

CS5030

Assignment 2 - Business Models in the Software Industry

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1 Introduction

By definition, a business model describes the logic of how a company creates, delivers and captures value [1]. Therefore, any business model is comprised of several elements revolving around its value, not limited to just financial rewards. This would include a company's logic behind operations, product development process, key technologies, etc. In essence, business models describe the “architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value” [2].

There are five main elements in a software company's business model: distribution, code licensing, revenue stream, interaction, and target audience [3]. (Please refer to Figure I.) Distribution refers to how the product will be delivered and where the users will have access to it. Code licensing is the level of ownership of the code used in the product; proprietary would be entirely unique, custom, company-owned code. Revenue stream describes the way in which value will flow through the software. Interaction is the part of the business model that states how users will associate with the product. For instance, Uber connects many drivers with many passengers making it a many-to-many product while Angry Birds connects one game with many users making it a one-to-many product. Lastly, we have target audience which can be B2B (business-to-business) or B2C (business-to-customer).

In this report, in relation to the above definitions, we have outlined three main types of business models in software industry and how they generate value. Through thorough research we have analysed both well established and emerging business models within the software industry.

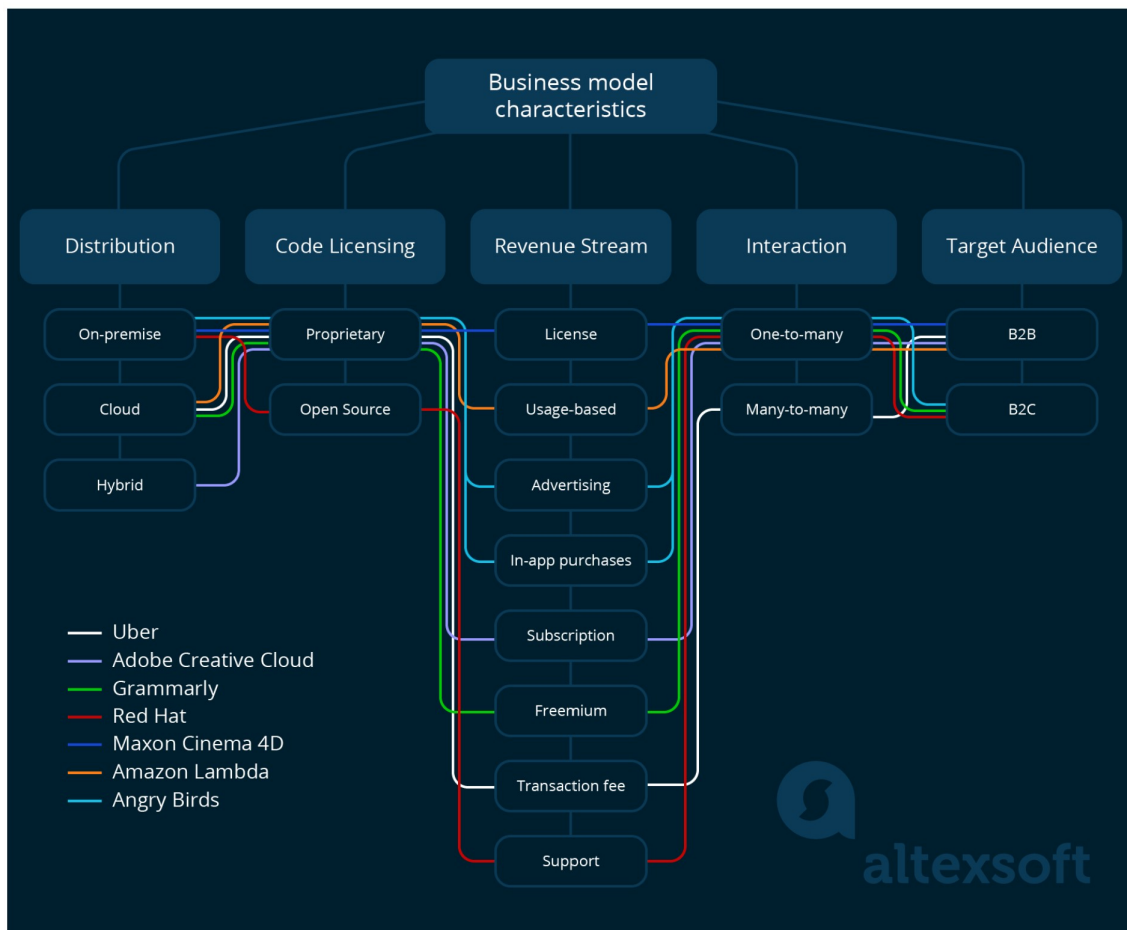


Figure 1: Elements of a business model [3]

2 Commercial Open-Source Models

Open-source software is software that is openly and freely available in source code form. It can be freely redistributed and modified by anyone [4]. Commercial open-source software is when one entity owns the software license and generates revenue from it. In this scenario typically part of, or all the codebase is made open source [5]. This is a fascinating model, as the rise of open-source software was partially motivated by the desire to move away from paid for, proprietary software.

To create revenue, commercial open-source software companies approach the monetisation and commercialisation of their products using different methods [6]. These are:

- Open core – for compliance reasons, some clients are unable to accept an open-source license. Clients may purchase a license to receive certification and a full guarantee for the product.
- Whole product – often software companies make the base version of their product open-source. This is made available to non-commercial users. The full product suite then includes additional proprietary software. The full product is then licensed and sold to clients for commercial use.
- Technical support – customers may need readily available technical support to ensure that the software runs as intended. This can come in the form of ongoing systems monitoring and bug fixes.
- Consulting services – customers may need support in the initial implementation of the software and tailoring it for their specific needs. This can also take the more basic form of documentation and training.

In the commercial open-source model, companies that own the software license often have in-house teams who develop the product. The direction of the project is retained and driven by these developers who control commit access. By virtue of the source code being at least partially open source, there is faster adoption of the product and frequently a user community grows. An engaged user community is the lifeblood of any open-source project [5]. This community offers feedback and ideas and provided they are willing to transfer ownership rights, occasionally users may also make contributions to the codebase. This reduces costs as users are free testers who can find and report bugs and suggest new features. The major risk of this model is that a company could end up competing against a product that is based on its own open-source software.

As users often form part of the development team, the engineering of open-source software tends to be fluid. There is an emphasis on collaboration, continuous integration and testing, and interaction with the users/customers throughout [7]. In commercial open source, by making their software available the original creators in effect invite many people to collaborate on their software [8]. The company who owns the software license has control over what gets committed

but both users and developers can submit feature requests. Features are then designed, tested, and implemented by both in house developers and by the user community. There is a feedback loop as features are refined, changed, and reviewed by many people before being released incrementally. Upon release, completed features are maintained and supported by both groups.

This open-source approach reflects principles outlined in the agile manifesto and is an example of feature driven development. There is a strong emphasis on user and development team collaboration throughout development and in fact the distinctions between these groups are often blurred. Features are often requested by users and each feature is incrementally added to the codebase. Given that anyone with the required skills can contribute, there is an emphasis on people as opposed to processes and people can be allocated based on their individual ability. One of the great strengths of open-source software development is the emphasis on peer review throughout the process as both users and developers can review code and test as new features are developed [7].

Open-source software is inherently an ethical approach to development as by definition it must not discriminate against anyone [4]. As users are involved throughout the design and development lifecycle, they provide oversight on the direction of the project and ensure its quality. This is the wisdom of the crowd in action, as the community of users are involved throughout development and delivery of each feature. There is also a strong emphasis on frequent and early releases to enable further review and quick feedback [9]. While source code is freely available for review by any potentially malicious users, the community involved in delivery can ensure that high quality is maintained, and any potential security breaches are identified and resolved quickly.

With commercial open-source software, one entity controls the direction a project takes. Initially this appears no different to a typical closed source business, but as mentioned earlier an engaged user community is at the heart of any open-source development [5]. The fact that the company's code is freely available and reusable, and that they are dependent on their user community enforces a form of social contract on the company [9]. While users may not have commit permission, they collectively have a strong influence on the company. If the company diverges from what the community deems to be ethical, they can create their own version of the software using the freely available open-source code.

One area that merits further investigation that doesn't appear to have been covered is the internal structure and workings of commercial open-source companies [10]. Further research topics could include how companies manage their time between engaging with their user community and developing proprietary software and how they determine which features to prioritise for development. This is a seemingly conflicting relationship but is prevalent throughout the industry.

We can conclude that the commercial open-source software business model functions well as a model that both generates revenue for the license holder while ensuring high quality software due to the level of peer review and collaboration with users. This review and input from people who are both users and contributors also ensures that projects maintain high ethical standards.

3 Target Matched Advertising Models

3.1 Digital Advertising

Since 2019, digital advertising constitutes a greater share of global advertising revenue than traditional forms of marketing [11]. The two companies dominating this field, Google and Facebook, generate over 50% of the digital ad market revenue [12]. To achieve this, both organisations design and maintain free of charge software products and services that attract massive user bases. Through the extensive harvesting of user information they ensure that those running ads on their platforms can precisely target the intended audience.

Although the capability to successfully categorise and match ads for billions of users is a marvel of the advancements of software engineering, both ends of the digital ad business model raise significant ethical concerns.

When trying to build and maintain a large user base, design features intended to maximise user retention have caught criticism for promoting controversial and divisive content. Conversely, when gathering user information to ensure that adverts are efficiently deployed on their platforms, the invasive levels of user data collection naturally raise questions on how we as consumers should interact with these services. Now more frequently than ever it is called into question if more extensive regulation is needed to limit the power these organisations hold at the forefront of the information era.

3.2 Facebook

Across Facebook's core collection of apps – Facebook, Messenger, Instagram, and WhatsApp – the organisation has attained an ever growing monthly active user base of over 3.5 billion people [13]. It is through these apps that Facebook hosts the digital advertising services that generate over 98% of the companies 85-billion-dollar revenue [14].

Facebook subscribes to the project management methodology dubbed 'Scrum'. In the overlap between Scrum and Agile development is a focus on the fast-paced creation and implementation of new features, with regular updates for their products. Software engineers have high levels of self-autonomy to propose and develop new features that could be pushed for development and implementation on the fly. This rapid development is best captured by the fact that the core Facebook mobile app receives an update every week.

Where Facebook's development differs from the Agile manifesto would be in its values, as Agile places a high importance on customer collaboration, whereas little is known of Facebook's internal systems both to users and customers alike. Most notably is the secretive nature of the AI algorithms that dictate the content that reaches users via custom news feeds, and how users are categorised for ads. Facebook oftentimes finds itself as the focal point for debate surrounding data privacy, a topic which is closely interwoven with the digital advertising field

as a whole.

One of the most notable instances of this is the Cambridge Analytica scandal, whereby Facebook sold user data to a third party. The gathered data enabled the identification of key voter groups in the 2016 presidential election. These groups were then subjected to targeted messaging on the Facebook platform in order to influence public opinion. The controversy speaks to the extent of how the digital advertising companies that harvest personal information on their millions of users now wield questionably high levels of social power [15].

A more recent controversy relates to the internal Facebook whistle blower Francis Haugen, when she leaked thousands of private internal research documents. Although it is already well studied that social media usage is linked to negative effects in the mental health of its users [16], the leaked documents reveal that actively promoting this damaging content can increase user interaction on Facebooks family of apps. As such, the AI driven content algorithms are then deliberately tuned to promote this divisive and polarising material, placing the platforms value to investors and advertisers over the wellbeing of users.

3.3 Google

Google is the largest player in the digital advertising market. They dominate the search engine field, hosting over 90% of all search engine queries with nearly four billion regular users across their platform [17]. The google business model generates ad revenue through three main methods: search result ads, AdSense on publishers' sites and mobile apps, and ads within googles own products which includes YouTube and the whole host of services that comprise the Google+ network.

Although Google adopts different software development processes across its hundreds of software teams, in general they ascribe to the Agile framework, which sees google apps receiving continuous updates and new features. Some teams do utilise more traditional approaches such as the Waterfall methodology, where a project is partitioned into stages that must be completed and tested sequentially before deployment. Google has been huge a proponent of beta testing, where products are released to users in unfinished states and routinely receive significant overhauls and changes in response to user feedback. Even their largest apps such as Gmail hosted beta stages of over 5 years during development.

Googles chokehold on the search engine market sees some of the most sought-after advertising space in the field of digital marketing. Googles pay-per-click (PPC) platform for search results has high value keywords such as 'Business Services' netting them an average of \$58 per click [18].

The vast array of services within googles network enables the gathering of data across nearly every aspect of a users life, allowing them to precisely target ads for the millions of web pages and mobile apps monetized by Google's Ad Sense program [19].

To quote ex-Google CEO Eric Schmidt, “We know where you are. We know where you’ve been. We can more or less know what you’re thinking about.” The uncanny level to which Google gathers the data of its users raises serious ethical concerns relating to data privacy and confidentiality. In response to much criticism, Google has started to employ features that allow users to limit the tracking of information that occurs while using their software services. This still leaves unanswered the issue of informed consent, whereby the billions of Google users that may not be as technologically literate are truly unaware of the level of personal privacy they forgo when they interact with any service on the Google network.

4 Blockchain Business Models

4.1 Blockchain Technology's Relevance in Software Industry's Business Models

Blockchain is considered as one of the most disruptive technologies in the software industry. It has enhanced the creation of new business models and forced software companies to work completely differently [20]. This section will illustrate the ground-breaking ways in which blockchain technology has transformed software business models and created its own ecosystems. A blockchain business model, in this section of the essay, refers to a business model that is fundamentally influenced by and operates via the blockchain technology.

Although blockchain is merely a structure and storage type of data, the implication it has on a business's operations and product development is causing a revolution in the way financial institutions, for example, are run and how people use social media. As a result, a blockchain business model reflects the three key characteristics of blockchain technology [21] :

- **Decentralisation:** According to Amazon Web Services, in blockchain, decentralisation refers to the “transfer of control and decision-making from a centralised entity (individual, organisation, or group thereof) to a distributed network”. Therefore, decentralised networks reduce “the level of trust that participants must place in one another and deter their ability to exert authority or control over one another in ways that degrade the functionality of network” [22].
- **Based on peer-to-peer transactions or activities:** The implementation of blockchain technology in a software company also fundamentally changes the flow of transactions and profit [21]. As blockchain is essentially a decentralised ledger tracking of one or more digital assets on a peer-to-peer network, the use of this technology eradicates the need of intermediaries, such as banking institutions.
- **Operates within a trusted and reliable network:** Blockchain also ensures the accuracy of data by keeping complete copies of data chained together in chronological order. Decentralised blockchains are immutable and irreversible. This is to say any stored data, for example transactions and wallet balances, are permanently recorded and viewable to the public [21].

Therefore, in order to understand the concept of a blockchain business model, it is crucial to understand the definition and functions of blockchain and the applications of the technology in various business models.

A blockchain is an electronic ledger, a digital list of transactions of events [23]. This ledger is a shared database with no single user having control over the data – rather, all the users together

[24]. Once data is added to the ‘chain’, the mathematical structure of the ledger makes any changes to the data impossible, as it’s append-only.

Blockchain technology, by definition, offers three key benefits to its users (decentralisation, peer-to-peer interaction, and reliability). This is because blockchain provides a secure and reliable ledger of transactions or activities; enables efficient transactions or activities without intermediaries or a central controlling entity; and the high levels of data security and reliability of blockchain means machine agents can be integrated (e.g., nonhuman artificial intelligence bots in transactions) [25].

This public user-to-user structure removes many ethical concerns surrounding the companies that currently mediate financial transactions. No longer can a governing body control your capital freedom or legal counsel act in their best interest. Any user of a blockchain can act as they wish if they are within the parameters of the smart contracts.

4.2 Decentralised-Finance (“DeFi”)

Recent developments in blockchain technology are empowering a new paradigm in finance that revolves around decentralisation and disintermediation [26]. This means blockchain technology eliminates the need for intermediaries in financial transactions. This increases efficiency and speed, as well as decreases costs in financial transactions within DeFi.

As a result, this makes previously impossible business models in finance possible. This is mainly due to the “distributed trust” between individual networks (“peer-to-peer”) enabled by valid, immutable, and verifiable data recorded on activities, I.e., transactions [27].

Such decentralised features of DeFi have several implications on the new software business models within the rising industry, according to Chen and Bellavitis [26].

- **Innovativeness:** In traditional centralised platforms, the owners of platform mostly control access and revoke access to exert governance control [28]. However, decentralised platforms do not have a central, controlling party, which allows for open access and permissionless innovation, just like open-source software development model discussed above [29].

For example, decentralised cryptocurrencies and platforms such as Bitcoin and Ethereum, most representatively, publicly share their core technologies through permissive open-source licensing [26].

- **Interoperability:** Decentralised finance is built on public blockchains. Currently, Ethereum is the most dominant platform for DeFi, and Ethereum-based projects enjoy high interoperability [26]. This reduces barriers for users of DeFi to collaborate and conduct transactions.

- **Borderlessness and Transparency:** Furthermore, DeFi allows borderless financial transactions at low costs. This is advocated by the fact that blockchain technology's public ledgers through distributed consensus creates the source of truth and transparency.

With such characteristics, DeFi is certainly an area where the blockchain technology has fundamentally changed the software industry's business models. Major business models in the DeFi world include decentralised currencies, obviously, decentralised payment services, decentralised fundraising, such as ICOs, and decentralised contracting, i.e. smart contracts which are programmes that "automatically execute when pre-specified conditions in the protocols are satisfied" [30].

4.3 The Business of Security Tokens and STOs

Furthermore, one of the great new business models in the software industry that has emerged from the blockchain frenzy is tokenisation. Tokenisation refers to issuing tokens, known as security tokens, to denote equity for any liquid or illiquid asset including both digital and real-world entities. This equity can be of a company, decentralised autonomous organisation [31], or even real-world assets.

- Denoting ownership in this way allows smart contracts to manage properties such as who is allowed to purchase tokens, who is allowed to sell tokens, and when they are allowed to make these transactions.
- This means that, for example, SEC regulations can be baked into the program resulting in automated compliance for securities exchange platforms. This model can save millions of dollars in processing fees by removing the need for intermediaries such as lawyers and accountants.

Security Token Offerings (STOs) [32], often referred to as a mini-IPO, is when the initial security tokens are sold to the public at a fixed and pre-determined price. If the offering is successful, meaning the minimum cap has been met, then both the party selling the equity and the platform will profit.

- The most important use-case of STOs is crowdfunding [33]. Of course, existing systems for crowdfunding exist, however the implementation of blockchain technology allows investors to trust that their stake is recognised and protected on the immutable public ledger.
 - If a business project of any kind seems promising, they can 'tokenise' equity and run funding rounds through STOs. In this case, the public can invest small amounts of money to acquire hyper-fractional parts of the project. Accredited and non-accredited investors can participate in different types of offerings with varying degrees of freedom.

- Another use case is to liquidate existing assets [34].
 - For example, if a \$100m block of offices or apartments is failing to sell to an individual or institution, the real estate can be tokenised, and the public can buy small equity stakes (e.g., 1m individuals can each buy a \$100 stake and own 0.0001% of the property).
 - The advantages of this are access to a much larger capital pool and a reduction of wealth inequality as regular working-class people now have access to previously restricted investment opportunities.
 - A disadvantage of the model is deciding how the real-world asset will be managed and how rights will be distributed. This issue will vary in severity depending on the individual use case. A solution to this would be for the original owner to only tokenise a portion of the asset to raise funds and keep the rest of the equity retaining maintenance and management responsibilities.
- There are two levels to the business of security tokens. The first is the issuance of these digital assets and the second is providing infrastructure to allow users to interact with and control their holdings.
 - Platforms such as INX [35] take commission on trades made by users. The business model involves giving users as much freedom and power over their assets as possible to encourage platform activity. Companies like this can take commission on secondary trading volume of security tokens as well as on offerings if they are registered and licensed broker-dealers.
 - There are also platforms that offer tokenisation services such as Polymath [36]. Polymath will connect you to various service providers to allow individuals to tokenise their assets. Their platform interacts with the Ethereum blockchain and can deploy smart contracts tailored with their GUI to hold many types of offerings. Every aspect of the issuance can be customised with their platform including whitelisting and blacklisting certain types of investors. Polymath charges a fee to deploy each smart contract as well as for some customisation options.

5 Conclusion and Future Considerations

This report has achieved the following with regards to business models in software industry:

1. Defined the key elements of business models in software industry in the introduction.
2. Based on the definition outlined in the introduction, the content section of the report illustrated three types of business models that are already globally well-established and recently rising and disruptive.
 - (a) Commercial open-source business models.
 - (b) Targeted matching business models.
 - (c) Blockchain business models.

The analysis of the definition of business model in software industry and delving into three separate examples in the field has demonstrated the diversity of software business models. The room for creativity and the variation is gigantic and growing at a rapid pace in the software industry as new business models appear and mature models evolve.

To conclude, a key difference between traditional business models and software business models is that in software, the definition of stakeholders is becoming increasingly broad. Open-source and blockchain business models expose the product development process and database to the public. Companies with targeted matching business model base their operations on gathering data about the public. As such, we can conclude that the responsibility to behave ethically in the software industry not only belongs to businesses, but also software engineers and even the public. As the public become more engaged there is also increased demand on developers to produce higher quality software in shorter time frames. Agile and feature driven methodologies will continue to evolve as customers become more involved in the development process through either their participation or data. With the huge potential for further seismic developments in business models in software industry, accountability and integrity for both the industry and the public must be kept in mind to prevent unethical activities and transactions.

6 Individual Report

My individual responsibility for the report was to write the introduction section and to research and discuss the business models surrounding security tokens. Security tokens are an element of blockchain technology that I believe will transform the financial industry for the better. After reading countless articles and papers about the structure and application of equity tokens on a blockchain I put together the second half of the section on blockchain.

The group stayed in touch both over email and Microsoft Teams, updating one another on progress, notifying others of issues, and asking for help. Frequent phone calls both one-to-one and group calls allowed us to collaborate smoothly, remaining aware of and confident in our peer's current work.

Since Won and I worked together on the blockchain section, we had significantly more contact than with the other members. We kept on top of each others research via WhatsApp messages and multiple daily phone calls. Working simultaneously on blockchain-related business models enabled us to bounce off one another with ideas on what to research and what to discuss. It was also helpful keeping an informal conversation open sharing useful links to articles and unique decentralised finance protocols.

Overall I think our group managed collaboration extremely efficiently. The three different channels of communication (email, Teams, and WhatsApp) each played their part in keeping us in conversation. Email was used mainly to update the group on progress and to give feedback on our peers' sections. We used Teams to keep a log of what needed to be completed and WhatsApp for questions that could be answered quickly.

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