: a blockchain technology based solution for the affiliate marketing industry. This meets the qualifications of Design Science (Wieringa, 2014). Hevner & Chatterjee (2010) describe design science as following:

"Design science research is a research paradigm in which a designer answers questions relevant to human problems via the creation of innovative artifacts, thereby contributing new knowledge to the body of scientific evidence. The designed artifacts are both useful and fundamental in understanding that problem."

Because an artifact is both studied and designed in its current context, this research uses the design science methodology of Wieringa. For this research both the design science cycle by Wieringa and the Design Science Research Methodology (DSRM) (Peffers et al., 2007) were considered. In the end the design science cycle by Wieringa was chosen for its clear guidelines and because we felt it was better suited for our research problem. In this methodology both the empirical research as well as the design process is treated as problem-solving techniques, with the aim to improve a problem. These artifacts contribute to the body of knowledge of scientific evidence and are both useful and fundamental in understanding the problems (Hevner Chatterjee, 2010). During this research the problem context is investigated and artifacts are designed using existing problem-solving knowledge and newly gained knowledge from the investigation. The problem context (the investigation) and the design of the artifact (the design) phases are iteratively investigated by combining the existing problem-solving knowledge and the newly gained knowledge from the investigation. The artifact and problem context can be defined by using the template of Wieringa:

> This research aims to **increase trust** between the merchant and the publisher in the affiliate marketing industry **by** developing a feasible blockchain solution **in order to** solve the trust grap between the merchant and the publisher.

Various research methods are applied to answer the research questions as defined in section 2.2. The *engineering cycle* is used to structure the research, as the goal of the research is to design an artifact that solves a problem context. The engineering cycle is divided in five phases: (i) problem investigation; (ii) treatment design; (iii) design validation; (iv) treatment implementation; (v) treatment validation. The phases are tailored to the research at hand, by applying different research methods. This thesis left out the treatment validation phase, as we felt it was out of scope due to the extensive execution of the other four phases.

(1) Problem investigation

During the problem investigation phase we look at the current affiliate marketing model. This helps to create a body of knowledge that can be used later on to design the artifact for the treatment design phase. A systematic literature review is conducted to get insight in how the affiliate marketing industry operates. The snowballing technique is used to structure the literature review. This review results in a list of *pain points* for the affiliate marketing industry. The literature review is used to create an *iStar 2.0 model* and a *Data Flow Diagram*. The iStar 2.0 model uses the iStar 2.0 modelling language and helps to capture the goals and intentions of relevant stakeholders. The Data Flow Diagram maps the flow of information for the affiliate marketing industry and describes how the stakeholders interact with each other.

(2) Treatment design

During the treatment design phase we look at the interaction between the artifact and context. A systematic literature review is conducted to get insight in the possibilities of blockchain technology. This review results in a list of *blockchain opportunities* that are matched with the pain points from the previous phase. In order to create a blockchain based artifact for affiliate marketing, the required features need to be described in a structured manner. To do this a list of *user stories* is forged by analysing the current model. These user stories, combined with the pain points and blockchain opportunties, are analysed to create a Functional Architecture Model. The Functional Architecture Model demonstrates the design of the new artifact. It describes the system functionalities and their underlying processes.

(3) Design validation

For the Design Validation phase semi-structured interviews with affiliate marketing experts are conducted. The analysis of these interviews result in an updated and validated list of the pain points. And it allows us to look at the feasibility of a potential blockchain solution.

(4) Treatment implementation

During the Treatment Implementation phase we look at the limitations of the proposed blockchain system. The advantages and disadvantages based on the literature review and conducted interviews. We look at how to announce such a system to the public to gain traction and adoption.

2.4 Literature review

Two literature reviews will be conducted, one for affiliate marketing and one for blockchain technology. Blockchain technology is such a new innovation, therefore the scientific information about the subject is fairly limited. The same applies to affiliate marketing, which is not a new innovation per-se, but still the amount of scientific information regarding the subject is limited. The reviews are conducted separately from each other, because there is no scientific information regarding the two topics together. For both reviews the snowballing method (Wohlin, 2014) was used during this review to find all the relevant papers. The starting point of this method was the paper: **Affiliate Marketing: Perspective of content providers** by Benediktova & Nevosad (2008) and **Bitcoin: A peer-to-peer electronic cash system** by Nakamoto (2008). Both the backward- and forward snowballing technique is used. Backward snowballing means using the reference list of the paper to identify and include new relevant papers. Forward snowballing means looking at different papers who cite the paper that is studied. The citations to the paper being examined are studied using Google Scholar. Additional papers were found by searching on Google Scholar with the following keywords: *"affiliate marketing", "affiliate payments", "affiliate network", "revenue sharing affiliate marketing", "affiliate publisher", "affiliate merchant", "affiliates", "affiliate advertising"* and *"blockchain", "decentralized", "blockchain trust", "blockchain availability", "blockchain applications"*.

2.5 Expert interviews

Affiliate marketing experts will be interviewed during this research. The interviews will be semi-structured (Drever, 1995). It will follow the checklist of points for explanation before an interview (Whiting, 2008), which includes recording the interview with permission from the interviewee. Expert interviews provide a quick way to obtain field knowledge (Bogner et al., 2009).

The focus of the interviews with the affiliate marketing experts is to find out what their opinion is on the affiliate marketing industry and the pain points found by the literature review. These interviews are part of the empirical research cycle as described by Wieringa and provide a good way to collect real-world knowledge regarding the industry. The goals of the interviews are to (i) validate the pain points found by the literature study, (ii) find additional pain points that the literature did not point out, and (iii) collect information that will be used to create the design of the new artifact. For selecting the experts we looked at the following criteria:

- The expert needs to be active in the affiliate marketing industry for roughly over five years. This is so they have enough experience and knowhow of the market.
- The expert needs to have experience in (dealing with) both the publisher and the merchant side of the industry.
- The expert needs to be exploring blockchain technology. This would help to explore the opportunities of blockchain.

The first two criteria are the most important ones for investigating the problem. The third criteria would help with building the new artifact, but this criteria can be dropped

if there are hardly any companies that meet this criteria. The interviews will be in-depth and semi-structured with open-ended questions as defined by Turner (2010). The checklist of points for explanation before an interview, as described by Whiting (2008), was used as preparation. This includes explaining the reason for the interview, the format of the interview and asking permission to record the interview. Before starting the interview the candidate was asked to review and sign the informed consent form. The candidate was given the option to remain anonymous if he or she wants, and/or for the organisation to remain anonymous. The entire consent form can be found in Appendix A. The following interview protocol was used:

Introduction

- Thank you for participating in this research, by allowing this interview and giving your insights about affiliate marketing. We highly appreciate it, and believe your knowledge of the industry is valuable for the research project. First I would like to explain the research, the structure of the research, the goals of the research, and the reason for this interview.
- Explain the structure of the interview.
- Ask for permission to record the interview.
- Let the interviewee sign the informed consent form.

Interviewee Background

- Ask the interviewee about his/her experience with affiliate marketing.
- Ask about current involvement with affiliate marketing.

Affiliate Marketing

- Ask the interviewee about his/her opinion on every pain point.

Closing

- Where do you see affiliate marketing in ten years from now?
- Thank the interviewee for his/her time.
- Explain what will happen with the interview.

Table 2.1: Interview Protocol

2.6 Contributions

Even though affiliate marketing is not a new concept, not much scientific research has been conducted on it. Affiliate Marketing could potentially benefit from blockchain, but the how, why or to which extend is still unclear and not yet researched. This thesis will broaden the scientific knowledge about the affiliate marketing industry by researching and documenting the affiliate marketing model. It also aims to broaden the scientific knowledge of blockchain technology in general, and more specifically the value it can provide to the e-commerce world. Therefore the scientific contributions of this research are (i) the definition of a model for affiliate marketing, (ii) a systematic review of the pain points in the industry, (iii) insights into the opportunities of blockchain technology applied to affiliate marketing.

Chapter 3

Literature Review

This chapter presents the systematic literature review for the affiliate marketing industry and blockchain technology. The result of this chapter is a detailed list of Pain Points, which summarises the problems found in the affiliate marketing industry during this literature review, and a detailed list of Blockchain Opportunities, which summaries the opportunities that blockchain yields.

3.1 Affiliate Marketing

Information technology (IT) has been improving rapidly, and so have the opportunities that come with it. The advances that this industry makes enables companies to engage in innovative and productive strategies. One example of these advances that made a massive impact on today's internet consumption is e-commerce. Shopping online is one of the most popular activities on the web, and IT has made it easy for anyone to create and maintain their own online shop. The history of e-commerce started 40 years ago and, to this day, continues to grow with new technologies, innovations, and thousands of businesses entering the online market each year. The growth of the e-commerce world has let to companies spending more and more money on (digital) marketing. Companies like Google, Facebook and Instagram allows retail stores to engage with a broader audience, reaching out and promoting their products to people all over the world. Advances in IT also provides new opportunities and choices for customers, that retail stores can use to obtain important benefit when they can associate their objectives with other competing firms' objectives. Affiliate Marketing Programs facilitates (digital) marketing departments to enhance their extent and to obtain other firms' customers when the other firms decide to refer their customers to the third parties (Akcura, 2010). Affiliate Marketing Programs are one of the most dominant tools for online marketing as the person presenting the product or a service decides on the commissioning model and the commission is granted only if the anticipated outcomes have been reached (Iva, 2008). They have emerged as one of the fastest growing methods to acquire customers and enhance sales on the web (Fox & Wareham, 2012).

Affiliate Marketing is a prominent, contemporary type of performance-based Internet Marketing whereby a firm reimburses affiliates for each customer referred through the affiliates' marketing effort. It is a promotional model that allows independent publishers to

promote products for merchants, who sell the products, in exchange for a small commission fee (Duffy, 2005). Affiliate marketing relates to a system and method supporting commerce syndication. More specifically, the the invention relates to a system and method for computer based information providers to receive outsourced electronic commerce facilities in a context sensitive, transparent manner (Ross Jr et al., 2003). The model consists of four involved parties (Messer, 2006) that each play their own role in the e-commerce cyclus. The four parties are:

- **The merchant** (the one that sells the action)
- **The publisher** (the one that does the advertising and generates traffic)
- **The network** (the one that takes care of tracking the CPA's and arranges payments)
- **The customer** (the one that performs the action)

The key to successful affiliate marketing lies in the construction of a win-win relationship between the merchant and the publisher (Duffy, 2005). The publisher promotes the products of the merchant by using any sort of digital marketing that he feels will work for the specific products. The merchant sells the products and rewards the publisher with a commission fee. This is not limited to selling a physical product, it can be any (digital) action that can occur on the website of the merchant. Examples of actions are: buying a physical or digital product; downloading software; registering for a service; signing up for a newsletter. The term Cost-Per-Action, also called CPA, is used to indicate the action that the customer has to perform in order for the publisher to claim his commission fee (Nazerzadeh et al., 2007). This is a form of performance-based advertising (Horowitz, 2010) that is increasing in popularity. Hoffman and Novak (2000) defined affiliate marketing as "the online act of promoting someone else's goods and services to earn commissions from sales leads provided". According to Stokes (2008) publishers are sometimes considered to be an extended sales force for a website. Since these publishers are paid for their performance; affiliate marketing is sometimes called performance marketing (Ivkovic & Milanov, 2010). Hence, the essence of affiliate marketing can be summarized as follows: first a publisher attempts to send visitors (i.e. potential customers) from his online portal (i.e. his website, Instagram, Facebook, app) to a merchant's website through affiliate links; secondly, a number of those visitors carry out a desired action necessary that the merchant opts for (i.e. a sale, a sign-up, a newsletter subscription); finally, the merchant rewards the publisher per action demanded to finalise the sale or service, which is traced back to the publisher (Stokes, 2008). The benefits of affiliate marketing are significant (Ross Jr et al., 2003) and include:

- For the publisher it constitutes revenue-generating web content without requiring an investment in product inventory or additional infrastructure.
- The model creates new revenue without necessarily reducing the website's available ad inventory.
- The advertiser benefits from the marketing resources that the publishers are bringing to the table.
- The customer always visits the website of the advertiser, therefore they are able to lure the customer away from the publisher and to other products as well.

The performanced actions and the types of commissions can be grouped in four different categories. First there is the cost per sale (CPS) or pay per sale (PPS). This is a model where the publisher is paid based on the number of sales that are directly generated by sending customers from the publishers' platform through affiliate links. It is a variant of the CPA model (cost per action), where the merchant pays the publisher in proportion to the specific action committed (e.g. downloading certain software, signing up to a program, subscribing to a newsletter, etc.) by the visitors to the website (Cudmore et al., 2009). Then there is the cost per lead (CPL) or pay per lead (PPL) model. This is another commonly used method whereby the publishers are paid for referrals regardless of whether these referrals are converted to specific actions (Libai et al., 2003). The CPL method is more profitable when a merchant negotiates a separate deal with a publisher. The final most commonly used model is cost per click (CPC), also called pay per click (PPC). It is an online advertising payment model where the total payment is based completely and only on qualifying click-throughs. With this agreement, the merchant only pays for the qualifying clicks to the publisher based on a prearranged per click rate. Hossan and Ahammad (2013) claim that the CPC model is perhaps the best advertising medium available for Internet-based businesses and for small businesses in general. It allows them to carefully cut the advertising fat by choosing exactly what they will pay for and what they would not.

Libai et al., (2003) describes two different kind of affiliate programs. First there is the one-to-one program, in which the publisher has direct contact with the merchant. It is usually the case that both parties negotiate a unique contract which specifies the terms and conditions of the arrangement between them. In this case, the merchant hosts the affiliate software and therefore has access to a large number of customers and thus has significant negotiation power with the publisher. The commission payment agreement is more often than not long-term and usually involves up-front payment for all, or a portion of, the commission payments. The other one is the one-to-many program. Originally created by Amazon.com where publishers link to the Amazon.com site and earn up to an 8.5% referral fee when visitors who click on the links make a purchase. This is an example of an one-to-many affiliate program where the merchant (in this case Amazon) makes the program available to numerous publishers and establishes the terms of the agreement including pricing, advertising formats available, and acceptable practices. The publisher simply decides whether he wants to join the program, or not. Once the publisher has signed-up, the merchant has considerable power, he may change the terms of the agreement, or cancel at any time. One-to-one programs are, by nature, easier for partners to monitor: there are fewer involved parties and the communication line is more direct. Because the one-to-many programs come with difficulties like keeping track of the performance of many different publishers, and the time-consuming behaviour it entails, affiliate networks started to take over these responsibilities.

A study by Rakuten and Forrester Consulting has shown around 83% of the merchants are using an affiliate network to connect to publishers and to view all kinds of performance metrics, and 11% are considering to include it in the next future. Publishers are connecting to multiple networks, with 71% of them belonging to three or more networks. The study shows that affiliate networks have a large impact on the affiliate marketing industry in general. Networks serve as a middle-men between the publisher, merchant, and the customer (Messer, 2006). The responsibilities of a network include (Walker et al., 2010;

Edelman Brandi, 2015):

- Connect publishers with merchants (and the other way around).
- Provide publishers with generated content from the merchants.
- Provide publishers and merchants with performance metrics.
- Provide technology for tracking activities; Credit sales to publishers (Amarasekara & Mathrani, 2016).
- Manage the payment cycle between publishers and merchants (Kelle et al., 2013).

Using an affiliate network is not without risk. Fox & Wareham (2007) discuss the lack of transparency from the affiliate network towards both the publisher and the merchant. Transparency can be defined as "the availability of full information required for collaboration, cooperation, and collective decision making", and is an essential factor for establishing trust between two stakeholders. All the essential information between the merchant and the publisher flows through the affiliate network, which makes it more difficult for merchants to manage their affiliate programs. There is always the threat of the network conspiring with either the merchant or the publisher. Fox & Wareham acknowledge this problem, and their study demonstrated that the lack of transparency from the network limits the full potential of the partnership between the publisher and the merchant.

Pain Point: *There is a lack of transparency from the affiliate network towards both the publisher and the merchant (Fox & Wareham, 2007).*

Because of the lack of transparency from the network, there is a lack of trust between the merchant and the publisher (Gregori et al., 2013). The concept of trust has been identified as a key ingredient for a successful business relationship in online environments, because it significantly influences the behaviour of the stakeholders, and is critical for their loyalty (Chen Dhillon, 2003). This is especially important in affiliate marketing, as the merchant is allowing the publisher access to the name and overall awareness of his brand. Moreover, trust is considered to reduce the perception of risk, to increase the reliability of perceived information, to increase traffic to a website and leads to positive word-of-mouth (Lee Lin, 2005). There is a common agreement on the importance of trust in e-commerce, and the formal study of its importance has been addressed in several studies. Affiliate marketing is no exception, because the publisher and the merchant work so closely together, establishing trust between them is of vital importance for the work collaboration. Studies on online trust in commercial websites have revealed a couple of factors that support the development of trust. Trusting beliefs represent an individual's impression about attributes and characteristics of the trusted party that are critical for the formation of trust relationships. The most frequently adopted trust beliefs are: competence, integrity, openness, and benevolence (Papadopoulou et al., 2001). Competence refers to the ability of the trustee to fulfil the promise as communicated initially to the trustor. It reflects the necessary skills for the merchant to fulfil the expectation of tracking actions and paying the commission fee according to the predetermined agreement with the publisher. Integrity — also referred to as reliability, honestly or credibility — reflects the ethical traits of the trustee, and is considered critical for establishing trust in e-commerce, as the

trustee relies on the truthfulness and honesty of the presented information. Openness is defined as the extent to which relevant information is kept back from the trustee. Guarding and/or withholding information deliberately might cause suspicion on behalf of the trusting party and, moreover, sharing information openly can establish confidence in the trusted party. Benevolence in the context of commercial trust relationships is defined as the probability that the trustee places the interest of the trusted party ahead of his own (Chen, S. C., Dhillon, G. S. (2003). This is usually related to the privacy of sensitive personal information in e-commerce, but because the merchant and the publisher do not share this kind of information, this is of less importance. In addition to these beliefs, an important basis of online trust is knowledge-based trust. More concretely, the knowledge about and predictability of the trustee's competencies, motives, and goals. The ability to predict a partner's behaviours and intentions enables the trustee to evaluate the expected quality of performance, and, therefore, to assess trustworthiness (Ratnasingam Phan, 2003).

Pain Point: *There is a lack of trust between the merchant and the publisher (Gregori et al., 2013).*

Because the affiliate network connects the publishers and merchants with each other, there is hardly any need for both stakeholders to get in touch with each other. This results in the lack of communication between them (Gregori et al., 2013), and that most of the communication lines are between the publisher-network and the merchant-network. Webster's Dictionary defines communication as "a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior". The Affiliate Cencus report conducted by Econsultancy revealed the universality of the problem. The vast majority of publishers (70%) stated that they have limited communication, indirect communication or no communication with merchants. Many of the publishers complain about the lack of personal attention, irregularity of communication, and other related problems. The Affiliate Cencus report emphasized that: "A lack of communication is clearly holding back the industry. In this research, the need for greater communication between publishers and merchant was frequently cited, either as something for networks and merchants to improve upon, or as an example of a change that would positively impact the affiliate marketing sector". The Affiliate Summit (who run the biggest affiliate marketing events in the world) released their AffStat Report which was entitled: "Communication with Affiliates: Methods and Frequency". They conducted a survey with 1.150 publishers worldwide where the question of how often do you want to be in contact with the merchant. The result showed that over 85% of all the affiliates want to hear from the merchant monthly (49%) or weekly (36.1%).

Pain Point: *There is a lack of communication between the merchant and the publisher (Gregori et al., 2013).*

Mariussen et al (2010) have studied the unintended consequences in the evolution of affiliate marketing. Their paper, called "Unintended consequences in the evolution of affiliate marketing networks: a complexity approach" describes the necessity of sharing knowledge and expertise, skills augmentation, collaboration and networking as the key economic drivers for future growth. According to Strategic Network Theory (Dale, 2003),

partnerships may create mutual benefits and are critical in creating added-value. Affiliate marketing, in this context, represents an attractive and effective form of partnering on the Internet for marketing purposes. During their empirical research they concluded that one of the challenges of affiliate marketing is to validate the information received from the networks. The technology from the networks poses challenges for the publisher and merchant in terms of excessive monitoring of their online activities, being unable to verify the commissions paid.

Pain Point: *There is a lack of external monitoring validation (Mariussen et al., 2010).*

Papatla & Bhatnagar (2002) claimed that an affiliate partnership should be established between businesses, which sell products that are linked to each other. They revealed four types of relationships among products including strict substitutes, strict complements, episodic substitutes, or episodic complements. Based on their research, the authors expect managers to select affiliate partners in couple of steps. First, they should narrow down the choice to a few products, and in the second step, they choose particular firm(s) within chosen categories. In case of multiple products across a number of categories in the product mix and given that different products have strict and episodic substitute, they suggest at least two types of publishers per product. The authors warn the merchants not to do everything in one step, otherwise there would be thousands of publishers and the decision-making would be unmanageable. They state that because of the many publisher sign-ups the merchant receives through different affiliate networks, they often deny partnerships for unknown reasons. This process does not have clear guidelines and agreements, and therefore leaves publishers frustrated and annoyed with the unknown entry barriers the merchants are using for accepting or denying publishers into their affiliate programs.

Pain Point: *The entry barriers are unknown (Papatla & Bhatnagar, 2002).*

Using an affiliate network means that the network needs to know where the click is coming from and where the action is coming from (Edelman & Brandi, 2015). The publisher links his customer to the affiliate networks' website using tracking links. The network then saves the customers' information and redirects the customer to the merchants' website. The merchant has tracking code running on his website (Burema & Makino, 2002) that allows the network to know when a specific action has occurred. The network then attempts to credit this action to a certain publisher, in order for the commission fee to be paid. The most popular method for crediting a publisher is by using cookies (Miller, 2010). A cookie is a text file that a Web browser stores on a user's machine. Cookies are a way for Web applications to maintain application state (Kristol, 2001). A cookie can only be retrieved and opened either by the web server that set it on the web browser, or locally by the owner of the machine that the web browser is hosted on. In affiliate marketing using persistent cookies is the generally accepted practice to track visitor clicks and sales behavior (Miller, 2010). Usually the cookie contains lots of user detailed information and other environment values. The important information however is the referring publisher and the network identifications (Humphries, 2013). With the network identifications set the affiliate network is able to link an action to the referring publisher and therefore put the money at the right place (Edelman & Brandi, 2015).

Crediting a publisher can be divided into two processes: (i) Tracking a click; (ii) Tracking a conversion. The end result of the tracking a click process is that the customer now has a cookie set from the affiliate network containing tracking information. Usually the cookie has a life time span of 30 days (Amarasekara & Mathrani, 2016), after it will be removed from the customers' web browser. So the customer is on the website of the merchant with a tracking cookie loaded on his web browser from the affiliate network. The network now uses this cookie to credit a publisher for the conversion. It could occur that there are multiple cookies found from different publishers. In this case the business rules from the affiliate network determines which publisher is credited, usually based on the timestamp of the cookie.

Looking at the two processes there a couple of things that stand out. The first interesting issue is how the network matches a cookie to a publisher. The network only knows about the transaction if the tracking code on the website of the merchant is valid. There is no way to verify if this tracking code is not modified with, which could potentially lead to dishonest merchants. Another issue is if the customer has tracking cookies from multiple publishers on his computer. Then the business rules of the network decide how the situation is handled. This could mean that a publisher is not credited for a legitimate sale. Even though tracking failures are not fraudulent activities, they can cause losses to publishers by losing their rightfully earned commissions. Tracking failures can occur when (Amarasekara & Mathrani, 2016): (i) the customer clears the browser cache between the click-tracking and conversion-tracking process; (ii) the customer uses incognito modus; (iii) the cookie has expired when the customer returns to complete the purchase; (iv) the customer uses different browsers.

Pain Point: *Unable to detect dishonest merchants (Edelman & Brandi, 2015).*
Pain Point: *Unable to detect invalid tracking code (Burema & Makino, 2002).*
Pain Point: *Unable to detect invalid transactions attribution (Humphries, 2013).*
Pain Point: *Unable to detect dishonest affiliate networks (Humphries, 2013).*

Not only the publisher is vulnerable to affiliate fraud, the merchant is at risk too. Amarasekara Mathrani (2016) discovered there is an imminent threat for fraud for the merchant. These fraudulent activities include: (i) load-time click (a publisher mimics a "click" on a tracking link from the customer); (ii) cookie stuffing (Edelman & Brandi, 2015) (the publisher places different cookies belonging to different advertisers on the customer's' computer); (iii) conversion hijack (the publisher monitors the activity of a customer and triggers a click-pixel just before a purchase); (iv) conversion stealing (the network steals legitimate sales from an advertiser by creating tracking entities, attributing the sale to rogue publishers). Literature review indicates that the individual perceptions and definitions of fraudulent activities are somewhat subjective. What some companies consider as an illegal activity can be quite legitimate with another company. Because cookies are widely used for tracking, the manner of usage of cookies is a very important business decision, that differs from company to company. This means that there is a very thin line between fraud being detected or undetected, and will differ for each affiliate network. What some networks consider to be fraudulent, would go undetected and be "legitimate" in another network (Edelman & Brandi, 2015). Nevertheless the merchants (and networks) have to be aware of these risks, and account for the fact that there are

fraudulent publishers that try to exploit these vulnerabilities.

Pain Point: *Vulnerable to publisher cookie spamming (Amarasekara & Mathrani, 2016).*
Pain Point: *Vulnerable to publisher cookie stuffing (Amarasekara & Mathrani, 2016).*
Pain Point: *Vulnerable to publisher click spamming (Amarasekara & Mathrani, 2016).*
Pain Point: *Vulnerable to network conversion stealing (Amarasekara & Mathrani, 2016).*

Newman (2004) and Fox & Wareham (2007) have researched the impact of different affiliates on the brand of the merchant. There are various ways for publishers to promote the products of the merchant, and the merchants should be careful in selecting their publishers to make sure that the way of promoting complements the brand, and that there is congruency between the websites. Otherwise, they found that the relationship could negatively impact the brand of the merchant. Some of the merchants forbid the publishers the use of their trademarks in searching engine marketing activities. They found that 59% of the CPC affiliate programs and 61% of the CPL affiliate programs have arrangements that forbid publishers in some ways to use their trademarks. The efficacy of these measures is far from clear, however. While there is a risk of missing out on some conversions by the publishers, many have suggested allowing the use of trademarks to effectively "filling the channel", which ultimately should result in a higher conversion for the merchant. The following question summarizes the dilemma: *"Would you rather have (a) your brand name and 7 of your competitors show up on a search for your brand or (b) your brand name and 7 of your publishers show up?".*

Pain Point: *Negative impact on the brand (Fox & Wareham, 2007).*

To join an affiliate network the merchant first pays a startup fee (Sarelson & Treiber, 2009). Besides the startup fee the merchant has to pay 10-30% per generated transaction. The payout process method the networks use is called revenue sharing (Gallaugher et al., 2001). It means that the total amount of income generated is distributed between all the contributors. The process starts with the customer purchasing a product in the webshop of the merchant. At this point all the money is in the hands of the merchant. Assume the customer was directed to the merchant's website through a publisher, this now means that the transaction is recorded by the affiliate network. At this point the merchant has a specific amount of days (usually around 30) to approve or reject the transaction. If the transaction is rejected it means the customer returned the product and the merchant has to refund the received money. Unfortunately, there is no way for the publisher to validate if the transaction was rejected in a fair manner, or that the merchant is dishonest (Benediktova & Nevosad, 2008). If the transaction is marked as rejected, the payment cycle now stops. However, if the transaction is approved, the merchant now has to pay a percentage of the product's price as commission to the affiliate network. Because bank transactions are costly, the affiliate network creates an invoice after a specific set of days (usually around 15) that holds all the commission that the merchant has to pay from the approved transactions of the last 15 days. So the merchant only keeps around 85% of the originally received money for his products. After the affiliate network has received the money from the merchant, they have to pay the publisher for the generated traffic. The

affiliate network takes a small percentage of this sum as a fee (usually between 10-30% of the total commission). The affiliate network doesn't pay the publisher straight away, but only pays out on specific days (usually the first day of the month), and only after the network has received the money from the merchant.

Because it is shared over multiple contributors, it is hard to track where the money is going and the paths it took to get there. Another aspect is that payments are often delayed (Khandelwal, 2017), due to the fact that the money has to be moved to and from multiple stakeholders. The network receives the money from the merchant usually on a monthly basis (although each network has its own business rules). Then the network takes a commission fee and moves the money to the publishers that are credited for the generated sales. This is also usually done on a monthly basis. This means that the publisher more often than not has to wait at least 90 days to get his payment. However when the merchant decides to delay the payment, or the network, this waiting time could increase very quickly. This would be troublesome for the publisher, as his cash-flow is unstable and unpredictable because of this.

Pain Point: *The payments for the publishers are delayed (Khandelwal, 2017).*
Pain Point: *The payment cycle is inefficient (Khandelwal, 2017).*
Pain Point: *Unable for the publisher to verify the rejected transactions (Benediktova & Nevosad, 2008).*

Chachra et al. (2015) researched the risks for both merchants and affiliate networks on the topic of cookie-stuffing fraud. Even though they only observed a limit amount of cooking-stuffing, their study did reveil a significant weakness for the affiliate networks. They identified that large affiliate networks are targeted disproportionately more compared to the merchant-run affiliate programs, and that the impact of a system failure within the network disrupts the affiliate programs significantly. This leads to publishers missing out of commission because of the unavailability of the networks. The network acts as a single point of failure within the affiliate industry. A single point of failure is when one fault or malfunction can cause an entire system to stop operating (Noveck, 2011). If the network is offline, the entire process is halted. Or, even worse, if the network is compromised there could be the potential of fraud and data leaks and neither the publisher nor the merchant will know about it.

Pain Point: *The affiliate network as a single-point-of-failure (Chachra et al., 2015).*
Pain Point: *Tracking unavailability (Chachra et al., 2015).*

The result of this literature review is a list of Pain Points associated with Affiliate Marketing. Below is a list that summarizes all the Pain Points found in this chapter.

	Description	Reference
PP1	There is a lack of transparency from the affiliate network towards both the publisher and the merchant	Fox & Wareham, 2007
PP2	There is a lack of trust between the merchant and the publisher	Gregori et al., 2013
PP3	There is a lack of communication between the merchant and the publisher	Gregori et al., 2013
PP4	There is a lack of external monitoring validation	Mariussen et al., 2010
PP5	The entry barriers are unknown	Papatla & Bhatnagar, 2002
PP6	Unable to detect dishonest merchants	Edelman & Brandi, 2015
PP7	Unable to detect invalid tracking code	Burema & Makino, 2002
PP8	Unable to detect invalid transactions attribution	Humphries, 2013
PP9	Unable to detect dishonest affiliate networks	Humphries, 2013
PP10	Vulnerable to publisher cookie spamming	Amarasekara & Mathrani, 2016
PP11	Vulnerable to publisher cookie stuffing	Amarasekara & Mathrani, 2016
PP12	Vulnerable to publisher click spamming	Amarasekara & Mathrani, 2016
PP13	Vulnerable to network conversion stealing	Amarasekara & Mathrani, 2016
PP14	Negative impact on the brand	Fox & Wareham, 2007
PP15	The payments for the publishers are delayed	Khandelwal, 2017
PP16	The payment cycle is inefficient	Khandelwal, 2017
PP17	Unable for the publisher to verify the rejected transactions	Benediktova & Nevosad, 2008
PP18	The affiliate network as a single-point-of-failure	Chachra et al., 2015
PP19	Tracking unavailability	Chachra et al., 2015

Table 3.1: Pain Points for the Affiliate Marketing industry

3.2 Blockchain Technology

The term blockchain can be a bit confusing because it mostly goes hand-in-hand with the term Bitcoin. More often than not the word Bitcoin is used to simultaneously denote three different things (Swan, 2015). First it refers to the underlying blockchain technology. Second it can mean the protocol that runs over the underlying blockchain technology to describe how assets are transferred on the blockchain. Third it is used for the digital currency called Bitcoin, which is, for now, still the largest cryptocurrency in the world.

This section focuses only on the underlying blockchain technology. A blockchain is a shared distributed ledger in which every transaction is digitally signed (Carlozo, 2017). It's a database that is shared by all the network nodes and owned and controlled by no one. It allows for direct online transactions between two parties, who have no real-world connection whatsoever and don't trust each other, without the need for a third party or a central instance (Beck et al., 2016). It offers the transport of data in a transparent, verifiable and safe way that is insensitive to crashes or down-time because it does not depend on a central instance. The difference between a normal ledger and a blockchain is that the blockchain is fully transparent (Hawlitschek et al., 2018).

A ledger is the foundation of any transactional system. In the old days it was a large book that was used to register all the economic transactions of a company. It is used by, for example, accountants and holds debit and credit columns and a beginning and starting balance (Evans, 2014). Nowadays the ledger is a digital one, stored on a computed owned by (for example) an accountant. It's called a digital ledger, which is a digital file, or a collection of files, or in most cases a database. A database is a collection of information that is organized so that it can be easily accessed, managed and updated (Greenspan Bulger, 2001). The data is organized in tables consisting of rows and columns. Most software programmers are well acquainted with database concepts through relational databases like Oracle, SQL Server, MySQL etc. These databases are the backbone of our society, all sorts of data is stored, for example money, bills, certificates, products, contracts etc (Cattell, 2011). This database is stored on a server, and the server is owned by someone that has access to the server. Only the owners are allowed to read the entire database. The difference between a traditional database and a distributed database (or: distributed ledger) is that the database is held and updated independently by each participant (or: node) in the network (Abeyratne Monfared, 2016). The distribution is unique: records are not communicated to various nodes by a central authority, but are instead independently constructed and held by every node. That is, every single node on the network processes every transaction, coming to its own conclusions and then voting on those conclusions to make certain the majority agree with the conclusions. Once there is this consensus, the distributed ledger has been updated, and all nodes maintain their own identical copy of the ledger. This architecture allows for a new dexterity as a system of record that goes beyond being a simple database.

The distributed ledger consists of a chain of blocks. A block on the blockchain is made up of digital pieces of information. It contains four different parts of information (Mills et al., 2016):

- It stores information about transactions. Usually this contains information like a time, a date and for example the amount of money in the transaction.
- It stores information about who is participating in the transactions. Instead of using actual names, or for example email-addresses, a transaction is recorded without any identifying information using just an unique digital signature. It looks like a username and is usually a generated hash of some sorts (Zyskind Nathan, 2015).
- It stores information that distinguishes it from other blocks. Just like a relational database table has unique ID's for each table row, each block has a unique hash that that allows us to tell it apart from every other block.
- It stores information about the previous block, usually the unique hash of the previous block.

Each blockchain consists of a chain of these blocks, with every block pointing towards his predecessor, all the way up to the genesis block.

A block needs to be added to the blockchain in order for the transactions to count. There are four steps that need to happen before a block is being added (Mills et al., 2016):

- A transaction has to occur. For example a purchase has to be made, or a money-transfer command has to be issued.
- The transaction has to be verified. Instead of a central authority that verifies it, with blockchain it's verified by a network of nodes.
- The transaction has to be stored in a block. After your transaction has been verified as accurate, it gets the green light and is added to a block together with multiple other transactions.
- A unique hash has to be generated for the block.

A block is signed using a cryptographic hash. A cryptographic hash function always gives the same output for the same input, but always a different output for different input. This cryptographic hash function is used by the Bitcoin blockchain to give the blocks their signatures (Anjum et al., 2017).

Now that a block is signed it needs to be added to the blockchain. Because the blockchain has no central authority, it makes decisions using a consensus algorithm. Consensus decision-making is a group decision-making process in which group members develop, and agree to support a decision in the best interest of the whole. Consensus may be defined professionally as an acceptable resolution, one that can be supported, even if not the favourite of each individual (DeGroot, 1974). In other words, consensus is a dynamic way of reaching an agreement in a group. Before blockchain all the decentralized systems failed to answer the biggest problem when it came to reaching a consensus. The problem was called the Byzantine Generals Problem (Lamportetal., 1982), and can be summarised as a question: How do you make sure that multiple entities, which are separated by distance, are in absolute full agreement before an action is taken? Satoshi Nakamoto, Bitcoin's creator, was able to bypass the problem by inventing the Proof of Work protocol (Nakamoto, 2008). The Proof of Work protocol is the first blockchain algorithm introduced in the blockchain network. The central principle behind this algorithm is to solve complex mathematical problems and easily give out solutions. Every node can use the computational power of his computer to solve these mathematical problems. Solving this problem is called mining. The benefit of this algorithm is the strong defence against DDOS attacks and solving the consensus (Gervais et al., 2016). The disadvantage is the power wasted that the miners use, which is useless except for the blockchain (Saleh, 2018). Another disadvantage is a 51% attack, where the blockchain can be hacked if someone manages to have 51% of the mining power in the network (Yli-Huumo et al., 2016).

The original use of blockchain is for the transfer of money. It demonstrates the potential as a means of transferring value and is known widely as cryptocurrencies. The most known cryptocurrency to date is Bitcoin. But there are more scenarios where blockchain could provide value by allowing programmatic transactions. This is called Blockchain 2.0. These transactions can be modified by a condition or a set of conditions. Because blockchain is not just limited to cryptocurrencies a lot of new opportunities arise. These include (Kehrli, 2016):

- Microtransactions
- Decentralized exchange
- Creating and transferring digital assets
- Smart contracts

This section will focus on smart contracts. Smart contracts are scripts executed in blockchain environment; their codes are accessible to all and anyone can verify the correctness of code execution. The verification is carried out by miners in the blockchain environment. This ensures honest execution of the contract (Christidis Devetsikiotis, 2016).

A classic example of a smart contract is a vending machine. It always operates the same according to a fixed set of rules. You insert money, you make a choice which product you want and the vending machine releases the product for you to pick it up. In the smart contract context the code becomes the law, the code will always be executed when the conditions are met.

These smart contracts offer several advantages (Christidis & Devetsikiotis, 2016): Accuracy; because all the transactions are saved in the blockchain, there is a high level of accuracy when using smart contracts.

- **Transparency;** it also results in a high level of transparency, because the blockchain is visible to anyone.
- **Speed;** these contracts run on software code and live on the internet. As a result, they can execute transactions very quickly. This speed can shave hours off many traditional business processes.
- **Security;** automated contracts use the highest level of data encryption currently available, which is the same standard that modern crypto-currencies use. This level of protection makes them amongst the most secure items on the world wide web.
- **Efficiency;** this comes along with the speed and accuracy.
- **Trust;** smart contracts generate absolute confidence in their execution. The transparent, autonomous, and secure nature of the agreement removes any possibility of manipulation, bias, or error.

The first blockchain network who successfully implemented smart contracts on its platform is Ethereum. Ethereum is a decentralized platform that runs smart contracts. They enable developers to create markets, store registries of debts or promises, move funds in accordance with instructions given long in the past (like a will or a futures contract) and many other things that have not been invented yet, all without a middleman or counterparty risk. Their programming language Solidity is currently the most popular language to write smart contracts in (Bhargavan et al., 2016).

Blockchain technology together with smart contracts offer several opportunities. Scriber has researched 23 different blockchain based projects and defined a list of characteristics (Scriber, 2018) that can help to determine blockchains' appropriateness for an application. Together with smart contracts we can extract a list of characteristics or opportunities that blockchain technology, together with smart contracts, can offer. Table 4.1 lists these opportunities, and are defined as blockchain opportunities (BCOs).

Immutability; immutability is used to denote something which can never be modified or deleted. In a blockchain, it refers to the logs of transactions, which is created by consensus among the chain's participants. The basic notion is this: once a blockchain transaction has received a sufficient level of validation it can never be replaced or revised or edited. Each transaction that is verified by the blockchain network is timestamped and embedded into a block of information, cryptographically secured by a hashing process that links to and incorporates the hash of the previous block, and joins the chain as the next chronological update. Immutability has the potential to transform the auditing process into a quick, efficient, and cost-effective procedure, and bring more trust and integrity to the data businesses use and share every day. Other benefits are: (i) complete data integrity; (ii) simplified auditing; (iii) increase in efficiencies; (iv) proof of fault (Zheng et al., 2017).

Visibility & Transparency; In blockchains, all the participants can see the chain (even if other protections exist for each transaction privacy or anonymity). This allows for validation of contractual limits (for example, you're allowed to sell a product to only n number of other participants). These limits can also be audited and validated programmatically through script execution (assuming the blockchain enables that functionality). With visibility automatically comes transparency, which eliminates the need for audits. Blockchain systems offer a fully auditable and valid ledger of transactions. This ledger is unforgeable and immutable, resulting in that entries into the ledger can only be made if they are validated by the system (Scriber, 2018).

Trust; Using blockchain technology does not automatically mean that trust is added to the equation. Instead, they can remove the need for trust from an ecosystem or a central authority.

It can be used to find agreement about the shared state of collaborating parties, and it opens the door for the removal of friction between stakeholders in many economic environments (Weber et al., 2016). By using smart contracts the need for trust is removed because they generate absolute confidence in their execution (Christidis Devetsikiotis, 2016), so there is no need for lawyers, witnesses, banks and other intermediaries.

Availability & Security; Blockchain allows for a wide variety of computers to take part in a network, therefore distributing the computing power. What this means is that unless all the connected computers lose their connection, the network will continue to exist and to function. This makes a blockchain network a decentralized entity (Wright & De Filippi, 2015), and increases the availability of the system (Weber et al., 2017). Availability refers to the percentage of time that the infrastructure, system, or a solution remains operational under normal circumstances in order to serve its intended purpose. For cloud infrastructure solutions, availability relates to the time that the datacenter is accessible or delivers the intend IT service as a proportion of the duration for which the service is purchased. Where traditional servers are generally centralized, it's a likely target for malicious attacks, because the hacker only has to breach one node to infiltrate the network. By using blockchain, this risk is minimized because the decentralization greatly increases the difficulty, therefore increasing the security of the system.

Efficiency; In a smart contract approach, an asset or currency is transferred into a program and the program then runs this code and at some point it automatically validates a condition and it automatically determines whether the asset should go to one person or back to the other person, or whether it should be immediately refunded to the person who sent it or some combination thereof (Buterin, 2014). Smart contracts are basically self-executing contracts which are programmed in a way to ensure that the terms of agreements are met/unmet and then take a resulting action. These smart contracts live on the server, and are executed straight away in the most efficient manner. Therefore using smart contracts can avoid the pitfalls of manually filling in / auditing forms by executing logic in a pre-defined way.

The result of this literature review is a list of Blockchain Opportunities. Table 3.2 describes a list that summarizes all the Blockchain Opportunities found in this chapter.

	Description	**Reference**
BCO1	Immutability	Zheng et al., 2017
BCO2	Visibility & Transparency	Christidis & Devetsikiotis, 2016
BCO3	Trust	Scriber, 2018
BCO4	Availability & Security	Wright & De Filippi, 2015
BCO5	Efficiency	Buterin, 2014

Table 3.2: Blockchain Opportunities (BCOs)

Chapter 4

Findings

To validate the Pain Points found in Chapter three, semi-structured interviews (Drever, 1995) are conducted with affiliate marketing experts. Interviewing experts allows for a quick way to obtain field knowledge (Bogner et al., 2009) and a structured way to validate the results from the literature study. This chapter describes how the interviews are structured, based on the information in section 2.4.

In total, **seven** interviews with experts in the affiliate marketing industry were conducted. The convenience sampling method was used to find the candidates (Etikan et al., 2016). Convenience sampling is a type of sampling where the first available primary data source will be used for the research without additional requirements. The reason for using the convenience sampling method is because of the unwillingness of candidates to cooperate, mainly claiming to be too busy or not seeing the added benefit for them. This is especially the case for the merchants, as affiliate marketing is just a small part of their revenue stream so the focus lies elsewhere. Most merchants that were approached do not have a person dedicated to just the affiliate marketing part, it is the webshop manager that does affiliate marketing on the side. This made it harder to find suitable candiates for the interviews. In the end, suitable candidates were found by changing the criteria from 2.4 slightly. Instead of having five years experience in the affiliate marketing industry, only two years of experience was asked for.

The checklist of points for explanation before an interview, as described by Whiting (2008), was used as preparation. This includes explaining the reason for the interview, the format of the interview and asking permission to record the interview. Before starting the interview the candidate was asked to review and sign the informed consent form. The candidate was given the option to remain anonymous if he or she wants, and/or for the organisation to remain anonymous. The entire consent form can be found in Appendix C. The interviewee was asked about his experience with affiliate marketing, and his current involvement with the industry. Afterwards the interviewee was asked for his opinion on the pain points as described in chapter 3. To close the interview the interviewee was asked for his opinion on the future of affiliate marketing, and was thanked for participating. The entire interview protocol can be found in Appendix A.

☑ indicates that the candidate strongly supported the pain point
☒ indicates that the candidate strongly opposed the pain point

PP	Results		Prominent comment
PP1	☑ × 6	☒ × 1	☑ "By switching networks our sales dropped by 50% and we could not figure out why."
PP2	☑ × 5	☒ × 2	☑ "Losing the commission for over 2000 generated sales without a specific reason is why we find it hard to trust merchants anymore."
PP3	☑ × 4	☒ × 3	☒ "We have a direct communication line with each of our merchants, but this is because there are not that many."
PP4	☑ × 5	☒ × 2	☑ "We use the APIs of the networks to save transaction data, but the data we receive changes often and without reason."
PP5	☑ × 7	☒ × 0	☑ "We were used to getting denied often by merchants, and having to send multiple emails to find out the reasoning behind this."
PP6	☑ × 5	☒ × 2	☑ "When the merchant changes a parameter, it could halt the entire tracking process. But this does not mean that the merchant is fraudulent."
PP7	☑ × 4	☒ × 3	☑ "We place lots of test orders everyday to make sure the tracking code of the merchants are fully functional."
PP8	☑ × 1	☒ × 6	☒ "This is not a pain point for us, per se, as we do not give much thought about whether this happens correctly, we just assume it does."
PP9	☑ × 4	☒ × 3	☑ "There is no way to check if the network does its job correctly, we just assume they do."
PP10	☑ × 3	☒ × 4	☒ "With the advancement of ad blocking techniques, this problem has disappeared."
PP11	☑ × 5	☒ × 2	☑ "This has occurred quite recently, with a rogue publisher using advanced cookie stuffing techniques."
PP12	☑ × 5	☒ × 2	☑ "It happens, and even though we have advanced detecting software, it still occurs and costs us money."
PP13	☑ × 1	☒ × 6	☒ "Together with the analytics data from the merchant, it would be incredibly hard and risky for the network to steal conversions from legitimate publishers."
PP14	☑ × 7	☒ × 0	☑ "This is a problem, but not specifically related to affiliate marketing. It is a continuous struggle for merchants."
PP15	☑ × 6	☒ × 1	☑ "One merchant has a cancelling period of 90 days, resulting in us having to wait over half a year before being compensated."
PP16	☑ × 7	☒ × 0	☑ "The financial department of the merchants is our (the network and publisher) common enemy, resulting in us working together to get the money."
PP17	☑ × 5	☒ × 2	☒ "Our special analytics software tracks fraudulent behaviour from the merchant on a grand scheme. We can not validate individual transactions however."
PP18	☑ × 4	☒ × 3	☑ "We sometimes feel worried about our vulnerability if something happens with the network."
PP19	☑ × 7	☒ × 0	☑ "Most networks have a compensation plan for when the tracking is unavailable, but still it happens more often than it should."

Table 4.1: Pain Points Evaluation Results

Table 4.1 displays the evaluation results of the affiliate marketing pain points. It shows, for each pain point, how many interviewees agreed with the statement, and how many interviewees disagreed with the statement. If the interviewee did not clearly state if he supported or opposed the statement, the result was taken based on the positive and negative comments made by the interviewee about the pain point, as judged by the interviewer.

PP1 (☑ × 6 ☒ × 1): There is a lack of transparency from the affiliate network towards both the publisher and the merchant; Six out of the seven interviewees agreed with this pain point. All the interviewees agreed that the most common method of the network to show transparency to both the publisher and the merchant is through an affiliate dashboard. The affiliate dashboard displays the statistics like clicks, transactions, leads and offers solutions like link generation, creating reports, exporting data to excel. One interviewee stated that he thought this dashboard is sufficient, and that he felt like all the crucial information was available to him. The other interviewees all felt that the dashboard was lacking in some ways, although they claimed that some networks (Rakuten) were worse than others. One interviewee said that when they switched from Tradetracker to Rakuten as a network for one of their merchants, their sales suddenly dropped and they could not figure out why. They stated that the Rakuten dashboard was outdated, and that they found it very difficult to find the important information they needed.

PP2 (☑ × 5 ☒ × 2): There is a lack of trust between the merchant and the publisher; Two interviewees disagreed with this pain point. One of the interviewees is active in the health care sector, and works together with around 10 different merchants. He stated that he has a very close relationship with each of the merchants, as he feels that trust between the parties is essential and therefore puts a lot of effort in it. He feels that because of the close relationship he has with the merchants, and with the network as well, that there is enough trust between them for the business to function.

The other interviewees all agreed with the pain point. One interviewee stated that his business lost around 2000 generated sales because the merchant decided to suddenly cancel all the transactions, without a specific reason. Because they could not validate this reason, and neither could the network, they lost all the commission gained. This resulted in a lack of trust between them, and the interviewee said that he finds it hard to trust any merchant as it is "*too easy to do something fraudulent that goes unnoticed*". Another interviewee witnessed a merchant cancelling transactions, because the transaction was tracked by two different networks. They also felt that it is hard to trust the merchants because they are unable to validate the actions of the merchant.

PP3 (☑ × 4 ☒ × 3): There is a lack of communication between the merchant and the publisher; Three interviewees strongly disagreed with this pain point, as they felt that the communication between them and the merchants is plenty. However, they did state that this was not the case when they were still growing their business. They noticed that when they started to generate more sales, the merchants were more inclined to get in touch with them, and that they responded faster to mails. But the opposite applies too, as they are less inclined to get in touch with partners that their customers are not that interested in. The other four interviewees agreed with the pain point, all stating that they wished there was a more constant communication flow. One interviewee claimed that, in the market that they are active in, the better the communication the more sales they generate. It is because they can more easily communicate things like special product discounts, or newly available products to their customers.

PP4 (☑ × 5 ☒ × 2): There is a lack of external monitoring validation; Five interviewees agreed with this pain point. According to those interviewees this corresponds

with the lack of transparency by the network. Because they depend so much on the data and logic from the network, there is a high need to validate this information. Currently, nothing like this exists, therefore the network has free reign to do as they please. One interviewee stated that they use the API (Application Programming Interface) of the networks to download and save the transactional data from the different networks, but that this data changes often and that they find it hard to figure out why. Two interviewees indicated that they agreed with the statement, but that they felt this was not necessary for them. They feel they can trust the network and therefore do not worry about external validation.

PP5 (☑ × 7 ☒ × 0): The entry barriers are unknown; All the interviewees strongly supported this pain point. The main reason for this is that the impact of affiliate marketing is still lacking behind other advertisement methods for the merchants. Therefore they are less inclined to spend much time and effort checking every publisher that signs up. Especially if the publisher is fairly unknown to them, they are scared that the publisher could have a negative impact on their brand and decide to deny the request of the publisher. Five interviewees claimed that the more successful the publisher is, the more inclined the merchant is to accept the publisher. One interviewee stated that when they just started they sometimes had to send over 10 emails to a merchant before getting accepted, but when they started to generate more traffic, the merchants came to them and they are accepted a lot faster by merchants.

PP6 (☑ × 5 ☒ × 2): Unable to detect dishonest merchants; Five interviewees supported this pain point, and the other two interviewees supported the statement but felt like it was not a problem. One interviewee claimed that this is a problem for both the publisher and the network. As both of them benefit from a successful tracking method, they keep an eye out for dishonest merchants. The interviewee stated that, in his experience, when something goes wrong on the side of the merchant it is usually due to inexperience or just a human error. A small change by the merchant could have an innocent nature (e.g. the merchants' affiliate manager changes a parameter), but catastrophic consequences as it could put a halt to the entire tracking process. The interviewee stated that this occurs quite often, but does not mean that the merchant is fraudulent.

PP7 (☑ × 4 ☒ × 3): Unable to detect invalid tracking code; Three interviewees strongly opposed this pain point, they all claimed that this is testable by doing a test order at the webshop of the merchant. By clicking on a publisher tracking link, and then purchasing a product, the transaction should be added and visible in the dashboard of the network. One of the interviewees indicated that his company tests the tracking code of the merchants quite often, sometimes up to seven test orders a day. Sometimes they forgot to cancel the order, having additional costs just to make sure the tracking code works. The other four interviewees supported this pain point, even though all of them explained that it is possible to verify if the tracking code works. However, testing it manually is an erroneous and time consuming process that is inefficient and slow. They use real-time data analysis to search for bumps in the throughput of the data. The problem is the time lost before something broken is discovered, which results in lost income for both the publisher and the network.

PP8 (☑ × 1 ☒ × 6): Unable to detect invalid transactions attribution; All the interviewees acknowledged that this statement is true in essence, but only one supported it as a real pain point for the industry. This interviewee stated that he has experienced anger and confusion by publishers that wonder why they are not credited more sales. However, by digging deeper into the data they always found a logical reason for why the publisher was lacking in performance. All the other interviewees opposed the statement as a pain point, as they all do not give much thought to whether this is happening correctly, or not. They all just assume this happens fairly and is working accordingly.

PP9 (☑ × 4 ☒ × 3): Unable to detect dishonest affiliate networks; Four interviewees supported this pain point, all agreeing that it differs per network however. This correlates with the amount of effort and communication they have with the network. If the network seems uninterested and unwilling to help them with problems they face (e.g. answering late, no personal contact, unhelpful comments), they are more likely to distrust the network. All of the interviewees experienced *"strange things"*, as they described it, with several networks over the course of their career. One interviewee stated that "there is no way to check if the network does its job, we just assume they do". The other three interviewees felt that they trust the networks they are working with, mostly because of the personal contact they have with the employees of the networks. They also never experienced any shenanigans so they have no reason to distrust the networks, therefore they state that they do not support this pain point.

PP10 (☑ × 3 ☒ × 4): Vulnerable to publisher cookie spamming; Three interviewees supported this pain point, claiming that they feel this is still a problem within the industry. The other four interviewees strongly opposed this pain point. One interviewee stated that with the advancements of ad blocking techniques, this problem has disappeared.

PP11 (☑ × 5 ☒ × 2): Vulnerable to publisher cookie stuffing; Two interviewees stated that they have no experience with this, and therefore do not think this is a problem in the affiliate marketing industry. The other five interviewees support this pain point, as they all experienced it, or suspect that it has happened to them. One interviewee said that it has happened recently, where a publisher suddenly noticed a drop in sales, even though they generated the same amount of traffic. By digging into the data, they found out that the sales were credited to another publisher, that used advanced cookie stuffing techniques to override the affiliate cookie from the legitimate publisher with their own, resulting in them taking credit for the sales.

PP12 (☑ × 5 ☒ × 2): Vulnerable to publisher click spamming; Five interviewees supported this pain point. One of the interviewees was quite clear on the subject: *"it happens"*. Even though there is software that should be able to detect rogue publishers that exploit the tracking links in the CPC model by using e.g. bots, it still happens. The software that generates the clicks is advancing as well, therefore it can sometimes be hard to detect and results in the merchant paying for rogue leads. Two interviewees stated that they felt this is not an issue anymore in the industry. They claimed that the detecting software for rogue publishers is advanced enough that it should not happen anymore.

PP13 (☑ × 1 ☒ × 6): Vulnerable to network conversion stealing; One intervie-

wee supported this statement as a real pain point for this industry. The interviewee stated that experience has taught him that it can occur, and that there is no way to find out. The other interviewees agreed that it can not be checked, but did not feel that it is an actual problem. Because the networks have set rules that forbid them from becoming publishers, the interviewees feel safe enough to trust the networks on this part. One interviewee said that together with the analytics data from the merchant, it would be incredibly hard and risky for a network to steal conversions from legitimate publishers.

PP14 (☑ × 7 ☒ × 0): Negative impact on the brand; All the interviewees agreed with this pain point. One interviewee said that this is not a specific affiliate marketing problem however, as negativity can occur everywhere. One interviewee claimed that merchants, over time, pay more attention to the way publishers are promoting their brands. If there is something that they do not like, or they feel that the promoting tool that the publisher is using is damaging the name of their brand, they do not hesitate to ask the publisher to take it offline. Another interviewee stated that publishers who do not take the image of a brand serious, are more likely to disappear over time, either by being denied access to the affiliate program by the merchant, or by having their traffic decline. He said that, in the Netherlands, customers care more about the way a brand is represented. This results in both the merchant and the publisher paying more and more attention to this.

PP15 (☑ × 6 ☒ × 1): The payments for the publishers are delayed; Six interviewees agreed with this statement, with three of them describing it as a functional flaw in the industry. One interviewee said that this is especially a problem in the early days of a publisher, as they do not have a constant stream of money coming in. When they have a month with lots of sales, the receive the money a couple of months later, making it hard to make estimates about their budget and a business plan for the future. When they became more experienced, and a more steady flow of income, they found it just became annoying. One interviewee claimed that the problem is with the financial department of the merchants, as he figured out that they are the bottleneck in the process, paying invoices too late. One interviewee described a merchant that has a 90 days cancellation period, resulting in them having to wait over half a year before being compensated by the work they have done. One interviewee said that it is just how affiliate marketing works, and that it is impossible to change. The interviewee felt that it is not a huge problem as the publishers know what they sign up for.

PP16 (☑ × 7 ☒ × 0): The payment cycle is inefficient; All the interviewees agreed with the payment cycle being inefficient, and would prefer for it to be different. This is especially annoying for the publisher and the network, as those two parties have to wait for their money. One interviewee described the merchant as the *common enemy*, having the two parties work together to get the money. One interviewee stated that sometimes the cycle can not be more efficient. For example when merchants supply loans or creditcards, there is an entire process that happens before the loan is granted, at can go wrong at any time. Therefore the (longer) cancelling period is justified. One interviewee described a merchant that has a contract saying he pays after one year of the sale taking place. The hardest part, he said, is to get your administration in order and to make sure you remember to invoice the merchant even if it is a year later. One interviewee claimed that even though it is inefficient, it is part of affiliate marketing and not likely to change in the future.

PP17 (☑ × 5 ☒ × 2): Unable for the publisher to verify the rejected transactions; Five interviewees agreed with this pain point. One interviewee stated that this is a common problem for both the publishers and the networks, as they do not have a full overview of the orders of the merchant. This lack of information results in them guessing and hoping that the merchant cancels orders in a legitimate way. Another interviewee spoke about a merchant that canceled the orders that had the most money involved. Confronting the merchant did not leave them satisfied, as the merchant just stated that it was legitimate. This is just one example that has led them to mistrust the transaction rejection process, and for them to consolidate special contracts that leaves out the rejection process. Two interviewees opposed the pain point, claiming that they have developed special analytics software that notifies them if the transaction cancelling rate is above the standard. One interviewee stated that it is still possible for the merchant to cancel transactions as he pleases, but that in the grand scheme of things they are able to figure out if the merchant behaves in a fraudulent manner.

PP18 (☑ × 4 ☒ × 3): The affiliate network as a single-point-of-failure; All the interviewees agreed that the network is a single point of failure, but only four of them recognized it as a pain point for the affiliate marketing industry. Each of these interviewees told stories about how they sometimes feel vulnerable about what happens when the network goes down, especially on important days (e.g. a day where they expect to make lots of sales). The other three interviewees acknowledged the statement, but feel secure enough that everything will work out fine with the networks. They are not worried, and state that most networks have a solid contingency plan. One interviewee claimed that because the network is also losing money, they will do everything in their power to make sure they are always up and running.

PP19 (☑ × 7 ☒ × 0): Tracking unavailability; All the interviewees agreed that this is a pain point in the affiliate marketing industry. Everyone of them has examples about tracking links not working and losing money because of it. Usually, it is a human error that resulted in the failure, but it is still annoying. One interviewee spoke about special testing software they built to continuously validate if the tracking links are still up and running. He says it makes them feel safe, but still remembers the days when they did not have this. Another interviewee stated that most networks have a compensation plan for when the tracking is unavailable, resulting in them always being paid. Another interviewee talked about the tracking links producing errors, resulting in their visitors not being redirected to the webshop of the merchant.

Based on the results of the interviews, that are summarized in table 4.1, pain points **[PP8, PP10, PP13]** are not recognized as valid pain points for the affiliate marketing industry and are therefore removed from the list.

Chapter 5

Analysis

5.1 Blockchain Opportunities in Affiliate Marketing

This section looks at the features and benefits of blockchain technology as defined in the previous chapter. We hypothesize that a blockchain platform could replace some of the functionalities of the third-party, the *affiliate network*, in the affiliate marketing industry, because of its ability to establish trust between two stakeholders. The Pain Points (PPs) of affiliate marketing as defined in Chapter 3.1 are analyzed and reflected against the blockchain opportunities (BCOs) as defined in Chapter 3.2. This results in a list of blockchain opportunities for the affiliate marketing industry.

PP1: There is a lack of transparency from the affiliate network towards both the publisher and the merchant; Using an affiliate network adds benefits for both the publisher and merchant, e.g. less maintenance work and a larger audience reach. However, the downside is the lack of transparency from the network towards both parties. It is unknown how the network stores, modifies and displays the data. There is an opportunity here for a blockchain solution to increase between the publisher and the merchant. BCO2 (see Chapter 4) describes how, and why, blockchain technology increases TRANSPARENCY. Everytime an *action* takes place on the website of the merchant (e.g. a sale, a user registered, someone signed up for the newsletter), the action will be stored in the chain. The network determines if the action should be linked to a publisher, or not, and adds this information to the action in the chain. By storing the transactional data from the merchant in the chain, it would be available for all the participants that are connected to the chain. This would result in more transparency between the publisher and the merchant, as they are able to verify all the transactions that occured. Because a blockchain is IMMUTABLE (BCO1), the publisher can be certain that the transactional data is valid, and not modified with.

PP2: There is a lack of trust between the merchant and the publisher; Because of the lack of transparency from the network, there is a lack of trust between the merchant and the publisher (Gregori et al., 2013). Therefore, increasing transparency as described above, automatically results in increasing trust. BCO3 describes how using blockchain technology does not automatically mean that trust is added to the equation.

Instead, they can remove the need for TRUST between two parties. By using a blockchain solution to store all the transactional data, there would be no need for a publisher and merchant to trust each other, or the network. They would be able to verify all the information in the chain without any information from the other party, and because a blockchain is IMMUTABLE (BCO1) they can be sure that the information is valid.

PP3: There is a lack of communication between the merchant and the publisher; Chapter 3 describes how there is a lack of communication between the publisher and the merchant, even though both parties would like to interact more. The vast majority of publishers (70%) stated that they have limited communication, indirect communication or no communication with merchants. Many of the publishers complain about the lack of personal attention, irregularity of communication, and other related problems. All the affiliate networks facilitate communication between the publisher and the merchant however. The reason why this communication line is not being used more often is unknown, and we hypothesise that it has to do with human negligence. This is most likely not something that a blockchain solution can solve. It would probably decrease the communication between both parties in fact, because both parties have more information at their disposal due to the blockchain being visible and transparent.

PP4: There is a lack of external monitoring validation; Dale (2003) describes in his Strategic Network Theory how one of the challenges of affiliate marketing is to validate the information received from the networks. This problem would disappear entirely by using a blockchain solution. Because a blockchain is IMMUTABLE (BCO1), the network is unable to modify or delete any information saved in the chain. This automatically results in the removal of the need to validate this data.

PP5: The entry barriers are unknown; Papatla Bhatnagar (2002) stated that there are not clearly defined guidelines for an approval or rejection of a publisher that registers for an affiliate program of a merchant. This leaves publishers frustrated and annoyed with the unknown entry barriers. Using a blockchain solution will not directly impact this process, as it is still a human decision whether the merchant accepts or denies the publisher. One could hypothesise that using smart contracts and clearly defined guidelines could solve this problem, but the variety of reasons that result in a decision by the merchant can never all be captured. For example, there could be history between both parties unknown to the smart contract, or there could be a detailed arrangement involving other elements also unknown to the smart contract. Therefore a blockchain solutions seems unlikely to solve this problem.

PP6: Unable to detect dishonest merchants; The *action* that takes place, and leads to a transaction according to the CPA model, happens on the website of the merchant. The merchant is responsible for notifying the network that this action has occurred. Unfortunately, there is no way to validate for the network and the publisher that this always happens. The only way is to randomly do a test and validate if the merchant notifies the network. A blockchain solutions seems unlikely to have any impact on this process, as the core of the problem lies in the fact that the data is not added to the blockchain. Only if the *action* is easily verifiable (e.g. just a click) could a blockchain solution help.

PP7: Unable to detect invalid tracking code; The same principle applies here as for PP6 as described above. The tracking code lives on the server of the merchant, and both the network and publisher have no access to this code. Therefore the only way to validate if the tracking code works is to randomly do a test. It is not possible for the network and publisher to know for certain that the tracking code is correct all of the time. A blockchain solution would not solve or have a positive impact on this problem.

PP8: Unable to detect invalid transactions attribution; This pain point focuses on the logic of the affiliate network that credits an occurred action to a publisher. This code lives on the server of the affiliate network, that the publisher has no access to, and is unable to validate the logic. What could happen is that a publisher is not credited for a legitimate sale, but instead another publisher. Unless the affiliate network shares the business rules they use for crediting an action to a publisher, this would be impossible for the publisher to detect. Using a blockchain solution can have a positive impact on this problem, because a blockchain is VISIBLE and TRANSPARENT by design (BCO2). What this would mean is that the publisher is able to validate if a transaction is credited to a publisher, and to which publisher. This still does not enable them to validate the business rules of the network, but it does allow them to do random tests and see if the transaction is attributed at all. So a blockchain solution solves part of the problem.

PP9: Unable to detect dishonest affiliate networks; By moving to a blockchain solution to store all the transactional data, detecting dishonest affiliate networks becomes much easier for both the publisher and the merchant. Because the blockchain is VISIBLE, TRANSPARENT (BCO2), and IMMUTABLE (BCO1) by design, both parties will have much more information available to detect fraudulent behaviour from the network (e.g. conversion stealing, invalid tracking attribution).

PP10: Vulnerable to publisher cookie spamming; Cookie spamming is the art of creating lots of tracking cookies on the computer of the visitor, hoping the visitor will buy from one of the affiliate merchants. Fraudulent publishers use this technique to increase the chances of obtaining commission from a sale, essentially stealing this commission from the rightful publisher. Usually the visitor is not even redirected to the page of the merchant, but the cookie is set nevertheless. Therefore the merchant has to pay commission for fraudulent leads. Because the cookies are needed for tracking to work, it is hard to detect fraudulent publishers from non-fraudulent ones. One approach a blockchain solution could offer is requiring the publishers to pay a small fee to add a click to the blockchain. Because MICRO-TRANSACTIONS are EFFICIENT (BCO5), this would not result in any overhead, and would have fraudulent publishers think twice about sending false leads to the website of the merchant.

PP11: Vulnerable to publisher cookie stuffing; The same scenario applies here as for PP10. With cookie stuffing the fraudulent publisher utilizes AdWware to set several tracking cookies on the website of the visitor. By requiring the publisher to pay a small fee to add a click to the blockchain, this would make it harder and more costly for the publisher. However, a blockchain solution will not prevent this problem from occuring.

PP12: Vulnerable to publisher click spamming; In the CPC model (*Cost per Click*) the merchant pays a commission to the publisher for each click (or: visitor) the publisher sents to the website of the merchant. Fraudulent publishers exploit this model by sending illegal clicks, obtaining a commission from the merchant whilst having no impact on the profit for the merchant. It is difficult for a merchant to detect when this happens, and time consuming. When the clicks are registered through a blockchain solution, the VISIBILITY and TRANSPARENCY (BCO2) that come with blockchain helps the merchant to detect these fraudulent publishers, and solve the problem by utilizing smart contracts that can automatically remove these clicks from the commission payments.

PP13: Vulnerable to network conversion stealing; Based on the pain point PP9, there is no way for the publisher and merchant to detect dishonest networks. Because the business rules for crediting an action are unknown, the network could create a publisher account and credit an action to his own account, instead of the rightful publisher. An additional risk for the merchant is that a network could credit a sale to a publisher that should not be credited at all. This would look like a legitimate transaction for the merchant, leaving them unable to detect the invalidity and dishonestly of the network. Unfortunately, because these business rules are executed outside of the blockchain, a blockchain solution would have no impact on this problem.

PP14: Negative impact on the brand; A blockchain solution will have no impact on this problem. Because the publisher has several ways to damage the reputation of a merchant using the internet, and this has nothing to do with what a blockchain is used for (i.e. a way to store transactional data).

PP15: The payments for the publishers are delayed; Publishers often have to wait at least 90 days before they receive their commission, as described in Chapter 3. Using a blockchain in combination with smart contracts, this process can be sped up tremendously. Because a blockchain, and especially smart contracts, are EFFICIENT by design (BCO5), micro-transactions become a valid option. For the traditional affiliate marketing industry this would not be the case, as the overhead from banks would make this process costly. By adding a smart contract to every transaction stored in the blockchain, money could be transferred immediately from the merchant to the publisher in the case of a transaction. The same applies for when a transaction is canceled (e.g. when a product is being returned by the customer), the money could be transferred back to the merchant from the publisher.

PP16: The payment cycle is inefficient; Because the banks have overhead for transferring money from one party to another, the payment cycle in affiliate marketing becomes very inefficient. The money first has to be transferred from the merchant to the network, and the network then spreads the payment from the merchant between the various publishers that receive commission. By using a blockchain solution and smart contracts, the money can be transferred from the merchant to the publisher immediately, resulting in lesser waiting time for the publishers to receive their money, and less costly for the merchant as they do not have to pay the commission fee to the network.

PP17: Unable for the publisher to verify the rejected transactions; Trans-

actions can be marked as rejected by the merchant, for example if the product is being returned by the visitor. This process of returning a product is only known by the merchant, as it happens on his website. Therefore the merchant is the one that can mark a transaction as rejected, and neither the publisher nor the network is able to verify if the transaction was legitimately rejected. Even though the transaction data is stored on the blockchain, verifying whether the product is returned or not is done on the server of the merchant. This means that a blockchain solution will not solve this problem.

PP18: The affiliate network as a single-point-of-failure; Chachra et al. (2015) identified that large affiliate networks are targeted disproportionately more compared to the merchant-run affiliate programs, and that the impact of a system failure within the network disrupts the affiliate programs significantly. This leads to publishers missing out of commission because of the unavailability of the networks. The network acts as a single point of failure within the affiliate industry. Using a blockchain solution to store the transactional data will solve this problem, as a blockchain is DECENTRALIZED by design (BCO4). The risk of the network being compromized is minimized, because blockchain technology greatly increases the difficulty, therefore increasing the security of the system.

PP19: Tracking unavailability; This pain point relates to the previous pain point (PP18), as the network being a vulnerability for the industry. If the network is down, all the tracking information and crediting transactions is lost for that duration. By using a blockchain solution, and the DECENTRALIZATION it yields, this problem can be solved, because it means that in order for the tracking to be unavailable first all the computers in the network need to be offline. The chance of this happening is significantly lower than the chance of just the network going down. Therefore BCO4 will solve the problem that this pain point describes.

Table 5.1 summarizes the information in this chapter. The table matches the pain points listed in chapter 3 against the blockchain opportunities listed in chapter 4. The last row displays the pain points that could not be solved by any blockchain opportunity. As can be seen in the table, there are six pain points that are unsolvable with any blockchain opportunity.

BCO	**Pain Points**
BCO1	PP1; PP2; PP4; PP9; PP12
BCO2	PP8; PP9
BCO3	PP2
BCO4	PP1; PP18; PP19
BCO5	PP10; PP11; PP15; PP16
No BCO found	PP5; PP6; PP7; PP13; PP14; PP17

Table 5.1: Blockchain Opportunities for Affiliate Marketing Pain Points

5.2 Affiliate Marketing Model

Based on the literature study from Chapter 3 a model for affiliate marketing is created. This section is divided in two parts: (i) the iStar 2.0 model; (ii) a Data Flow Diagram.

5.2.1 iStar 2.0 model

First the context will be defined in which the affiliate marketing industry operates. The context is modelled using the iStar 2.0 modelling language (Dalpiaz et al., 2016), and has its data gathered from the literature study and the interviews conducted in previous chapters. The iStar 2.0 modelling language is a goal- and actor-oriented modeling and reasoning framework. It can be used for an early phase of system modelling in order to understand the problem domain, provides the possibility to achieve information in an early phase of the software engineering process, and provides an early understanding of the organizational relationships in a business domain. It allows requirement engineers to see the connection between the functional requirements of the intended system and the organizational goals in the organization modelling. The model will illustrate how the different parties interact with each other in the current affiliate marketing model.

The model consists of four stakeholders, as defined by Messer (2006) that each play their own role in the affiliate marketing cyclus. The stakeholders are: (i) the merchant; (ii) the publisher; (iii) the network; (iv) the customer. Each stakeholder has their own goals and are therefore modelled as Actors.

The customer; The customer is defined as a *Role*, as it represents an abstract characterization of the behaviour of a customer within the context of affiliate marketing. It is the stakeholder that performs the action. The only goal for the customer within the affiliate marketing model that is relevant, is the goal to perform an action (Duffy, 2005). This action can be defined as e.g. buying a product, or subscribing to a newsletter, or registering as a new user, etc. The customer performs this action on the website of the merchant, and is redirected to this website coming from the website of the publisher (Cudmore et al., 2009).

The publisher; The publisher is defined as an *Agent*, as it is an organization with concrete, physical manifestations. It is the stakeholder that uses a website to promote actions that the customer can perform on the website of the merchant. The publisher receives a list of actions from the network, that includes tracking links to track the customers. The goals of the publisher are as following:

- Receive the commission fee from the network (Edelman & Brandi, 2015).
- Provide quality content to the customer (Messer, 2006).
- Sign up to the network (Papatla & Bhatnagar, 2002).
- Sign up for an Affiliate Program (Papatla & Bhatnagar, 2002).
- Import tracking links from the network (Edelman & Brandi, 2015).

The merchant; The merchant is defined as an *Agent*, as it is an organization with concrete, physical manifestations. It is the stakeholder that sells the action performed by the customer. The goals of the merchant are as following:

- Display the details of the action (Stokes, 2011).
- Allow the customer to perform the action (Stokes, 2011).

- Approve/reject publishers (Papatla & Bhatnagar, 2002).
- Approve/reject performed actions (Walker et al., 2010).
- Share a list of available affiliate actions (e.g. products) with the network (Walker et al., 2010;Edelman & Brandi, 2015).
- Pay the commission fee to the network (Edelman & Brandi, 2015).

The network; The network is defined as an *Actor*. It is the stakeholder that connects the publisher and the merchant. The goals of the network are as following:

- Connect publishers with merchants (Walker et al., 2010).
- Provide publishers with tracking links from the merchants (Walker et al., 2010).
- Collect and send commission fees (Edelman & Brandi, 2015).
- Provide performance metrics for both the publisher and the merchant (Fox & Wareham (2007).

The iStar 2.0 model offers social relationships in the form of *Dependencies*. A dependency links a *depender* (the actor that depends for something) with a *dependee* (the actor that provides something), through a *dependum* (an intentional element that is the object of the dependency). The affiliate marketing model has the following dependencies:

- The customer depends on the publisher for content that promotes products of the merchant (Stokes, 2011). The *dependum* is the content provided by the publisher that has tracking links associated with it.
- The customer depends on the merchant for the details of the action (Stokes, 2011). The *dependum* is the details provided by the merchant that has instructions on how to perform the action (e.g. buy the product).
- The customer depends on the merchant for the opportunity to perform the action (Stokes, 2011).
- The publisher depends on the network for the opportunity to sign up (Papatla & Bhatnagar, 2002). The *dependum* is the publisher filling in the sign up form.
- The publisher depends on the network for the possibility to sign up for an Affiliate Program from the merchant (Papatla & Bhatnagar, 2002). The *dependum* is the sign up form that the network provides.
- The merchant depends on the network for the opportunity to accept or deny publisher requests (Papatla & Bhatnagar, 2002). The *dependum* is the details of the sign up request.
- The network depends on the merchant to pay the commission fees (Edelman & Brandi, 2015). The *dependum* is the invoice that the network sends.
- The publisher depends on the network to pay the commission fees (Edelman & Brandi, 2015). The *dependum* is the invoice that the network sends.

- The network depends on the merchant for a list of available actions (e.g. products) to convert to tracking links (Walker et al., 2010). The *dependum* is a list of available actions.
- The publisher depends on the network for the tracking links that the publisher uses to send customers to the website of the merchant (Walker et al., 2010). The *dependum* is the tracking links.

Figure 5.1 displays the iStar 2.0 model as described above. It contains the four stakeholders including their goals, tasks, resources and dependencies with other stakeholders. The four stakeholders (the customer, the merchant, the publisher, the network) are modeled as *actors*. The dependencies between them are visualized with the lines containing the "D", and the nature of the dependency is visualized by the direction of the line.

Element	Symbol	Description
Actor		Actors are active, autonomous entities that aim at achieving their goals by exercising their know-how, in collaboration with other actors.
Role		Abstract characterization of the behavior of a social actor within some specialized context or domain of endeavor. Its characteristics are easily transferable to other social actors.
Agent		Actor with concrete, physical manifestations, such as a human individual, an organization, or a department.
Is-a link		The is-a association represents a generalization, with an actor being a specialized case of another actor.
Participates-in link		Represents any kind of association, other than generalization / specialization, between two actors. No restriction exists on the type of actors linked by this association.
Goal		Represents a state of affairs that the actor wants to achieve and that has clear-cut criteria of achievement. The specifics of how the goal is to be satisfied is not described by the goal.
Resource		The actor desires the provision of some entity, physical or informational. This type of elements assumes there are no open issues or questions concerning how the entity will be achieved.
Task		The actor wants to accomplish some specific task, performed in a particular way. A description of the specifics of the task may be described by decomposing the task into further sub-elements.
Dependencies		Dependencies represent social relationships in iStar 2.0 between two actors, where one actor depends on another actor.
And refinement		The AND refinement is a relationship relating one parent to one or more children. An intentional element can be the parent in at most one refinement relationship.

Table 5.2: iStar 2.0 legenda (Dalpiaz et al., 2016)

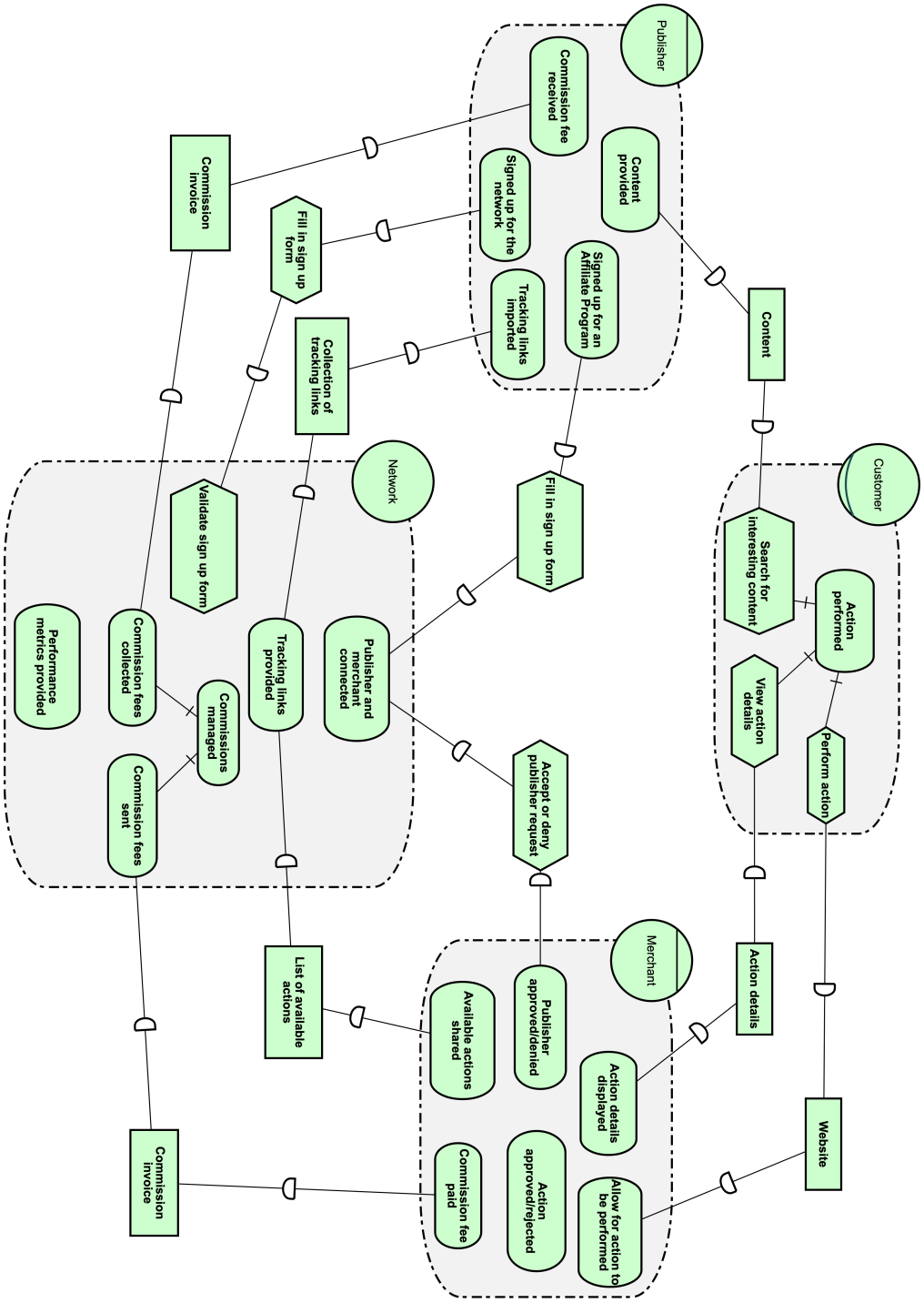

Figure 5.1: iStar 2.0 Model of Affiliate Marketing

5.2.2 Data Flow Diagram

The iStar 2.0 model has defined the context in which the affiliate marketing industry operates. It defines the four main stakeholders that operate in the industry, their goals and tasks, and their relationships with each other marked as dependencies. To dive in deeper on how the main stakeholders interact with each other, we look at the information flow of the model. The ultimate purpose of virtually any computer system is to manipulate information in some shape or form, and to share this information with other parties. Modelling the information flow of the system aids in: (i) describing the boundaries of the system; (ii) gives a detailed representation of system components; (iii) creating system knowledge; (iv) provide a high level system overview with boundaries and connections. To map the flow of information for this process a Data Flow Diagram (DFD) is created. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. It provides information about the outputs and inputs of each entity and the process itself. It has no control flow, and there are no decision rules or loops (Störrle, 2005). The following components are used for the DFD: (i) an external entity, a person, department, outside organization, or other information system that provides data to the system or receives outputs from the system; (ii) a process, any process that changes the data, producing an output; (iii) a data flow, the route that data takes between the external entities, processes and data stores; (iv) a data store, files or repositories that hold information for later use, such as a database table or a membership form. To create the DFD we use the stakeholders from the iStar 2.0 model as described previously as the external entities.

Figure 4.2 below displays the DFD with the following processes: *register click*; *perform action*; *credit publisher*; *send action list*; *share affiliate program*; *approve transaction.*

Register click; The customer clicks on a tracking link and the information is saved by the network (Stokes, 2011).

Perform action; The customer performs an action. At this point the traditional e-commerce flow starts as an order is placed on the website of the merchant. Additionally, the action information is send to the affiliate network (Duffy, 2005).

Credit publisher; When an action is performed by the customer, the network credits the action to a publisher. Both the publisher and the merchant will be notified (Edelman & Brandi, 2015).

Send action list; The merchant sends a list of actions to the network for the affiliate program (Walker et al., 2010).

Share Affiliate Program; The networks sends a list of actions to the publisher to promote (Walker et al., 2010).

Approve transaction; The merchant approves or rejects an action and sends the information to the network (Walker et al., 2010).

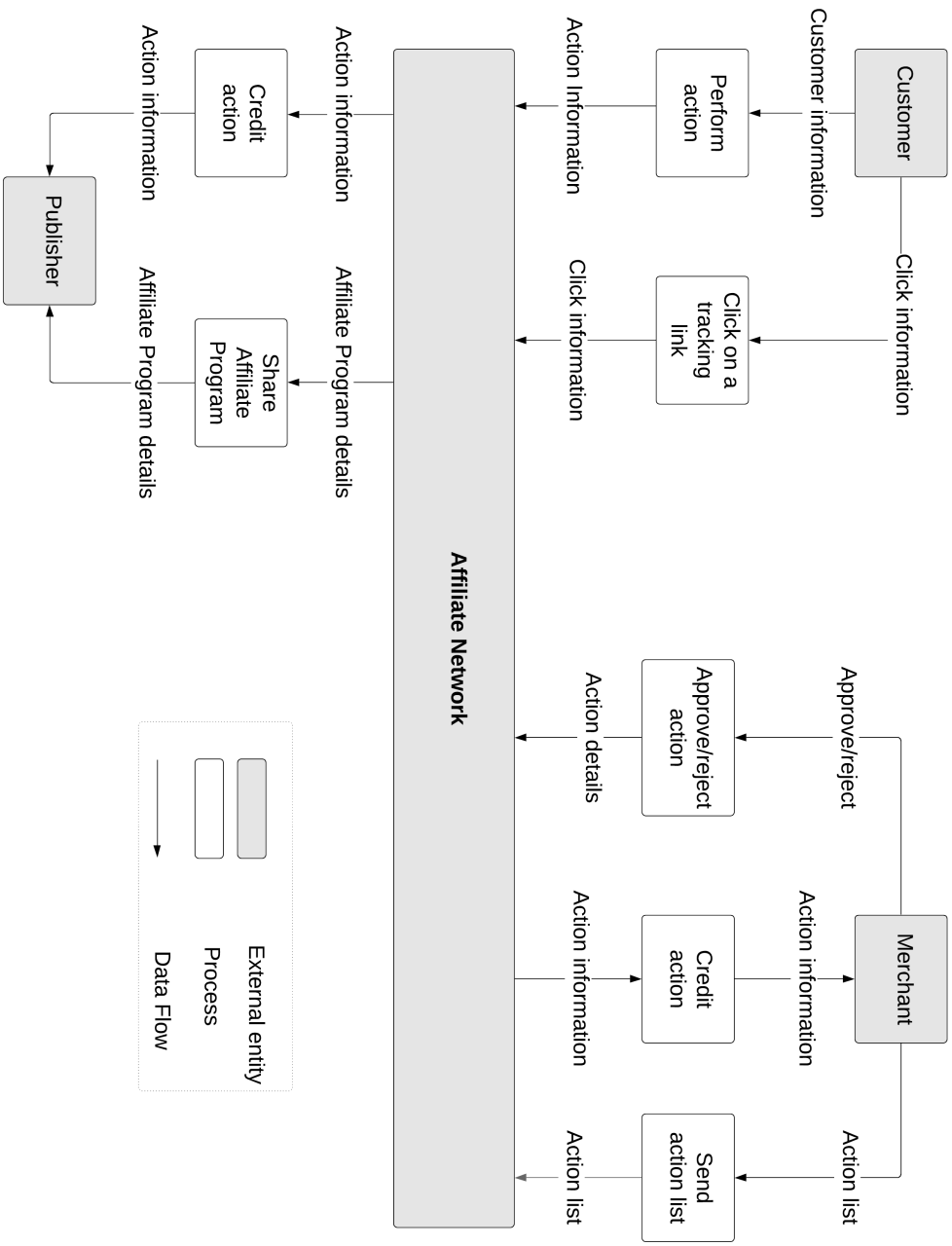

Figure 5.2: Data Flow Diagram Affiliate Marketing

Chapter 6

System Blueprint

The previous chapter describes what the opportunities for a blockchain based solution are, applied on the affiliate marketing industry. This chapter describes the proposed blockchain solution that solves some of the Pain Points as described in Chapter 3. Looking at both the iStar 2.0 model and the Data Flow Diagram there is a significant dependency from both the publisher and the merchant towards the network. All the data flows through the network, and is modified and visualized as they please. These models confirm some of the pain points found in the literature as described in chapter 3. The blockchain solution model for affiliate marketing will need to have at least all of the functionalities that the current model has, and add functionalities to solve the pain points that benefit from a blockchain based solution as described in chapter 6. In order to create a blockchain based model for affiliate marketing, the required features need to be described in a structured manner. To do this a list of user stories is forged. Based on these user stories the blockchain solution model is created using the Functional Architecture Model (Brinkkemper Pachidi, 2010). Afterwards the limitations of such a solution are discussed.

To design the new blockchain based affiliate marketing platform, the Functional Viewpoint as described in the viewpoint catalog by Rozanski & Woods (2011) is used. The functional view of a system defines the architectural elements that deliver the functionality of the system. The view documents the system's functional structure, including the key functional elements, their responsibilities, the interfaces they expose, and the interactions between them. Taken together, this demonstrates how the system will perform with the functions required of it. It describes the runtime functional elements and their responsibilities, interfaces, and primary interactions of the system. Each subsection follows a similar format, and the views contain at least the following parts:

- **Purpose and relation to other views;** describes what the motivation is for the included view and how it relates to other views in the document.
- **Description;** explains how the elements in the view are related, how the model is to be interpreted and includes details that cannot be conveyed through the modelling notation.
- **Elements;** catalogues the elements in the view, describes them and relates them to the user stories in the previous chapter.

6.1 User Stories

To create the user stories for the blockchain system the guidelines for high-quality user stories are followed (Lucassen et al., 2015). User stories are a good way to capture the requirements of a system in a well-formed and explicit manner. The user stories are based on (i) the literature review about affiliate marketing in section 3.1; (ii) the literature review about blockchain technology in section 3.2; (iii) the interview findings in section 4.1; (iv) the blockchain opportunities in section 4.2; (v) the current model defined in section 4.3. It focuses on the needs of the following stakeholders: (i) the customer; (ii) the publisher; (iii) the merchant. No user stories are formulated for the network, as the network has the same goals and serves the same purpose as the proposed blockchain solution, therefore the network could potentially be replaced by the proposed blockchain solution, or be the actor that implements it. Table 5.1, 5.2 and 5.3 contain all the formulated user stories, grouped by stakeholder. Each user story is given a unique alphanumeric identifier (ID), where numbers refer to an arbitrary ordering and alphabetic characters refer to the user story. Each table contains a Reference column which links the user story to either a pain point, the iStar 2.0 model or the data flow diagram.

ID	Description	Reference
US1	As a **customer** I want to perform an action without problems so that I am not troubled by the affiliate marketing process.	iStar 2.0

Table 6.1: User stories for the customer.

ID	Description	Reference
US2	As a **publisher** I want to view a list of available affiliate programs so that I can sign up.	iStar 2.0
US3	As a **publisher** I want to sign up for a merchant affiliate program so that I can start sending traffic.	iStar 2.0
US4	As a **publisher** I want to import all available tracking links so that I can redirect my visitors.	iStar 2.0
US5	As a **publisher** I want to receive my commission fee straight after the cancellation period so that I can pay my bills.	PP15; PP16
US6	As a **publisher** I want to see how many clicks I have generated for a merchant so that I can adapt my promotion tool.	PP1; PP2; PP4
US7	As a **publisher** I want to see how many sales I have generated for a merchant so that I can adapt my promotion tool.	PP1; PP2; PP4
US8	As a **publisher** I want to be able to validate the generated clicks so that I can trust the merchant.	PP1; PP2; PP4
US9	As a **publisher** I want to be able to validate the generated sales so that I can trust the merchant.	PP1; PP2; PP4
US10	As a **publisher** I want to see the same transactional data as the merchant so that I can trust the merchant.	iStar 2.0; PP2
US11	As a **publisher** I want to monitor my performance data so that I can adapt my promotion tool.	iStar 2.0; PP4
US12	As a **publisher** I want to create custom tracking links so that I can redirect my visitors.	iStar 2.0
US13	As a **publisher** I want to know how a sale is credited so that I can trust the merchant.	PP1; PP2; PP8; PP13
US14	As a **publisher** I want to know when a transaction is rejected so that I can adjust my promotion tool.	PP17

US15	As a **publisher** I want to know why a transaction is rejected so that I can trust the merchant.	PP17
US16	As a **publisher** I want to generate statistical reports so that I can improve my promotion methods.	iStar 2.0
US17	As a **publisher** I want to view my performance metrics in a transparent manner so that I can improve my promotion methods.	PP1; PP2
US18	As a **publisher** I want to know why am I being rejected for an affiliate program so that I can improve my promotion tool.	PP5
US19	As a **publisher** I want to know the terms and conditions when signing up for an affiliate program so that I can adjust my promotion tool.	iStar 2.0; PP5
US20	As a **publisher** I want to know when I am being paid so that I can make a financial estimate.	PP15; PP16
US21	As a **publisher** I want to know how much I am being paid so that I can make a financial estimate.	PP15; PP16
US22	As a **publisher** I want to be able to trace a sale back to a click date so that I can adjust my promotion tool.	PP1; PP2

Table 6.2: User stories for the publisher.

ID	Description	Reference
US23	As a **merchant** I want to approve or deny incoming publisher requests so that I can choose the publishers I want to work with.	iStar 2.0; DFD
US24	As a **merchant** I want to create a new affiliate program so that I can increase my traffic.	iStar 2.0; DFD
US25	As a **merchant** I want to share my available products in my affiliate program so that I can sell more.	iStar 2.0; DFD
US26	As a **merchant** I want to be able to cancel transactions so that I do not have to pay a commission fee.	iStar 2.0; DFD
US27	As a **merchant** I want to be able to remove publishers from my affiliate program so that I can choose the publishers I want to work with.	iStar 2.0; DFD
US28	As a **merchant** I want traffic from bots blocked so that I do not have to pay for fraudulent leads.	iStar 2.0; PP11; PP12
US29	As a **merchant** I want to monitor the performance from my publishers so that I can increase my traffic.	iStar 2.0; PP1; PP2
US30	As a **merchant** I want to validate the generated clicks so that I can trust the publisher.	PP2; PP4
US31	As a **merchant** I want to validate the generated sales so that I can trust the publisher.	PP2; PP4
US32	As a **merchant** I want to know how much commission I need to pay so that I can make a financial estimate.	PP16
US33	As a **merchant** I want to know how much commission I have paid at any given date range so that I can make a financial estimate.	PP16
US34	As a **merchant** I want to be able to create performance reports for any given date range so that I can improve my webshop.	iStar 2.0

Table 6.3: User stories for the merchant.

6.2 System scope

Purpose and relation to other views; Before detailing the system features, first the scope of the system is defined. *Scoping* is a key process in the *software product line* - i.e., the possible software products of a system. It draws the boundary between which system functionalities are included and excluded, in such a way that the product line is profitable. While the scope may be fuzzy at first, it is refined as domain understanding increases and the actual product is developed. Especially in defining a software architecture, the scope defines the structure and variability of products in the software product line (Clements, 2001).

Feature models declaratively specify a coherent set of features — of which multiple combinations may exist — that describe a system's software product line (Batory, 2005). *Feature diagrams* (FD) are graphical specifications of a feature model (Kang et al., 1990), which decompose features into more explicitly specified subfeatures in a tree structure (Batory, 2005). The root node represents the software system, while the features may be (i) concrete, (ii) abstract or (iii) simply an organizational notion to group other features (Czarnecki et al., 2004). Using the feature diagram, the features of the system within the scope are established. In doing so, the optionality of features are defined, and how optional and mandatory features can be combined to create the set of software products offered from the system.

Features diagrams are shown using the notations detailed in Batory (2005). Here, features are represented with boxes. The root node describes the main feature, which can be decomposed into multiple subfeatures. Each of these subfeatures can recursively decomposed into subfeatures. Decomposition relationships are signified by lines between the compound (parent) and its subfeatures (children). Relationships are required to have exactly one of the graphical notations, beyond lines, as are categorized in the table below.

Description; First, affiliate programs can be managed by the system. The system should allow for creating and maintaining programs, and sharing products through the program for publishers. Publishers can sign-up for a program, and be accepted or rejected by the merchant. Each transaction is linked to a publisher and a merchant. If the transaction is canceled on the website of the merchant, the transaction should be canceled in the system as well. General system functions that are not user-specific are grouped under feature *system usage*. These include managing accounts and logging in and out of the system. Both the publisher and the merchant should have access to the payments. They are able to create an overview of the payments and use different kind of date ranges to allow for different overviews. They should be able to export the overviews. Lastly, a feature for both the publisher and the merchant include generating reports. These reports can be exported, and generated for both transactions and leads.

Elements; the table below describes the features in the feature diagram, with the corresponding mapping to the user stories.

ID	Feature	Description	User Stories
F1	**Affiliate Programs**		
F1-1	Manage programs	Merchants can manage their affiliate programs. Sub features include *creating and editing programs* and *sharing products.*	US2; US3; US4; US23; US24; US25; US27
F1-2	Manage publishers	Merchants can manage the publishers that want to sign-up to their affiliate program.	US2; US3; US4; US23; US24; US25; US27
F2	**Transactions**		
F2-1	Cancel transactions	Merchants are able to cancel transactions.	US14; US15; US26
F3	**System usage**		
F3-1	Login/logout	The account is accessed via means of a login. When logged in, the account can be logged out of.	US2; US3
F3-2	Account management	Merchants and publishers can manage their account through the system.	US2; US3
F4	**Payments**		
F4-1	Overview	A payments overview can be generated with a specific date range.	US20; US21; US22; US32; US33
F4-2	Export	The generated payments overview can be exported.	US20; US21; US22; US32; US33
F5	**Reports**		
F5-1	Transactions overview	Reports can be generated for the transactions on a specific date range. These reports can be exported.	US7; US9; US10; US11; US16; US17; US29; US31
F5-2	Leads overview	Reports can be generated for the leads on a specific date range. These reports can be exported.	US6; US8; US10; US11; US16; US17; US22; US29; US30

Table 6.4: Feature diagram elements with description.

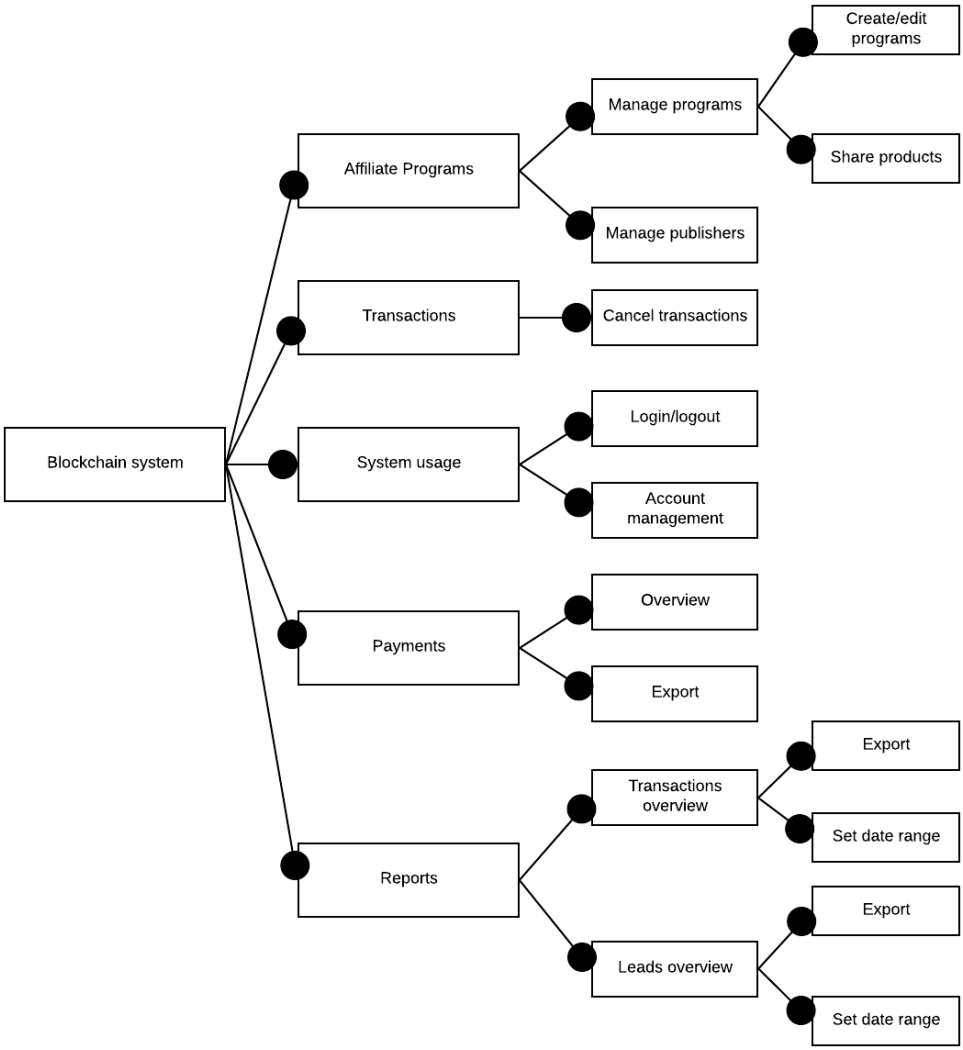

Figure 6.1: Feature diagram of the blockchain system

6.3 End-user interaction

Purpose and relation to other views; While the previous view describes the functionalities within scope of the system, it does not map these functionalities to their corresponding end-users and other systems. *Use case diagrams* are behavior diagrams that describe a set of *use cases* (actions) that the system can perform in collaboration with the *actors* (end-users and other systems) of the system (Object Management Group,

2015). While other views may focus on the internals of these actions, the use case diagram serves the purpose of showing *who* (i.e., which actor) can perform which action.

A UML Case diagram is a means to capture *use cases* - i.e., a list of interactions that define the requirements of a system (Rouse, 2007) - and the *actors* (end-users and other systems) to which these use cases apply. The one or more actors (represented by figures) are linked to the corresponding use case (represented by a horizontal ellipse) with a line. Actors may be involved in one or more use cases. Optionally, the line linking them may have source and target *cardinalities*. In addition, the *includes* and *extends* directed relationships can be used to denote a relationship between use cases. The includes relationship indicates that the tail use case is part of the head use case; which may be useful for re-using use cases by including them in multiple use cases. The extends relationship represents a use case being an extension of another use case. It is used when one use case uses all behavior of another use case, but additional behavior (possibly conditional) is added (Object Management Group, 2015).

Description; On the publisher end of the story, the publisher can view all the available affiliate programs (created by the merchants), sign up for those programs, import the tracking links that belong to the programs, view the performance metrics of their publisher account, and view the payments they have received. On the merchant end of the story, the merchant can create new affiliate programs, accept publishers for these affiliate programs, reject transactions that are credited to publishers, validate the credited transactions, and view the payments that are created by the system.

Elements; the table below shows the actors in the end-user interaction view, the use cases and the corresponding use cases.

ID	Use case	Description	User Stories
UC1	view available programs	The publisher can view all available affiliate programs	US2
UC2	sign up for programs	The publisher can sign up for any affiliate program	US3
UC3	view performance metrics	Both the publisher and the merchant can view the performance metrics for their programs	US6; US7; US10; US11; US17
UC4	generate reports	Both the publisher and the merchant can generate reports for their programs	US8; US9; US16; US29; US34
UC5	export reports	Both the publisher and the merchant can export reports for their programs	US29; US30; US31; US34
UC6	view rejected transactions	The publisher and the merchant can view their rejected transactions	US15; US18
UC7	import trackinglinks	The publisher can import the tracking links for his active programs	US4
UC8	create program	The merchant can create a new affiliate program	US24; US26;
UC9	accept publishers	The merchant can accept publishers that sign up for the affiliate programs	US23; US27;

UC10 view payments	The publisher can view the payments that the system has made for them	USUS5; US20; US21; US22; US32; US33;
UC11 reject transactions	The merchant can reject transactions that are credited to publishers	US13; US14; US15; US26
UC12 validate transactions	The merchant can validate the transactions that are credited to publishers	US6; US7; US8; US9; US10; US15
UC13 view payments	The merchant can view their payments that are created by the system	USUS5; US20; US21; US22; US32; US33;

Table 6.5: Use cases in the use case diagram.

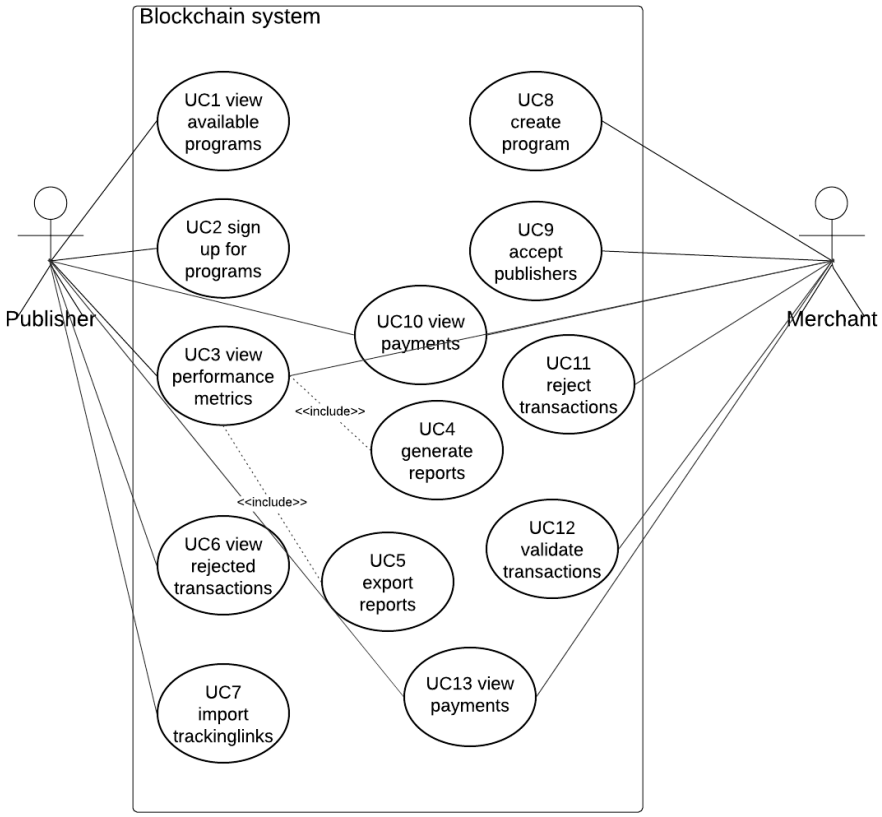

Figure 6.2: Use case diagram of the blockchain system

6.4 Functional Architecture Model

To fully describe the system functionalities, their underlying processes and the concurrency involved we utilize the Functional Architecture Model (FAM) with corresponding process overlays (Brinkkemper & Pachidi, 2010). Instead of using a single view, we present multiple views by hierarchically decomposing the modules within the overview model. After detailing the overview, the subsequent sections detail a selection of submodules.

6.4.1 Functional Overview

Purpose and relation to other views; The proposed platform has seven different modules, as can be seen in figure 5.1: *Tracking management, Affiliate Programs, Leads, Transactions, Performance Reports, Payments, Fraud Prevention.* These are portrayed by the white boxes within the platform scope. Beyond the system boundary - i.e. in the system context - are the two external parties, the publisher and the merchant, that are going to work with the platform. They are highlighted in green.

Description; The blueprint starts with an overview of the entire blockchain system, as can be seen in figure 6.3. The system has seven modules: *Tracking Management, Affiliate Programs, Payments, Transactions, Leads, Performance, Fraud Prevention.* These are portrayed by the white boxes within the product scope. Beyond the system boundary - i.e. the system context - are the two external parties, the publisher and the merchant, highlighted in green.

Elements; the table below shows an overview of the modules within system scope, with a unique identifier and description. For traceability purposes a column called User Stories holds the user stories that this module is linked to.

ID	Module	Description	User Stories
M1	Affiliate Programs	Holds the contracts between the publisher and the merchant	US2; US3; US18; US19; US23; US24; US25; US27
M2	Tracking Management	Enables the publisher to download promotion material and create tracking links	US4; US12; US25; US27
M3	Leads	When a publisher generates a new lead/click, this module converts and stores the information	US6; US8; US30
M4	Transactions	When a lead converts to a transaction, this module converts and stores the information	US5; US7; US9; US13; US14; US15; US26; US31
M5	Payments	Handles the payment process between the merchant and the publisher	US5; US20; US21; US22; US32; US33
M6	Performance	Module that displays performance metrics and generates reports for both the publisher and the merchant	US6; US7; US8; US9; US10; US11; US14; US16; US17; US29; US34

M7	Fraud Prevention	Checks and validates the generated leads by the publisher	US8; US9; US28

Table 6.6: FAM modules with description.

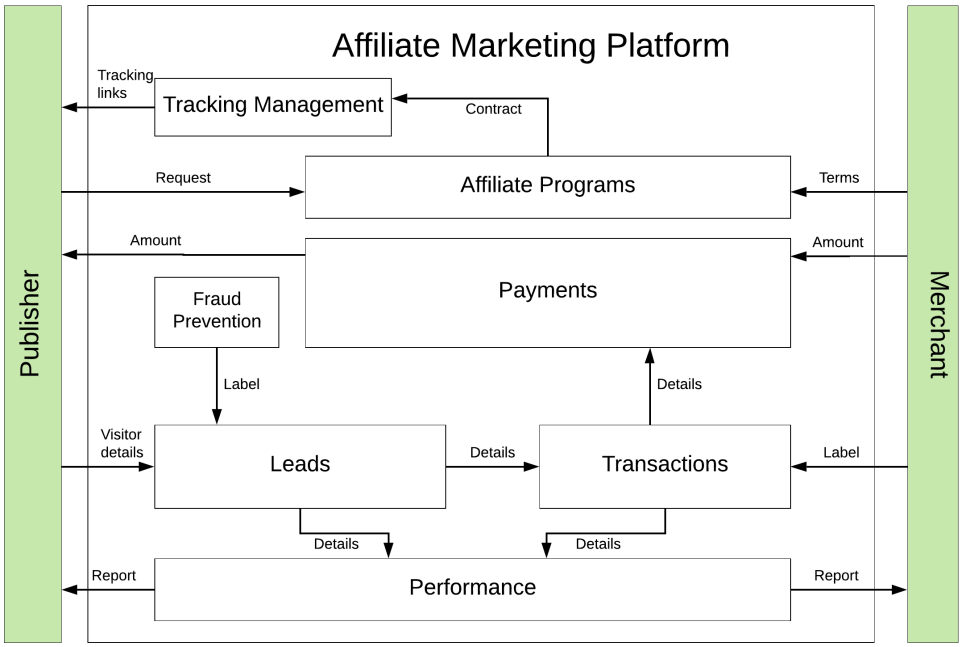

Figure 6.3: Functional Architecture Model

6.4.2 Transactions Module

Purpose and relation to other views; The analysis in chapter 5.1 has demonstrated that blockchain has the potential to solve problems in the affiliate marketing industry related to the validation of transactions. The blockhain characteristics IMMUTABILITY and VISIBILITY & TRANSPARENCY are key. By storing transactions on a blockchain, transparency between the publisher and the merchant increases. The figure below refines the transactions module. In doing so, a more detailed overview of the functionalities of this part of the system is provided. The modules in the context of this module are equal to all modules interacting with transactions as defined in the Functional Architecture Model.

Description; The module has a *blockchain* component that stores all the transactional data. It obtains the data from the *Leads* module, and the *Publisher Matching* component, that matches a transaction with a lead and a publisher. The *Transaction Validation*

component validates the transactions and allows for the merchant to approve and/or reject the transactions. The blockchain data is shared with both the *Performance* module and the *Payments* module. The *API* component allows for the blockchain data to be shared with other parties.

Elements; the table below describes the components in the transactions module and their accompanying user stories.

ID	Module	Description	User Stories
T1	Publisher Matching	Matches the incoming transactions and leads to a publisher	US2; US3; US4;
T2	Blockchain	Holds the transactional data in a blockchain	US6; US7; US9; US10; US30; US31
T3	Transaction Validation	Validates and approves/rejects the created transactions	US9; US13; US14; US15; US26
T4	API	Shares the blockchain data with other parties	US6; US7; US8; US9; US16; US17; US29

Table 6.7: Transaction module components with description.

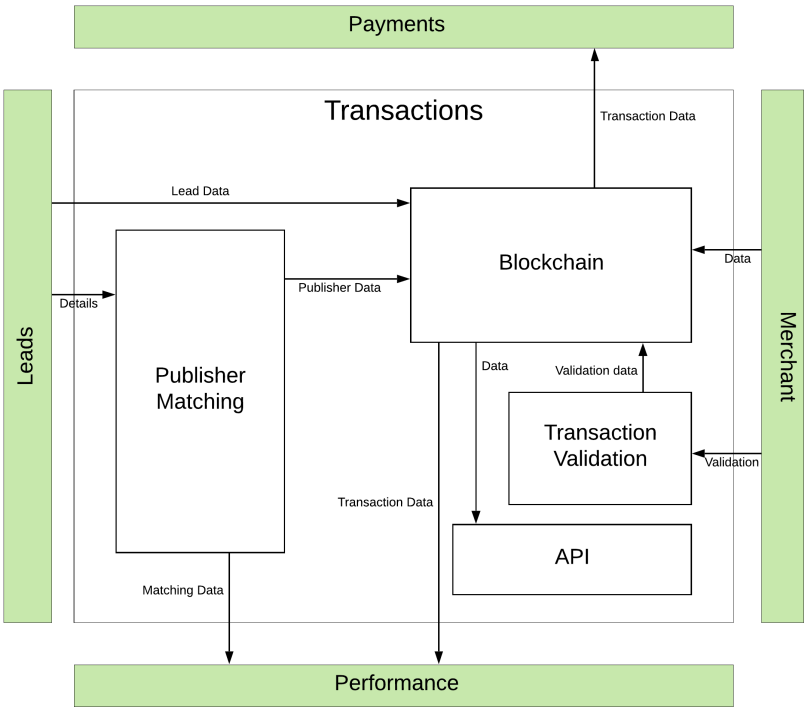

Figure 6.4: Transactions Module

6.4.3 Payments Module

Purpose and relation to other views; The Payments module holds the smart contracts that can be executed when a merchant approves or rejects a transaction. It solves some of the pain points as described in chapter 5.1 with the blockchain characteristic EFFICIENCY. By storing transactions on a blockchain, smart contracts can be used to handle the affiliate payments, and make the process more efficient (Bhargavan et al., 2016). Smart contracts are basically self-executing contracts which areprogrammed in a way to ensure that the terms of agreements are met/unmet and then take aresulting action (Buterin, 2014). These smart contracts live on the server, and are executed straight away in the most efficient manner. The figure below refines the Payments module, and holds the connections between the other modules as defined in the FAM.

Description; The module has a *Payment Providers* and *Balance* component that holds the payment information from both the publisher and the merchant, and their balances that they want to spend on the contracts. The *Smart Contracts* module hold the contracts that is connected to the blockchain in the *Transactions* module. The contracts are executed as soon as a transaction has taken place, and when the transaction is validated. The smart contracts are connected with the payment providers so that the process is transparent and that there is no need for a third party to manage the payments.

Elements; the table below describes the components in the payments module.

ID	Module	Description
P1	Payment Providers	Holds the payment information from both the publisher and the merchant
P2	Balance	Holds the balance
P3	Smart Contracts	Contracts that execute when a transaction has taken place and is validated

Table 6.8: Payments module components with description.

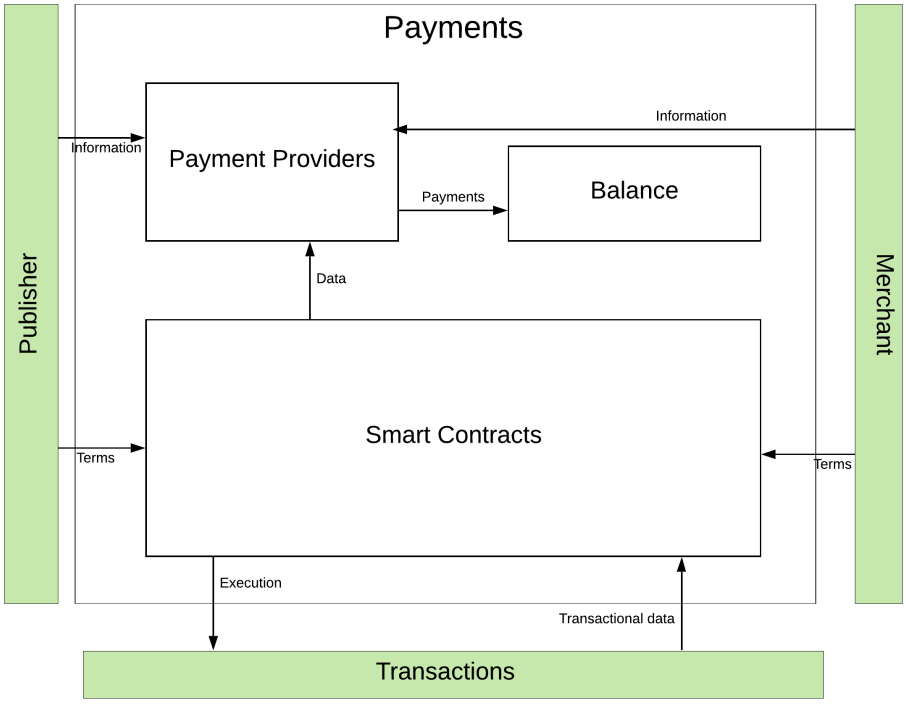

Figure 6.5: Payments Module

6.5 Limitations of the Proposed System

This chapter describes how the proposed blockchain solution looks like. Because organisations are demonstrating increasing interest in blockchain technology due to the promise of significant business benefits, affiliate marketing has the potential to benefit from the described system (Lacity, 2018). Chapter 3.2 has explored the opportunities that blockchain has to improve the affiliate marketing industry. These opportunities are: (i) Immutability; (ii) Visibility & Transparency; (iii) Trust; (iv) Availability & Security; (v) Efficiency. Chapter 3.1 describes the pain points that the affiliate marketing industry has, and chapter 4 has validated these pain points with expert interviews. Chapter 5.1 has connected the pain points and the blockchain opportunities, revealing which pain points can be improved upon. Combined with the system blueprint, described in this chapter, it gives a thorough overview of the potential impact that a blockchain based system could have on the affiliate marketing industry.

Chapter 5.1 also demonstrates the limitations that the system has. Not all of the pain points will be solved by using a blockchain based system, therefore these pain points will remain persistent. With six out of the nineteen pain points unsolved, this is a serious

limitation of the proposed system. The pain points that remain unsolved are **PP5; PP6; PP7; PP14; PP17** (PP13 is removed as it is not acknowledged as a valid pain points by the experts). Taking a closer look at the pain points we can conclude that they are related to human execution (i.e. a negative impact on the brand can not be improved by blockchain). Papatla Bhatnagar (2002) stated that there are no clear guidelines for affiliate marketing, therefore it will be hard for blockchain to have a real impact. Smart contracts require a clear set of defined rules to function, and some processes within affiliate marketing do not have these rules. It seems unlikely that these limitations can be addressed with any technological based system, and could better be solved by using regulated contracts between the publishers and the merchants.

Since the proposed system uses blockchain technology to store the transactional data, there are, besides several advantages, also limitations involved. Blockchain technology has the potential to offer a number of distinct benefits when compared to the traditional affiliate marketing model, but the technology exhibits a number of limitations that need to be factored in (Beck et al., 2016; Gomber et al., 2018). Aspects of the literature have identified the following limitations (Hughes et al., 2019): (i) *lack of privacy*; (ii) *high costs*; (iii) *security model*; (iv) *flexibility limitations*; (v) *latency*; (vi) *governance*. The above list of limitations outlines some of the specific technical challenges and unintended consequences that may limit the development and commercial adoption of blockchain technology. As blockchain technology is relatively recent, organisations have yet to fully tackle these key obstacles and could pose significant threats to the wider acceptance of the technology (Böhme et al., 2015).

Lack of privacy; Each node in the network maintains the complete history of the networks transaction data. This maybe an attribute for specific applications and an advantage in a security context, but a limitation for use cases where privacy is a necessity (Axios, 2018). This could potentially be a limitation for the system, as the privacy of the publisher and the merchant is not guaranteed. Therefore publishers could figure out the performance of other publishers, and the same for merchants.

High costs; The underlying processing of the blockchain where all the transaction history is replicated across all nodes, is computationally expensive. This attribute has security advantages but can be a limitation for larger networks (Böhme et al., 2019). While this could become a serious limitation, as the transactional data from different merchants has to be stored on the blockchain, the security advantage is equally impactful. This is a trade-off that depends on the amount of publishers and merchants that want to work together through the blockchain system.

Security model; Blockchains use public key encryption for transaction authentication and execution. This process although very se- cure, requires the use of a public and a private key. If in the event that a party loses or unwittingly publishes their private key, the system has no safety mechanism to provide additional security (Axios, 2018). This is a serious limitation, as there is no third party that can recover passwords for both the merchant and the publisher. This means that if they lose their authentication keys, there is no way for them to regain their commissions.

Flexibility limitations; The immutable append only characteristics of blockchain ensures the integrity of transactions are assured, but can act as a barrier to use cases that require changes to transactions (Coyne McMickle, 2017). In theory this is a great characteric of blockchain (IMMUTABILITY), but could potentially be troublesome in practice. Because there is no way for the merchant to undo transactions, i.e. if something goes wrong on his website and transactions are wrongly credited to publishers.

Latency; The principle of all nodes within the blockchain network storing the complete transaction record of all information blocks ensures the networks security credentials, however, the addition of new blocks and subsequent transaction records is at present computationally expensive (Beck, 2016). This is a trade-off between the merchants and the publishers that decide to use the system. The computational power required depends on how many publishers and merchants are active in the network, and how many sales they generate.

Governance; The distributed nature of the blockchain architecture offers distinct advantages for specific use cases but can be a significant limitation for overall control and governance by oversight based organisations (Drescher, 2017). Using a blockchain system means that the impact of the affiliate network is negligible and could be removed. However, this also removes the control they have over the account of the publisher and the merchant, meaning that they can always fix it if something goes wrong.

This section demonstrates that whilst a blockchain based system several advantages over the traditional systems that are out there and has the potential for delivering significant change, it also suffers from severe limitations. Blockchain is still a relatively immature concept and studies have indicated that there is a significant dilemma to organisations looking at the technology to understand the impact on their existing processes.

6.6 Adoption

Creating a blockchain system for affiliate marketing alone is not enough, it needs to be introduced in a way that supports adoption by the stakeholders of the industry. Adoption can be defined as: *the choice to acquire and use a new innovation.* Rogers (1983) defines innovation adoption as: *a customer's decision to make full use of an innovation.* Fishbein & Ajzen (1975) explain behavioral intention as *a person's subjective probability that he will perform some behavior.* Davis (1989) developed the Technology Acceptance Modal (TAM), that predicts how humans accept and utilize information systems on an organizational level. The model has been validated thoroughly through empirical tests and explains around 40 percent of the variance in intention of usage and actual usage. TAM suggests that perceived usefulness (PU) and perceived ease of use (PEOU) are two primary determinants in explaining individual users' adoption intentions. Davis (1989) defines perceived usefulness as: *the degree to which a person believes that using a particular system would enhance his or her job performance.* It explains the attitude and intention of usage in the TAM model. Perceived ease of use is defined as: *the degree to which a person believes that using a particular system would be free of effort.* Even though the information system is perceived usefull for the user, it could be perceived as impossible or difficult to use.

The most well-known theory about technical innovation is the Innovation Diffusion Theory (IDT). An innovation is *"an idea, practice, or object that is perceived as new by an individual or another unit of adoption"*. On the other hand, Diffusion is *"the process by which an innovation is communicated through certain channels over time among the members of a social system"* (Rogers, 1995). Therefore, the IDT theory argues that potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation (Karahanna et al., 1999). It tries to explain innovation decision process, determining factors of rate of adoption, and different categories of adopters. It includes five significant innovation characteristics: (i) compatibility (CPT; (ii) relative advantage (RAD); (iii) complexity (CPX); (iv) trialability; (v) observability. Compatibility is the degree to which innovation can be regarded as being consistent with the existing values, prior experiences and needs of stakeholders. Relative advantage is defined as the degree to which an innovation is better than the idea it replaced. Complexity is defined ass the perceived level of difficulty of the stakeholder in understanding innovations and their ease of use. Triability is the degree to which innovations can be tested on a limited basis. Observability is the degree to which the results of innovations can be visible by other people. According to Tornatzky & Klein (1982) however, only relative advantage, compatibility and complexity were consistently related to adoption of technical innovations.

Li (2017) has proposed a unified model integrating both the Technology Acceptance Model (TAM) and the Innovation Diffusion Theory (IDT) to take advantage of these two theoretical models. The two basic factors are PU and PEOU from the TAM model and CPT, RAD and CPX from the IDT model. She claims that the model will better reveal how these different factors influence business managers' acceptance intentions and usage behavior of blockchain technology adoption. The figure below displays the model.

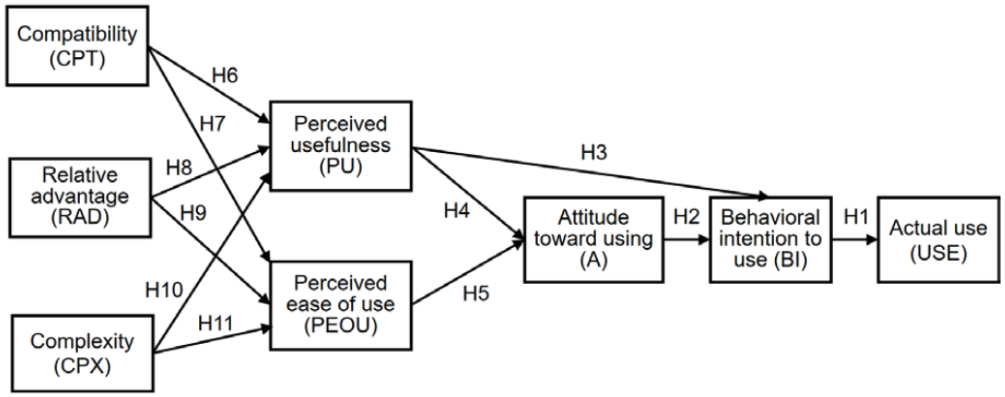

Figure 6.6: Blockchain adoption model by Li (2017)

Following this model we can make a proposal on how to introduce the blockchain solution for affiliate marketing to the public. By focusing on the characteristics defined by

the model, the blockchain system can gain traction and be adopted by the industry.
Compatibility; During the development of the system, we need to ensure that all the current features and functionalities of the affiliate marketing systems are included in the new system. By following this rule the system will be consistent with the current available systems. It will contain all the existing values, prior experiences and needs of the stakeholders, resulting in a low entry barrier for both the publisher and the merchant as the system is familiar with the systems they are currently using.
Relative advantage; By creating a system that contains all the current features and functionalities of the affiliate marketing systems, and replacing features with the blockchain, we hope to ensure that the innovation is better than the current system. The system needs to include new features that will provide value to the two important stakeholders (the publisher and the merchant), and by using blockchain technology to store the transactional data these features include the inclusion of transparency between the publisher and the merchant and the automated payment module that the smart contracts offer.
Complexity; During the development of the system, there should be an open communication line with both the publishers and the merchants that are willing to use the system to ask if they understand how to use the system. By using the experience from the stakeholders, we can ensure that the system is not too complex, and that it is ready for the mainstream. If the system becomes too complex, both the perceived usefulness and perceived ease of use will go down, leading to a lower adoption rate. Using *Agile Methodology* during development it is easy to make changes and reduces the risk of the system not doing what it is intended to do.
Perceived usefulness; The perceived usefulness of the system has been researched in chapter 4, resulting in stakeholders explaining what they think is limiting their job performance. By taking the pain points from affiliate marketing into account during the design of the system, we ensure that the perceived usefulness of the system will increase over the current available affiliate marketing systems.
Perceived ease of use; By ensuring that the compatibility of the system is high, that there is a significant advantage over the current systems, and that the complexity of the system is low we can obtain a high perceived ease of use of the system. By using the agile methodology, we allow the stakeholders to have frequent and early opportunities to see the work being delivered, and to make decisions and changes throughout the development project.

We propose to start with a Minimum Viable Product (Moogk, 2012) combined with the agile methodology, and to have a set of publishers and merchants use the system from an early phase. The MVP makes it easy to get a version of the system to market early to test the business concept and to gather user feedback. It allows to start small and iteratively build up to produce a better, more polished system.

Chapter 7

Discussion

During this research we looked at the affiliate marketing industry and the potential impact of blockchain on the industry. A list of pain points for affiliate marketing were found by doing a literature study and validated by conducting expert interviews. A list of blockchain opportunities were found by doing a literature study, and were connected with the affiliate marketing pain points. Afterwards we proposed a design for a new blockchain platform. In this section, we reflect on the way we conducted the research, the results of the study, and the limitations of the study.

7.1 Validity

In chapter 3 we conducted a literature study for affiliate marketing, which resulted in a detailed list of pain points found for the industry. For this literature study we used the snowballing technique, combined with a Google Scholar search for specific keywords. Several papers were cited to find the pain points, however, none of the papers had a set list of the pain points. This means that other researchers might find additional pain points, or formulate the pain points differently. To try and mitigate this, interviews with affiliate marketing experts were conducted to validate the pain points found in the literature.

Regarding the conducted interviews with the affiliate marketing experts, it has to be noted that the experts were chosen by using convenience sampling. This means that the first available experts were used for the research, without any additional requirements. The reason for using the convenience sampling method is because of the unwillingness of candidates to cooperate, mainly claiming to be too busy or not seeing the added benefit for them. This is especially the case for the merchants, as affiliate marketing is just a small part of their revenue stream so the focus lies elsewhere. Because of this the research might not be generalizable and could pose a threat to the external validity of the research.

The experts were all from the Netherlands, which means that they reflect only the opinion of the affiliate marketing industry in the Netherlands. Even though affiliate marketing is not restricted to a country, most affiliate marketing networks operate word-wide. The terms and conditions between the publisher and the merchant could differ from country to country, leading to different results on the opinion on transparency and trust. This poses

a threat to the external validity of the research. To get a better overview of transparency within affiliate marketing, multiple experts from multiple countries should be interviewed and asked for their opinion.

For the design of the blockchain system we used user stories as a base for the design, user stories are a good way to capture the requirements of a system in a well-formed and explicit manner. The design, however, is not validated by experts, which happened due to a lack of time. Validating the design by experts would be a great way to find out if the design has the potential to be adopted by the industry. We consider this to be the greatest weakness of the thesis, as there are many blockchain systems out there that work in theory, but are not gaining any traction. To succesfully introduce a blockchain system to the public, it should be validated by experts, which is beyond the scope of this thesis.

7.2 Future Work

For additional research there are several directions that could be taken:

Additional interviews; The most obvious way to improve the results is to have a larger pool of affiliate marketing experts to interview. This could lead to different results and/or different insights in how the affiliate marketing industry is perceived. By interviewing multiple experts from multiple countries, a more generalizable result could be obtained.

Pain Points; During the research for affiliate marketing, we used a literature study to find the pain points for the industry. Instead of using a literature study to find and define the pain points, real world affiliate marketing systems could be investigated and evaluated to have a more practical approach to finding the pain points. This could potentially result in more accurate pain points. Future research could look at the currently available systems and use iStar or Data Flow Diagram models to see if there is an opportunity for blockchain.

Create the blockchain system; By creating the blockchain system described in this research, the system could be validated in a real world setting. This would yield new results that could be used to create an even better blockchain system model.

New blockchain features; Because blockchain is still maturing as a technology, the significant potential keeps increasing as time passes. New functionalities and improvements could be used to create an even better blockchain system for affiliate marketing, and more pain points could potentially be solved with new blockchain features.

Potential of the iStar 2.0 model; The iStar 2.0 model, described in chapter 5.2, shows the context in which the affiliate marketing industry operates. It allows requirement engineers to see the connection between the functional requirements of the intended system and the organizational goals in the organization modelling. There could be an opportunity to use an iStar 2.0 model to find out if blockchain technology could improve an industry. Further research could investigate what makes a good use case for blockchain technology based on an iStar 2.0 model.

Chapter 8

Conclusion

This research set out to study the affiliate marketing industry, and to find out the potential of the new and upcoming blockchain technology to provide trust. The problem statement reads as following: *The Affiliate Marketing industry struggle with a lack of trust between the publisher and the merchant, limiting their performances. Blockchain technology could potentially solve this problem, but it is unknown how a blockchain platform could improve transparency.* The research has been divided in five sub questions, and one main research question, which will be answered in this chapter.

8.1 Main Findings

SQ1: What is the current state of, and are the problems in, the affiliate marketing industry? The current affiliate marketing model is being used for over ten years now. The original model has never changed, and therefore faces the same problems as ten years ago. These problems include a lack of transparency and trust between the publisher and the merchant, which leads to a decrease in performance.

Another problem that was pointed out was the vulnerability of the affiliate network. The network acts as a single-point-of-failure, therefore the entire industry could be halted when the network is down, or being hacked. If the network is compromised, there could be the potential of fraud and data leaks, and niether the publisher nor the merchant will know about it.

Fraud remains an imminent problem in the industry, for both the publisher and the merchant. The merchant is vulnerable to i.e. cookie spamming and conversion stealing, leading to the merchant paying more than they should. The publisher, on the other hand, is vulnerable to dishonest merchants that hijack the tracking code or illegitimately reject transactions that should be credited to publishers.

Another problem is the delayed payments for the publishers. A publisher could have to wait up to half a year before he receives the money that is owed by the merchants. This leads to cash flow problems that become unstable and unpredictable.

SQ2: How can blockchain technology increase transparency in affiliate marketing? The literature review in this research has found five blockchain opportunities that can be applied to affiliate marketing. These five opportunities are: (i) immutability; (ii) visibility & transparency; (iii) trust; (iv) availability & security; (v) efficiency. All five opportunities can be used to increase transparency in affiliate marketing, with the immutability opportunity being the most prominent one. Because in the current affiliate marketing model changes are often made after a transaction has taken place without clear supervision, the immutability opportunity that blockchain yields has the potential to increase the transparency.

SQ3: What are the features of a feasible blockchain solution? A feasible blockchain solution will store the transactional data in a blockchain, to make improvements to the transparency of the data. By using a blockchain to store the data, it is visible and transparent for both the publisher and the merchant. Both stakeholders have indicated that this would greatly benefit the industry, and solve some of the transparency and trust issues they currently have. Another benefit is that it is more costly for a publisher to commit fraud, as it is easier for the merchant to spot the fraud. Smart contracts can be used to handle the payments between the merchant and the publisher. It allows for the publisher to gain the commission he deserves immediately, in stead of waiting for over half a year.

SQ4: What are the limitations of a blockchain solution? The study describes the limitations of a blockchain based system for affiliate marketing. These limitations include: (i) lack of privacy; (ii) high costs; (iii) security model; (iv) flexibility limitations; (v) latency; (vi) governance. The above list of limitations outlines some of the specific technical challenges and unintended consequences that may limit the development and commercial adoption of blockchain technology. As blockchain technology is relatively recent, organisations have yet to fully tackle these key obstacles and could pose significant threats to the wider acceptance of the technology.

SQ5: How should a blockchain solution be introduced to gain traction and adoption? The blockchain adoption model describes the characteristics that are crucial for the adoption of a new blockchain system. These characteristics include: (i) compatibility; (ii) relative advantage; (iii) complexity; (iv) perceived usefulness; (v) perceived ease of use. By starting with a minimum viable product and using the agile methodology, the publishers and merchants can use the system in an early phase. This allows for the testing of the business concept and to gather user feedback. It allows to start small and iteratively build up to produce a better, more polished system. It is of vital importance to include the stakeholders as early as possible in the process, and to include all the currently available features in the new system.

RQ: How can blockchain technology be applied to increase transparency in affiliate marketing? The results of this research have demonstrated the potential of blockchain technology applied to the affiliate marketing industry. By storing transactional data on the blockchain, and combining this with the use of smart contracts, the transparency between the publisher and the merchant will increase. Additional benefits include the decrease of fraud potential, and more trust between the publisher and the

merchant. Smart contracts have the potential to improve the payment process, having multiple benefits for the publisher that includes a better cash flow management.

An iStar 2.0 model is created that represents the current affiliate marketing model. Interviews were conducted with affiliate marketing experts to validate the pain points found in the literature. These interviews were used together with the iStar 2.0 model to create a set of user stories that describe the required features of a blockchain system in a structured manner. Based on these user stories the blockchain system model is created using the Functional Architecture Model. The limitations of the system are described, as well as the adoption process.

This research has given a better understanding of how the affiliate marketing industry operates, the problems associated with this model, and the potential that blockchain technology has upon improving these problems.

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Bibliography

Abeyratne, S. A., Monfared, R. P. (2016). Blockchain ready manufacturing supply chain using distributed ledger. International Journal of Research in Engineering and Technology. 2016, 5(9), 1-10.

Akcura, M.T. (2010). Affiliated marketing. Information Systems and e-Business Management, 8(4), 379-394.

Anjum, A., Sporny, M., Sill, A. (2017). Blockchain standards for compliance and trust. IEEE Cloud Computing, 4(4), 84-90.

Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. " O'Reilly Media, Inc.".

Amarasekara, B., Mathrani, A. (2016). Exploring Risk and Fraud Scenarios in Affiliate Marketing Technologies from the Advertisers perspective. arXiv preprint arXiv:1606.01428.

Atzori, M. (2015). Blockchain technology and decentralized governance: Is the state still necessary?. Available at SSRN 2709713.

Axios (2018). Corporate America's blockchain and bitcoin fever is over. (Accessed July 2019) https://www.axios.com/corporate-america-blockchain-bitcoin-fervor-over-fb13bc5c-81fd-4c12-8a7b-07ad107817ca.html.

Batory, D. (2005, September). Feature models, grammars, and propositional formulas. In International Conference on Software Product Lines (pp. 7-20). Springer, Berlin, Heidelberg.

Beck, R., Czepluch, J. S., Lollike, N., Malone, S. (2016, May). Blockchain-the Gateway to Trust-Free Cryptographic Transactions. In ECIS (p. ResearchPaper153).

Benediktova, B., Nevosad, L. (2008). Affiliate Marketing: Perspective of content providers. Department of Business Administration and Social Sciences, Lulea University of Technology.

Bhargavan, K., Delignat-Lavaud, A., Fournet, C., Gollamudi, A., Gonthier,

G., Kobeissi, N., ... Zanella-Béguelin, S. (2016, October). Formal verification of smart contracts: Short paper. In Proceedings of the 2016 ACM Workshop on Programming Languages and Analysis for Security (pp. 91-96). ACM.

Bogner, A., Littig, B., Menz, W. (2009). Introduction: Expert interviews—An introduction to a new methodological debate. In Interviewing experts (pp. 1-13). Palgrave Macmillan, London.

Böhme, R., Christin, N., Edelman, B., Moore, T. (2015). Bitcoin: Economics, technology, and governance. Journal of Economic Perspectives, 29(2), 213-38.

Brinkkemper, S., Pachidi, S. (2010, August). Functional architecture modeling for the software product industry. In European Conference on Software Architecture (pp. 198-213). Springer, Berlin, Heidelberg.

Burema, H., Makino, Y. (2002). U.S. Patent Application No. 09/922,953.

Buterin, V. (2014). A next-generation smart contract and decentralized application platform. (Accessed July 2019) https://www.ethereum.org/pdfs/EthereumWhitePaper.pdf

Butler, E., Teddy, J., Waugh, M. (2006). U.S. Patent Application No. 11/437,989.

Carlozo, L. (2017). What is blockchain?. Journal of Accountancy, 224(1), 29.

Cattell, R. (2011). Scalable SQL and NoSQL data stores. Association for Computing Machinery Sigmod Record, 39(4), 12-27.

Chachra, N., Savage, S., Voelker, G. M. (2015, October). Affiliate crookies: Characterizing affiliate marketing abuse. In Proceedings of the 2015 Internet Measurement Conference (pp. 41-47). ACM.

Chen, S. C., Dhillon, G. S. (2003). Interpreting dimensions of consumer trust in e-commerce. Information technology and management, 4(2-3), 303-318.

Christidis, K., Devetsikiotis, M. (2016). Blockchains and smart contracts for the internet of things. Ieee Access, 4, 2292-2303.

Clements, P. C. (2001, October). On the importance of product line scope. In International Workshop on Software Product-Family Engineering (pp. 70-78). Springer, Berlin, Heidelberg.

Coyne, J. G., McMickle, P. L. (2017). Can blockchains serve an accounting purpose?. Journal of Emerging Technologies in Accounting, 14(2), 101-111.

Cudmore, B. A., McCoy, J., Shuhy, J., Taylor, J. (2009). Engaging online

consumers with an interactive cost-per-action advertising model. Journal of Internet Commerce, 8(3-4), 288-308.

Czarnecki, K., Helsen, S., Eisenecker, U. (2004, August). Staged configuration using feature models. In International Conference on Software Product Lines (pp. 266-283). Springer, Berlin, Heidelberg.

Dale, C. (2003). The competitive networks of tourism e-mediaries: New strategies, new advantages. Journal of vacation marketing, 9(2), 109-118.

Dalpiaz, F., Franch, X., Horkoff, J. (2016). istar 2.0 language guide. arXiv preprint arXiv:1605.07767.

Davis, F. D. (1987). User acceptance of information systems: the technology acceptance model (TAM). University of Michigan Business School. 1987. http://www.hti.umich.edu/cgi/t/text/textidx?c=busadwp;cc=busadwp;sid=048789c80e635ba0c1129f3cfe1c94c3;i

DeGroot, M. H. (1974). Reaching a consensus. Journal of the American Statistical Association, 69(345), 118-121.

Deloitte (2016). What is blockchain. Retrieved on June 02, 2019 from https://www2.deloitte.com/content/dam/Deloitte/uk/Documenst/Innovation/deloitte-uk-what-is-blockchain-2016.pdf

Drever, E. (1995). Using Semi-Structured Interviews in Small-Scale Research. (Edinburgh, The Scottish Council for Research in Education).

Drescher, D. (2017). Blockchain basics: A non-technical introduction in 25 steps. Blockchain Basics: A Non-Technical Introduction in 25 Steps. https://doi.org/10.1007/978-1-4842-2604-9

Driscoll, K., Walker, S. (2014). Big data, big questions| working within a black box: Transparency in the collection and production of big twitter data. International Journal of Communication, 8, 20.

Duffy, D. L. (2005). Affiliate marketing and its impact on e-commerce. Journal of Consumer Marketing, 22(3), 161-163.

Dwivedi, Y. K., Rana, N. P., Alryalat, M. A. A. (2017). Affiliate marketing: An overview and analysis of emerging literature. The Marketing Review, 17(1), 33-50.

Edelman, B., Brandi, W. (2015). Risk, information, and incentives in online affiliate marketing. Journal of Marketing Research, 52(1), 1-12.

Etikan, I., Musa, S. A., Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. American journal of theoretical and applied statistics, 5(1), 1-4.

Evans, D. (2014). Economic aspects of bitcoin and other decentralized public-ledger currency platforms. Coase-Sandor Institute for Law and Economics Working Paper 685, April

Fox, J. (2007). The uncertain relationship between transparency and accountability. Development in practice, 17(4-5), 663-671.

Fox, P. B., Wareham, J. D. (2012). Governance mechanisms in Internet-based affiliate marketing programs in Spain. In Transformations in E-Business Technologies and Commerce: Emerging Impacts (pp. 222-239). IGI Global.

Gallaugher, J. M., Auger, P., BarNir, A. (2001). Revenue streams and digital content providers: an empirical investigation. Information Management, 38(7), 473-485.

Gervais, A., Karame, G. O., Wüst, K., Glykantzis, V., Ritzdorf, H., Capkun, S. (2016, October). On the security and performance of proof of work blockchains. In Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security (pp. 3-16). ACM.

Gomber, P., Kauffman, R. J., Parker, C., Weber, B. W. (2018). On the fintech revolution: interpreting the forces of innovation, disruption, and transformation in financial services. Journal of Management Information Systems, 35(1), 220-265.

Greenspan, J., Bulger, B. (2001). MySQL/PHP database applications. MT Books: An imprint of IDG Books Worldwide, Inc., 2001.

Gregori, N., Daniele, R., Altinay, L. (2014). Affiliate marketing in tourism: determinants of consumer trust. Journal of Travel Research, 53(2), 196-210.

Hawlitschek, F., Notheisen, B., Teubner, T. (2018). The limits of trust-free systems: A literature review on blockchain technology and trust in the sharing economy. Electronic commerce research and applications, 29, 50-63.

Hevner, A., Chatterjee, S. (2010). Design research in information systems: theory and practice (Vol. 22). Springer Science Business Media.

Hoffman Donna, L., Novak, T. P. (2000). How to Acquire Customer on the Web. Harvard Business Review, 179-188.

Hossan, F., Ahammad, I. (2013). Affiliate Marketing: The Case of Online Content Providers in Bangladesh. World, 3(2).

Horowitz, R. C., Christothoulou, P., Caldwell, E., Keister, J., Korman, W., Busby, J. (2010). U.S. Patent No. 7,668,950. Washington, DC: U.S. Patent and Trademark Office.

Hughes, L., Dwivedi, Y. K., Misra, S. K., Rana, N. P., Raghavan, V., Akella, V. (2019). Blockchain research, practice and policy: Applications, benefits, limitations, emerging research themes and research agenda. International Journal of Information Management, 49, 114-129.

Humphries IV, W. F., Gelais, E. C. S., Humphries III, W. F., Crum, A. K. (2013). U.S. Patent No. 8,600,811. Washington, DC: U.S. Patent and Trademark Office.

Li, E. Y. (2017, December). Integrating Innovation Diffusion Theory and the Technology Acceptance Model: The adoption of blockchain technology from business managers' perspective. In International Conference on Electronic Business (Vol. 12, No. 4, pp. 299-302).

Lucassen, G., Dalpiaz, F., van der Werf, J. M. E., Brinkkemper, S. (2015, August). Forging high-quality user stories: towards a discipline for agile requirements. In 2015 IEEE 23rd international requirements engineering conference (RE) (pp. 126-135). IEEE.

Iansiti, M., Lakhani, K. R. (2017). The truth about blockchain. Harvard Business Review, 95(1), 118-127.

Ivkovic, M., Milanov, D. (2010, November). Affiliate internet marketing: Concept and application analysis. In 2010 International Conference on Education and Management Technology (pp. 319-323). IEEE.

Kang, K. C., Cohen, S. G., Hess, J. A., Novak, W. E., Peterson, A. S. (1990). Feature-oriented domain analysis (FODA) feasibility study (No. CMU/SEI-90-TR-21). Carnegie-Mellon Univ Pittsburgh Pa Software Engineering Inst.

Karahanna, E., Straub, D. W., Chervany, N. L. (1999). Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. MIS quarterly, 183-213.

Khandelwal, H. (2017). U.S. Patent Application No. 15/287,378.

Kehrli, J. (2016). Blockchain 2.0-from Bitcoin transactions to smart contract applications. Niceideas, November. Available at: https://www.niceideas.ch/roller2/badtrash/entry/blockchain-2-0-frombitcoin (Accessed: 5 January 2018).

Kelle, M., Kleinert, J., Raff, H., Toubal, F. (2013). Cross-border and foreign affiliate sales of services: Evidence from German microdata. The World Economy, 36(11), 1373-1392.

Kristol, D. M. (2001). HTTP Cookies: Standards, privacy, and politics. ACM Transactions on Internet Technology (TOIT), 1(2), 151-198.

Lacity, M. C. (2018). Addressing key challenges to making enterprise blockchain applications a reality. MIS Quarterly Executive, 17(3), 201-222.

Lamport, L., Shostak, R., Pease, M. (1982). The Byzantine generals problem. ACM Transactions on Programming Languages and Systems (TOPLAS), 4(3), 382-401.

Lee, G. G., Lin, H. F. (2005). Customer perceptions of e-service quality in online shopping. International Journal of Retail Distribution Management, 33(2), 161-176.

Libai, B., Biyalogorsky, E., Gerstner, E. (2003). Setting referral fees in affiliate marketing. Journal of Service Research, 5(4), 303-315.

Mariussen, A., Daniele, R., Bowie, D. (2010). Unintended consequences in the evolution of affiliate marketing networks: a complexity approach. The Service Industries Journal, 30(10), 1707-1722.

Messer, S. D. (2006). U.S. Patent No. 7,020,622. Washington, DC: U.S. Patent and Trademark Office.

Miehling, M., Buchanan, W. J., Lawson, A., Batey, A. Affiliate Advertising Fraud and an Investigatory Framework for Fraud. Proceedings of the 9th European Confeence on Information Warfare and Security, Thessaloniki, 2010.

Miller, J. B. (2010). U.S. Patent No. 7,783,719. Washington, DC: U.S. Patent and Trademark Office.

Mills, D. C., Wang, K., Malone, B., Ravi, A., Marquardt, J., Badev, A. I., ... Ellithorpe, M. (2016). Distributed ledger technology in payments, clearing, and settlement.

Moogk, D. R. (2012). Minimum viable product and the importance of experimentation in technology startups. Technology Innovation Management Review, 2(3).

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. [Online]. Available: https://bitcoin.org/bitcoin.pdf

Natoli, C., Gramoli, V. (2016). The blockchain anomaly. arXiv preprint arXiv:1605.05438.

Nazerzadeh, H., Saberi, A., Vohra, R. V. (2007). Dynamic cost-per-action mechanisms and applications to online advertising (No. 1450). Discussion paper//Center for Mathematical Studies in Economics and Management Science.

Newman, E. J., Stem Jr, D. E., Sprott, D. E. (2004). Banner advertisement

and Web site congruity effects on consumer Web site perceptions. Industrial Management Data Systems, 104(3), 273-281.

Newswire, P. R. (2015). First Performance Marketing Offering to Feature Realtime Fraud Detection Powered by Industry Leaders Cake by Accelerize and Forensiq. PR Newswire US.

Noveck, B. S. (2011). The single point of failure. In Innovating government (pp. 77-99). TMC Asser Press.

Nowiński, W., Kozma, M. (2017). How can blockchain technology disrupt the existing business models?. Entrepreneurial Business and Economics Review, 5(3), 173-188. Object Management Group (2015, March). OMG Unified Modeling Language (UML) Version 2.5. Retrieved July 03, 2010, from http://www.omg.org/spec/UML/2.5.

Papatla, P., Bhatnagar, A. (2002). Choosing the right mix of on-line affiliates: How do you select the best?. Journal of Advertising, 31(3), 69-81.

Papadopoulou, P., Kanellis, P., Martakos, D. (2001). Investigating trust in e-commerce: a literature review and a model for its formation in customer relationships. AMCIS 2001 Proceedings, 155.

Peffers, K., Tuunanen, T., Rothenberger, M. A., Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of management information systems, 24(3), 45-77.

Ratnasingam, P., Phan, D. D. (2003). Trading partner trust in B2B e-commerce: A case study. Information Systems Management, 20(3), 39-50.

Ross Jr, D. D., Ross, D. D., Michaels, J. R., May, W. R., Anderson, R. A. (2003). U.S. Patent No. 6,629,135. Washington, DC: U.S. Patent and Trademark Office.

Rozanski, N., Woods, E. (2011). Software systems architecture: working with stakeholders using viewpoints and perspectives. Addison-Wesley.

Rouse, M. (2007, April). Definition: Use case. Retrieved July 06, 2017, from http://searchsoftwarequality.techtarget.com/definition/use-case

Saleh, F. (2018). Blockchain without waste: Proof-of-stake. working paper.

Sarelson, S. H., Treiber, J. A. (2009). U.S. Patent Application No. 11/888,963.

Scriber, B. A. (2018). A Framework for Determining Blockchain Applicability. IEEE Software, 35(4), 70-77.

Snyder, P., Kanich, C. (2015, December). No Please, After You: Detecting

Fraud in Affiliate Marketing Networks. In WEIS.

Stokes, R. (2011). eMarketing: The essential guide to digital marketing. Quirk eMarketing.

Störrle, H. (2005). Semantics and verification of data flow in UML 2.0 activities. Electronic Notes in Theoretical Computer Science, 127(4), 35-52.

Swan, M. (2015). Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.".

Turner III, D. W. (2010). Qualitative interview design: A practical guide for novice investigators. The qualitative report, 15(3), 754-760.

Walker, J. S., Tedesco, D. E., Packes Jr, J. M., Jorasch, J. A. (2010). U.S. Patent No. 7,827,056. Washington, DC: U.S. Patent and Trademark Office.

Weber, I., Xu, X., Riveret, R., Governatori, G., Ponomarev, A., Mendling, J. (2016, September). Untrusted business process monitoring and execution using blockchain. In International Conference on Business Process Management (pp. 329-347). Springer, Cham.

Weber, I., Gramoli, V., Ponomarev, A., Staples, M., Holz, R., Tran, A. B., Rimba, P. (2017, September). On availability for blockchain-based systems. In 2017 IEEE 36th Symposium on Reliable Distributed Systems (SRDS) (pp. 64-73). IEEE.

White, S. A. (2004). Introduction to BPMN. Ibm Cooperation, 2(0), 0.

Whiting, L. S. (2008). Semi-structured interviews: guidance for novice researchers. Nursing Standard, 22(23).

Wieringa, R. J. (2014). Design science methodology for information systems and software engineering. Springer.

Wohlin, C. (2014, May). Guidelines for snowballing in systematic literature studies and a replication in software engineering. In Proceedings of the 18th international conference on evaluation and assessment in software engineering (p. 38). ACM.

Wright, A., De Filippi, P. (2015). Decentralized blockchain technology and the rise of lex cryptographia. Accessed: June, 2019. [Online]. Available: https://ssrn.com/abstract=2580664

Yli-Huumo, J., Ko, D., Choi, S., Park, S., Smolander, K. (2016). Where is current research on blockchain technology?—a systematic review. PloS one, 11(10), e0163477.

Zhao, J. L., Fan, S., Yan, J. (2016). Overview of business innovations and

research opportunities in blockchain and introduction to the special issue. Financ. Innov. 2, (2016).

Zheng, Z., Xie, S., Dai, H., Chen, X., Wang, H. (2017, June). An overview of blockchain technology: Architecture, consensus, and future trends. In 2017 IEEE International Congress on Big Data (BigData Congress) (pp. 557-564). IEEE.

Zyskind, G., Nathan, O. (2015, May). Decentralizing privacy: Using blockchain to protect personal data. In Security and Privacy Workshops (SPW), 2015 IEEE (pp. 180-184). IEEE.

Appendices

Appendix A

Informed Consent Form

This study researches the advantages and disadvantages of the Affiliate Marketing industry, and the potential of blockchain technology applied to the industry.

Consent for Participation in Interview Research

- I volunteer to participate in a research project. I understand that the project is designed to gather information about the Affiliate Marketing industry.
- I have been informed of the nature of the research project.
- I agree that the interview will be audio recorded.
- I understand that the data gathered from the interview can be used in the research project.
- I have been given a copy of this consent form.

Anonimity

- ▫ I wish to remain anonymous.
- ▫ My organisation wishes to remain anonymous.

Interviewer: Marten Weijer
Signature:

Interviewee:
Signature:

Date: