Final Report – Team Túlka

MS-E2177 Seminar on Case Studies in Operations Research

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1. Introduction

This section familiarises the reader with this business case and the project objectives.

1.1. Introduction to Túlka's business

The number of asylum seekers and immigrants is likely to increase in the future due to factors such as global warming, natural disasters and conflicts. Therefore, one of the key challenges in the future societies will be arranging the communication between people from different cultures without a common language and getting people from various backgrounds to understand each other. To provide a solution for this problem, Túlka, founded in 2016, has started to provide a mobile interpretation platform that allows anyone to reach a professional interpreter instantly. The company focuses only on cases requiring immediate interpretation and the service is crowdsourced from professional interpreters.

Driven by the macroeconomic trend, Túlka has grown significantly in the past year and is currently looking for ways to expand its business geographically. However, the company is concerned about how the expansion should be designed in order to reach its financials targets. In addition, Túlka is extremely interested in what kind of parameters are required to reach the financial targets, and hence in assessing whether the expansion is plausible. Our team was asked to address these questions.

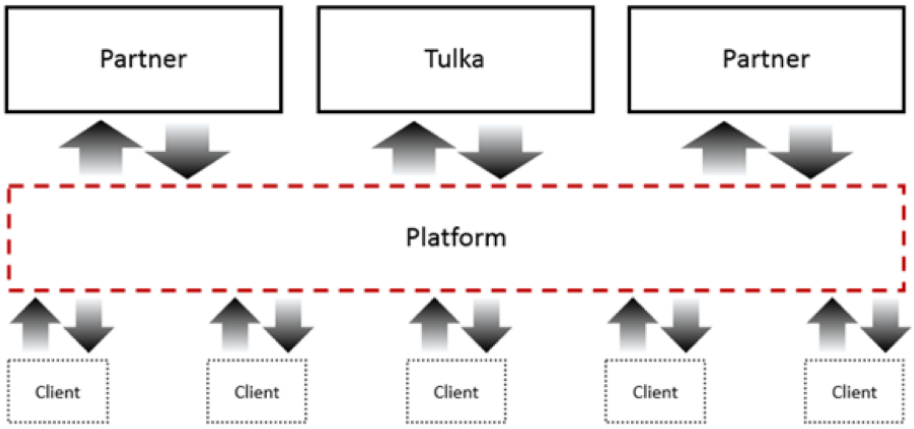

Figure 1. Illustration of the platform model

In order to address these questions, the fundamentals of Túlka's business should be understood. The current platform includes both Túlka's and its partners' interpreters. Additionally, other interpretation companies can join the platform and utilize Túlka's technology to serve their customers. However, the major benefit of the platform is the increased pool of interpreters, shortening the lead times and improving the capacity to answer to the demand. Figure 1 illustrates the current platform. The idea is that clients, needing an interpretation service, pass a request for interpretation by using an application. The request is routed to all of the interpretation service providers using the platform and, typically, the interpreter, who responds fastest, takes the request. However, in some cases there are exclusive customers and requests from these customers are routed exclusively only to certain partners.

Figure 2 illustrates the current revenue streams for Túlka:

1. Túlka serves its own clients. Typically, Túlka has brought these clients and, therefore, accounts for the majority of the current customers. The pricing is usually contractual with larger customers but otherwise the pricing follows standard pricing.
2. Túlka serves a partner's client. These clients have been brought by the one of the partner companies and, therefore, may have contractual pricing between the partner and its client. However, Túlka's interpreter may still serve these companies and, thus, take a fee from the service.
3. The partner serves Túlka's client. In some cases, the partners companies may be serving Túlka's clients. In these cases, Túlka charges the client, however, the partner company that had served the client charges a service fee from Túlka.
4. The partner serves its own client. In these cases, a partner company serves its own client and just uses Túlka's infrastructure. In these cases, Túlka charges a service fee from the partner, which is fixed.

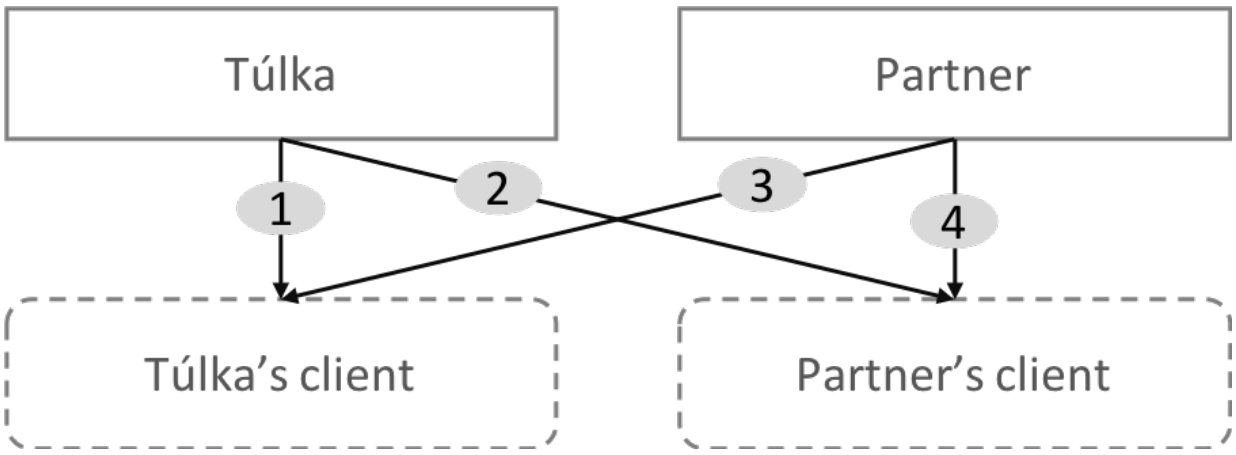

Figure 2. Combinations of interpretation service offering

1.2. Objectives of the project

Over the course of the project, the main objective was refined to build a profit and loss (P&L) model for Túlka to assess the outcome of different growth scenarios. The model will serve as a supporting tool in Túlka's decision-making process regarding the entry to new markets. The objective was iterated based on the feedback from the course staff, the opponent team and Túlka.

The idea is that the model takes estimated input parameters and uses them to create a financial scenario. Sections 4 and 5 explain the input parameters and the revenue and cost components which the input parameters affect respectively. The aim was to build a model that takes the input parameters for new markets on an aggregated level as well as for the Finnish market separately. The input sheets are linked to profit and loss calculations which are also automatically provided in the model. The Finnish and 'other markets' P&L calculations are aggregated to the Group -level. Finally, the model can be further extended and modified to include other market entities that are relevant to Túlka's business in the future. Alternatively, the market -sheets can be handled to present individual countries, but this could make the model unnecessarily complicated. The model was built iteratively based on Túlka's feedback.

The two sub-objectives whose completion have led to the final outcome are discussed briefly. First, the team acquainted itself with Túlka's business. This was done through in-depth discussions with the company personnel and by examining the provided data. Initially the team wished also to analyze the feasibility of the business, but this turned out to be rather unnecessary as Túlka has already proven the business model to work.

Second, once the functioning of the business was understood, the 2017 financial figures were attained through bottom-up calculations using the provided data on the number of interpretations, their durations, interpreter-, partner- and client information, pricing models and partner-specific pricing lists for the respective year. This gave the team the confidence in building the model correctly so that the model would correspond the business reasonably well for the purpose of predicting financial figures.

Lastly, each of us had personal objectives which were also successfully attained. We wanted to learn about the international expansion of a young start up as well as strengthen our management and communication skills. Our analytical skills also improved throughout the project.

2. Literature review

This section provides an overview of platform economy. More specifically it covers definitions of the terminology, discusses the users and complementary business partners, revenue generation, governance of platforms and the winner-takes-it-all mentality.

2.1. Definition of platforms

Many traditional companies have had difficulties in adapting to the changing world in recent years, when the technology and various business models have developed with unseen speed. Platform economy and ecosystems have been one very strong branch in this development and for example in 2015 five of the ten world's largest companies measured by market capitalization were strongly in the platform business. These companies were Apple, Microsoft, Google, Amazon and Facebook. (Zhu & Furr 2016) Even today, these companies are thriving in the listings. At the end of 2017 Apple, Google, Microsoft, Amazon formed the top 4 in the world's largest companies

with Facebook coming as sixth largest company. (Statista 2018a) Apple has for example made its App Store platform a huge success, which has allowed its devices to be among the world's most sold electronics devices. App store allows individuals to develop their own applications that for example the iPhone owners can then from there download and use. Apple has built many different features such as rating these applications into the platform, and we can see this kind of marketplace platforms in so many different forms. Sometimes the platform is a means to complement something else like in the Apple's case, but there are also more standalone marketplace platforms like Amazon. (Hagiu 2014; Zhu & Furr 2016)

Generally a platform can be defined as a good or system that provides technological architecture, which allows various types of users and complementary business partners to connect and benefit from the platform's functionalities (Suarez & Kirtley 2012). Most often, platforms are high-tech systems that have been recently developed and most of the largest platforms are just that, but platform as a concept has been around for a long time. Think of a gaming console from the 90s, which allows its users to play games, provided that the complementary business partners, who in this case could be the game developers, feel that the market for their contribution is great enough. However, the same logic applies the other way around as nobody would had actually bought the console, had there not been enough games available for it. This brings us to the key challenge for all of the platform businesses, that is how to attract enough users and complementors by providing motivation for both to participate and contribute to the platform (Eisenmann et al. 2006; Suarez & Kirtley 2012).

Attracting enough users and complementors is thus in the heart of the success of a platform, because there is not one without the other. In the beginning a platform business may have to for example subsidise both the users and complementors atop of the natural value exchange between the parties. The platform may have to form very close ties especially with its potential complementary business partners in the beginning of its journey. These partnerships may actually develop more into something of an alliance, which would actually play in the favour of the platform as these mutually beneficial situations could lock down the partner and hinder it from joining other platforms. This will be even more fruitful if the complementor sees the benefits that the platform could bring to its business and is willing and capable to contribute to

enhancing the functionality and features of the platform. (Eisenmann et al. 2006; Suarez & Kirtley 2012) For Túlka, the complementary business partners could play enormous role in their international expansion. These partners likely know their markets better than Túlka and could suggest how Túlka should approach the market with them. The challenge for Túlka is to provide strong enough image of its value to these potential partners so that these alliances could be formed.

Platforms are inherently multisided, meaning that there are different types of users and different types of complementary business partners. However, not every platform involves or should involve the same amount of different sides into its ecosystem (Hagiu 2014). Examples of sides in a social media context could be the individual users, advertisers and application developers. The benefit of increasing amount of different sides is that often they provide growth opportunities and new ways to expand the business even outside the original scope. There are however downsides to increasing the sides and complexity on the platform. One is that in certain cases the goals and wants of all sides do not meet and improving the standing of one, could hurt some other sides. This means that platforms have to strike the right balance between grasping at some growth opportunities and serving the core users and complementors without a compromise. (Hagiu 2014) Túlka is offering kind of a professional platform, in which the users of the interpretation service have a very clear view and picture on what they need and want from the service. In this kind of a platform, a clear and clean structure is necessary and there is likely no room for other sides to the platform than the buyers of the interpretations and the interpreters. Involving for example advertisers for already a paid service would probably have devastating consequences. However, if the business model evolved to include the consumer segment in addition to the current business focus, introducing other sides into the platform could be possible.

2.2. Platform monetization and governance

Platforms generate their money from the different sides involved in the platform. This means that a platform can potentially generate its monetary gains from multiple different sources with various logics. However, often the money is not generated equally between different sides. This means that sometimes platforms have to subsidize one or many sides on the account of other

side or sides. (Eisenmann et al. 2006; Hagiu 2014) There is an endless list of different pricing logics, but three basic principles are often present. First, the parties with less price sensitivity should be charged a higher price. The price sensitivity of each party is highly dependent on the availability of substituting alternatives to the focal platform. Thus, being able to create benefit and dependency increases pricing power. Second, charge the sides in proportion to the benefit that they receive from the platform. This is especially important when there are no priced transactions between different sides, like in for example Facebook, where the advertisers are charged quite heavily, but it is essentially free for individual users. Third, if the transactions between different sides are priced, then charge more from the side that can gain more value from the transaction. If for some reason, such as due to bargaining power, one side can benefit much more from a transaction that takes place through the platform than the other, the side with higher gain should be charged more by the platform than the other side to make it more equally beneficial for all. (Hagiu 2014) Túlka's platform offers clearly priced transactions. Túlka should make sure that the interpreting side finds its platform attractive and that its interpretation prices for the buyers are competitive. In addition, there should be a clear understanding of how much the interpreting side and the buyers perceive to gain value through the platform and make sure that there is sufficient balance in this equation.

Another extremely important dimension to the design of platforms is the employed governance model. Platform governance refers to the structure which defines who makes the decisions regarding different actions related to the platform. There are three different key perspectives regarding governance. First, the distribution of decision-making authority is in the heart of the platform management. The power can be divided differently between the platform owner, users and the complementary business partners. In some situations, the owner is responsible for all decisions and on the other end of the spectrum the owner merely maintains the platform based on the requests and decisions made by the users and complementors. Second, the level of control that the platform owner exerts over the platform participants defines much of the characteristics of the ecosystem governance. The control can take different forms and the owner can for example direct the complementary business partners in their actions through different more or less forceful means. For example, the owner can change the reward models to encourage

particular actions from the platform participants or, in more extreme cases, start to forcibly exclude participants, if they will not change their actions towards something that the owner wants. Third, the ownership of the platform is a major characteristic of the governance of the platform. The ownership of the platform can be shared between multiple stakeholders or it can be proprietary to a single firm. This obviously has a huge effect on how the decisions are made. (Hagiu 2014; Tiwana et al. 2010) Túlka's governance model could be considered to be among the tighter ones. This can be seen in that Túlka, for example, chooses who can participate to its platform. This is understandable, taken the nature of the interpretation industry, where official qualifications are needed to ensure quality of the interpretations.

2.3. Winner-takes-it-all mentality

There is an extremely important underlying phenomenon that is central in much of the platform economy. The winner-takes-it-all mentality is widely discussed and even though there are also numerous examples of how the "preliminary" winner has been dethroned, there are still extremely strong cases, where the winner totally dictates the market. (Ruutu et al. 2017) For example, in the UK Facebook's market share remains at over 70% even in January 2018 well over 10 years after its launch (Statista 2018b). Similar examples can also be found from many other sectors than social media. Compelling examples include Alibaba and Amazon, which have been able to leverage their early gained mass on further strengthening their position in the market (Hagiu & Rothman 2014).

Eisenmann et al. (2006) argue that the competition between platforms is even more furious than it may with other types of business models due to the winner-takes-it-all mentality. They argue that this mentality is likely to apply if three conditions hold for the focal networked market. First, the cost to use multiple different platforms is high for at least one user group or to a significant complementary business partner. This means that it would for example be technologically or timewise difficult or expensive to operate on / with many different platforms for a participant. We can for example to some degree see this on mobile applications, where some developers have chosen to only develop their applications to iOS or Android – this was especially the case some years ago. Second, there are strong benefits to the users, the complementary business partner or both from large volume of the other. This situation is at the core of creating a situation,

in which only the players with enough mass can survive and probably only the one with most volume can be successful on the long run. When there is enough volume on both the user side and the complementary business partner side, there is likely less need to subsidise either side, because both can benefit enough already. This creates a sustainable business. Third, none of the platform participants have significant a need for special features or differentiation. This means that a platform can gain the critical volume with rather standard features, that are generally suitable for all potential parties. However, if there are more diverse needs from the participants, then it may be that are opportunities for other platforms to provide their solutions to address them. At least initially it may not be beneficial for a platform to try to meet too diverse needs, because the likelihood to meet the needs of the core participants may be compromised. (Eisenmann et al. 2006; Ruutu et al. 2017) In this kind of situations the benefits of being the first one to gain the crucial mass are huge and many companies have been able to set themselves on a sustainable growth path by being the first mover in the right way. The same possibility is there for Túlka to take, as the market for their business is still quite undeveloped.

However, the first mover advantage in platform economy is considered overstated by some and the preliminary winner can also be dethroned (Hagiu & Rothman 2014; Suarez & Kirtley 2012). As with any business model there are also downsides with platforms on being the first to enter a market with serious scale. With platforms the greatest difficulties have to do with finding the best way to monetize on the transactions that the platform enables. Hagiu and Rothman (2014) describe how entering the market in a phase when the potential participants do not yet understand the benefits of the platform can prove to be costly and drain resources, leaving the early mover vulnerable to future competition at a more mature time. Timing is important with platforms, too, and the right time is not always the earliest possible opportunity to enter the market. (Hagiu & Rothman 2014) Suarez and Kirtley (2012) claim that dethroning an established platform can be difficult, but it is quite possible. They highlight four success factors on taking over a market from a winning platform. First, it is important to find a segment of platform participants, who are not entirely satisfied with the status quo. In this kind of situation, the prevailing platform cannot offer the features that some of its users would need and there would be room for a different kind of a platform with different features. By first meeting the needs of these

underserved participants, one can create a foundation for expansion. Second, using existing platforms to boost the growth of another platform. This means that the player who seeks to dethrone a platform in a sector can benefit from its other platforms employed at different sectors. The synergies could be found from e.g. technology or even from the participants of the existing other platforms. By creating complementing elements between different platforms, a player can create substantial value to all of the participants of the platform. Third, envisioning what the platform participants may want in the future and in a visionary manner answering that need before the established player has done so, can give momentum to the new player that the old one cannot counter. This is risky game and requires a lot of vision but can prove to be extremely lucrative if performed correctly. Finally, making the business simpler for the complementors than what the established platform has been able to do. By winning the potential complementary business partners a player can totally change the course of the game. As discussed above at length, the platform needs different sides to attach to it to make it really work. Thus, providing more benefits to a critical participant is a tremendous starting point for a new entrant. (Suarez & Kirtley 2012)

3. Modelling process and structure

This section describes the profit and loss modelling process and structure.

3.1. Data gathering

Due to the nature of the project, we needed data from various activities in order to be able to model Túlka's business thoroughly. The data set consisted figures from both sales and cost activities. The data was collected from Túlka's databases and meetings with Túlka's management.

3.2. Revenue activities

To model the revenue streams, we received an Excel file containing all of the transactions Túlka had made in 2017. The data included the following parameters: starting and ending times of the interpretations, the date of the interpretation, time before the request was answered, language, and customers. To calculate the revenue from the interpretation service, we received the pricing

models of the customers. In addition, Túlka is selling licenses, thus, we received the numbers and pricing of those as well. Túlka's management also provided us their financial targets.

3.3. Cost activities

Túlka's costs can be divided into fixed and variable costs. To model the variable costs, we received the invoicing information of freelancer and payroll interpreters as well as the fee information of the partner companies. For fixed costs, we received the estimations from the management about the employee, new office establishment, marketing, and rent costs.

3.4. Designing the model

P&L model is a well-founded way to build understanding of feasibility in business expansion. It also helps to structure the fundamentals and the dynamics of a business. Thus, a P&L model is especially suitable for our project as the objective was to estimate the feasibility of expanding Túlka's business into new markets and evaluate the parameters required for a successful future expansion. As the market is still immature and there is no real competition yet, Túlka can be perceived as a standalone player, which has the potential to capture quickly a large market share of the existing market. Therefore, as we can assume that "winner takes it all" applies also to the interpretation platform industry; the survival of a player is rather binary, thus, a P&L model does not necessarily have to take into account the possible competitors reactions.

The core idea was to build a model that could define what would be required businesswise to achieve the financial goals. In addition, the model can help understand what effects the different components have on the top and bottom lines and how they are related. The model helps assess the different ways of designing the expansion and evaluate the decisions behind them. In other words, the model provides reasoning for strategic decision-making and helps assess whether or not the growth plans are realistic and achievable.

Figure 4 illustrates the relations between different business components as well as the inputs and outputs of the model. The inputs can be generally divided into two categories; revenue inputs and cost inputs. Revenue inputs include typically the quantity and price of a certain revenue stream and the different streams eventually sums up to total revenue. On the other hand, variable costs take into account the number of interpretations, which are multiplied with

corresponding costs and fixed costs basically sum up the fixed costs. Fixed and variable costs are subtracted from the revenue resulting EBITDA.

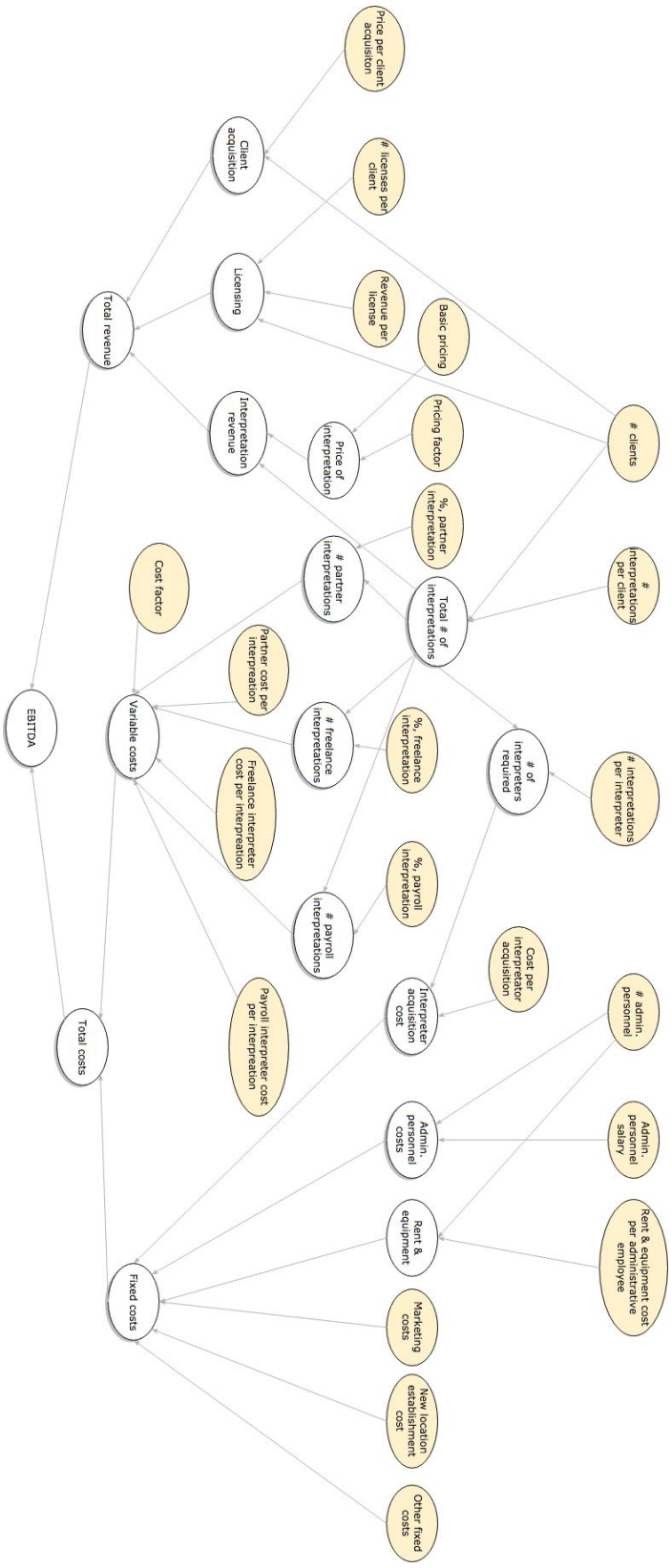

Figure 4. Relationships between the nodes in the financial model

4. Model implementation

This section describes the profit and loss model components in greater detail. It also introduces the modelling of the demand and interpreter activity. We built our P&L model based on the interviews with Túlka management and the data provided by them.

4.1. Revenue modelling

In the model, the total revenue is the sum of three different revenue components. These revenue components are assumed to cover all revenue streams of Túlka's business. The equation for the total revenue is presented below.

$$TR = R_{interpretation} + R_{licencing} + R_{client\ acquisition}$$

The first revenue component, revenue from interpretation, represents the revenue from the interpretation business. The revenue depends on the pricing model, the relative share of differently priced calls and the total number of calls. It is assumed that the pricing model is either a staircase model, which is currently used, a linear or a constant model. The model gets the relative shares and prices as inputs. The equations are stated below

Constant pricing:

Constant pricing model means that the price per hour is a constant value and is not dependant on the duration of the interpretation. Total revenue is calculated as follows:

$$R_{interpretations} = n_{interpretations} \sum_{i=1}^{3} s_i d_i P_i$$

where $n_{interpretations}$ is the total number of interpretations, s_i is the share of interpretations for each interpretation type (basic, premium or discount) ($s_1+s_2+s_3=1$), d_i is the average duration of interpretation for each interpretation type and P_i is the fixed price level (€/h) for each interpretation type.

Linear pricing:

Linear pricing means that the price level is linearly dependent (decreasing in this case) on the duration of the interpretation. The total revenue with linear pricing is therefore:

$$R_{interpretations} = n_{interpretations} \times \sum_{i=1}^{3} \left(s_i \times \int_0^{\infty} f(x) P_i(x)\, dx \right)$$

where f(x) is the probability density function for interpretation duration, $P_i(x)$ is the linear pricing function for each of the three interpretation types and s_i is the share of interpretations for each interpretation type.

The total number of interpretations done through Túlka's platform is defined as the number of clients and the number of interpretations per client. The equation is

$$n_{interpretations} = n_{clients} \times n_{interpretations\ per\ client}.$$

Based on our analysis, the distribution of interpretation duration for the linear pricing follows a gamma distribution. Gamma distribution is a continuous distribution function with parameters shape (α) and rate (β). Probability density function for gamma distribution is

$$f(x) = \frac{x^{\alpha-1} e^{-\frac{x}{\beta}}}{\beta^{\alpha}\Gamma(\alpha)}.$$ (Statistics How To 2018a)

We estimated the shape and rate parameters with transaction data from 2017 and the estimated values are 1.25 and 0.0011 respectively. The fit with this distribution was examined with R, and the fitting plots are shown in Figure 5.

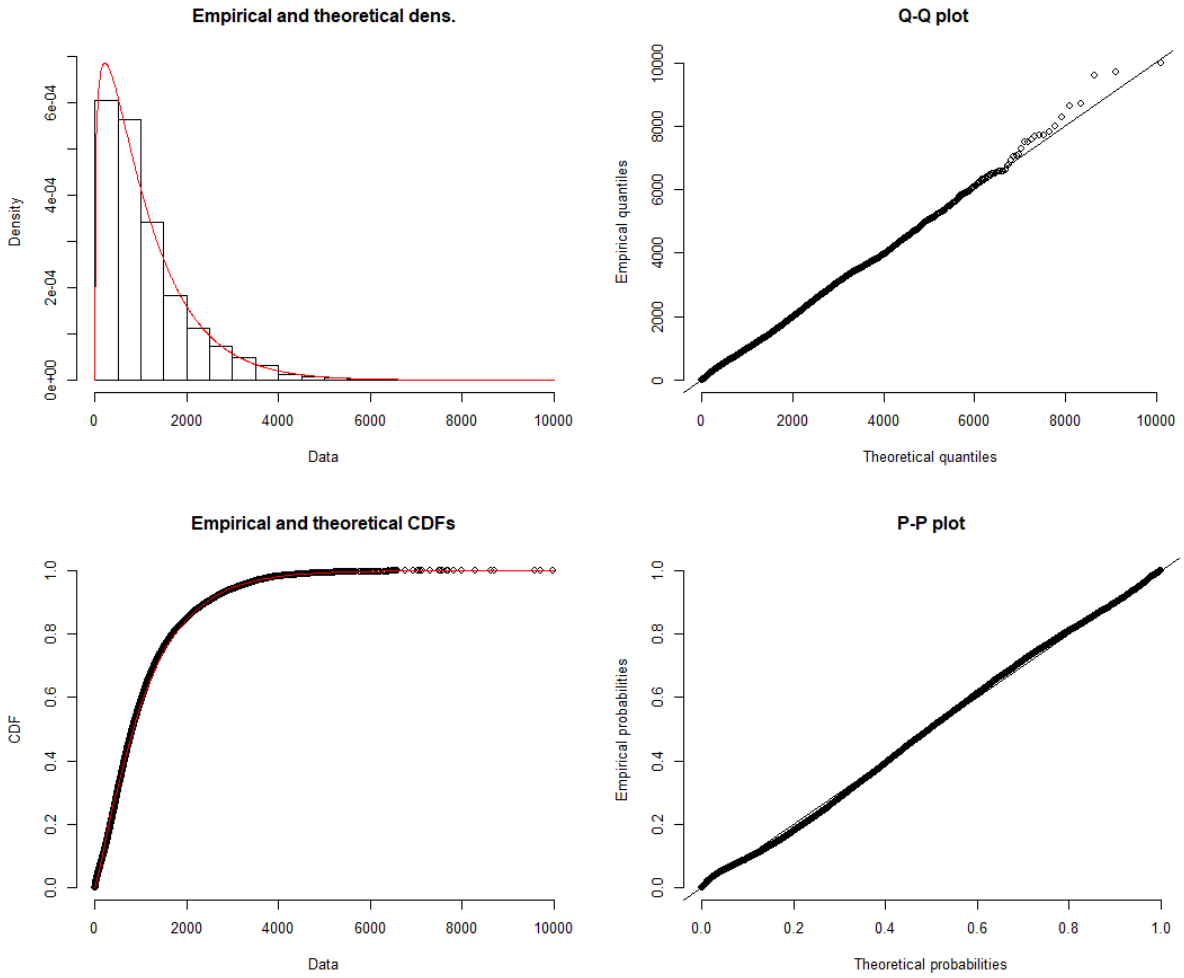

Figure 5. Fitted plots for Gamma distribution

The theoretical distribution is not implemented in our model, at least for now. We have used a discrete distribution which is derived directly from 2017 data. We will discuss with Túlka whether they want to use theoretical distribution or not. However, now that we have identified the distribution and the function for revenue it is easy to implement if necessary. The choice between the two options will not make a large impact to the model output so it is only a minor detail.

Staircase:

Table 1. Example of staircase pricing for 2018

Duration	Basic	Premium	Discount
under 5 min	10	12	10
over 5 - 10 min	15	18	12
over 10 - 15 min	25	30	16
over 15 - 30 min	37	44	28
over 30 - 45 min	55	66	43
over 45 - 60 min	60	78	47
over 60 min	65	78	55

The revenue from the staircase pricing is calculated as follows

$$R_{staircase} = \sum_{i=1}^{7} P_{i,Basic} n_{interpretations} p_{i,Basic} + \sum_{i=1}^{7} P_{i,Premium} n_{interpretations} p_{i,Premium} + \sum_{i=1}^{7} P_{i,Discount} n_{interpretations} p_{i,Discount}.$$

In the staircase revenue, the total number of interpretations is divided into basic, premium and discount prices. The respective and relative proportions (p) of these price-categories for each duration range are calculated based on 2017 data. P is the price of the interpretation for the respective duration-range and price-category. Table 1 shows an example of a staircase pricing matrix.

In the model the price of the interpretation is also affected by a pricing factor, that defines the multiplier for the basic prices, enabling opportunity to examine the effects of different price levels on the figures. The r is the pricing factor in the equation

$$P_i = P_{basic} \times r.$$

The average number of clients for a year is estimated to be the linear mid-point between the number of clients at the end of the year and at the end of the previous year. Thus, the subtraction of these end-of-year number of clients is divided by two and the result is added to the end of year client count from the previous year. The equation is

$$n_{clients,t} = n_{clients\ year\ end,t-1} + \frac{\mathrm{n}_{\text{clients year end,t}} - n_{clients\ year\ end,t-1}}{2}.$$

The second revenue component is revenue from licensing. The logic with the licenses is that customers need to pay a fixed fee for each account they wish to have. Therefore, revenue from the licenses is the product of the average number of licenses per customer, average number of customers at time t and price per license. The equation is

$$R_{licensing} = n_{license\ per\ client} \times n_{clients\ on\ average,t} \times P_{license}.$$

The third revenue component is revenue from client acquisitions. The idea behind this is that customers would have to pay a certain initial fee in order to join the platform. The revenue from this activity is calculated by multiplying the number of new clients with the price of the initial fee. The equation is

$$R_{client\ acquisition} = \left(n_{clients\ year\ end,t} - n_{clients\ year\ end,t-1}\right) \times P_{client\ acquisition}.$$

4.2. Cost modelling

Túlka's total costs consist of variable and fixed costs.

$$C_{total} = C_{variable} + C_{fixed}$$

The following equation describes Túlka's variable costs which are derived from the interpreter costs. Túlka advised that other variable costs are so minimal that they do not have to be included in the model. Thus, variable cost is defined by the cost that the interpreter takes in the transaction. Three different parties can perform the interpretation: an interpreter from Túlka's direct payroll, a freelance interpreter or a partner company's interpreter. The cost from each of these potential parties can vary and thus Túlka's total variable cost is the sum of the costs caused

by each of these three interpreter parties. Túlka pays their interpreters or their partners according to their staircase model and that has been implemented into our model. The variable cost equation is

$$C_{variable} = n_{payroll\ interpretations} \times C_{payroll\ interpretation} + n_{freelancer\ interpretations} \times C_{freelancer\ interpreation} + n_{partner\ interpretations} \times C_{partner\ interpretation}.$$

The number of interpretations performed by each of the three interpreting parties are defined through equations B, C and D. In equation B, β defines the share interpretations performed by Túlka's partner company's interpreters. In equation C, α defines the share of interpretations performed by freelancer interpreters. The rest of the interpretations fall to Túlka's payroll interpreters. The equations for number of interpretations per interpreter party are

$$n_{partner\ interpretations} = n_{interpretations} \times \beta$$

$$n_{freelancer\ interpretations} = n_{interpretations} \times \alpha$$

$$n_{payroll\ interpretations} = n_{interpretations} \times (1 - \beta - \alpha).$$

Túlka's fixed cost consists of six components. The cost of acquiring and interpreter, admin personnel costs, rent & equipment costs, marketing costs, new location establishment costs and other fixed costs are all inputs that can be entered into the model based on Túlka's estimations. The fixed costs equation is

$$C_{fixed} = C_{interpreter\ acquisition} + C_{admin\ personnel} + C_{rent\ \&\ equipment} + C_{marketing} + C_{new\ location\ establishment} + C_{other\ fixed}.$$

The number of interpreters required drives the total interpreter acquisition cost. This cost only applies for interpreters that Túlka directly acquires to their own payroll. This cost occurs when Túlka has to certify and validate interpreters to serve clients such as government officials who require certain certifications. Depending on the share of interpretations carried out by freelancers and partner interpreters, the need for these acquisitions is defined. The increase in total interpreter capacity requirements derives from the difference of interpreters needed this

year and the previous year. However, as described above only the payroll interpreter acquisition triggers the cost. The equation is

$$C_{interpreter\ acquisitions} = \left(\max\left(n_{interpreters\ required,t} - n_{interpreters\ required,t-1}, 0\right)\right) \times (1 - \alpha_t - \beta_t) \times C_{average\ per\ interpreter}.$$

The total amount of interpreters required to meet the demand is the total amount of interpretations done through Túlka's platform divided by the number of interpretations performed by an interpreter. The equation is

$$n_{interpreters\ required} = \frac{n_{interpretations}}{n_{interpretations\ per\ interpreter}}.$$

The number of interpretations per interpreter is inputted manually and for testing the model we have calculated that parameter from the data in 2017. However, there can be a need to adjust that parameter manually if the nature of the interpreter pool varies when expanding in new countries.

In the model the number of employees is inputted manually. Administrative personnel consist of all employees other than the interpreters working for Túlka. The total fixed cost caused by administrative personnel is derived from the number of these employees and their salaries. The equation is

$$C_{admin\ personnel} = n_{admin\ personnel} \times C_{average\ admin\ salary}.$$

Rent and equipment cost is calculated based on the number of administrative personnel, with an estimation of the costs inflicted by an employee. The equation is

$$C_{rent\ \&\ equipment} = n_{admin\ personnel} \times C_{rent\ \&\ equipment\ cost\ per\ administrative\ employee}.$$

Finally, the earnings before interest, taxes, depreciation and amortization (EBITDA) is calculated in the model by subtracting total costs (variable costs + fixed costs) from total revenue. The equation is

$$EBITDA = R_{total} - C_{total}.$$

4.3. Other cash flow components

The model also includes other cash flow components that can be inputted manually. Those components are investments in tangible and intangible assets, dividend, refund and debt. They are all set to zero in our scenario testing.

4.4. Demand modelling

Even though Túlka is currently capable of responding to almost 98 percent of the demand, it has to be taken into account that the demand is concentrated into few peak hours between 10 am to 3 pm. The figure 6 illustrates the demand and different distributions that could model it.

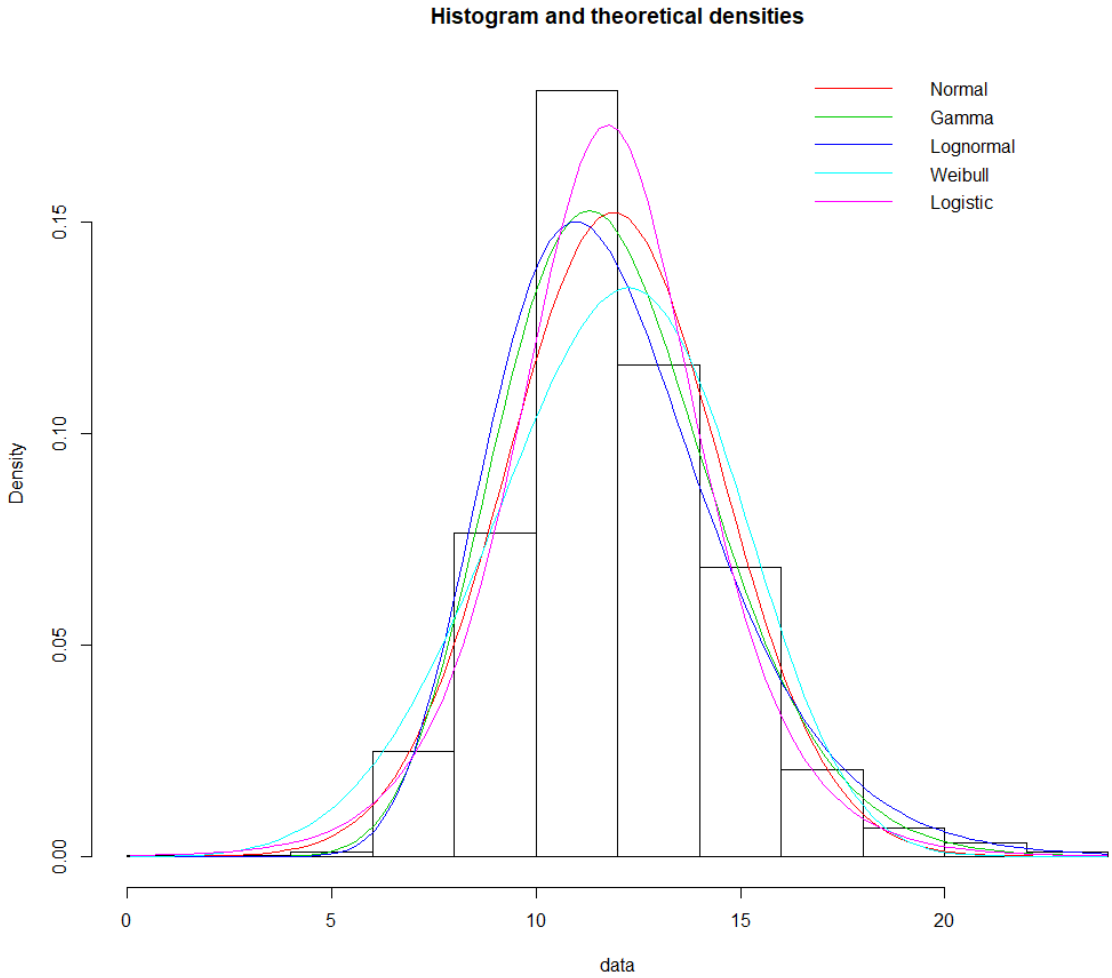

Figure 6. Interpretations by hour

Based on our analysis the demand can be modelled with Gamma, Normal or Logistics distributions. Figures 7, 8, and 9 illustrate the fit of these different distributions. Normal distribution is a symmetric and continuous distribution and probably the most common distribution used. It has two parameters: mean (μ) and standard deviation (σ). Mean is the value with the highest probability and standard deviation describes how much the other values vary from the mean. Probability density function for normal distribution is

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$. (Encyclopedia Britannica 2018)

Logistic distribution is a symmetric and continuous probability distribution and it is very similar to a normal distribution. It has two parameters: location (μ) and scale (σ). Probability density function for logistic distribution is

$$f(x) = \frac{e^{-\frac{(x-\mu)}{\sigma}}}{\sigma\left(1+e^{-\frac{(x-\mu)}{\sigma}}\right)^2}$$. (Statistics How To 2018b)

Our analysis suggests that the parameters for the different distributions could be the following:

- **Gamma:** shape (α) of 19.90 and rate (β) of 1.67
- **Normal:** mean (μ) of 11.89 and standard deviation (σ) of 2.62
- **Logistic:** location (μ) of 11.76 and scale (s) of 1.44

Figure 10 shows that the distributions of different week days are similar and the demand during weekends is relatively little, thus same distributions can be applied to all week days.

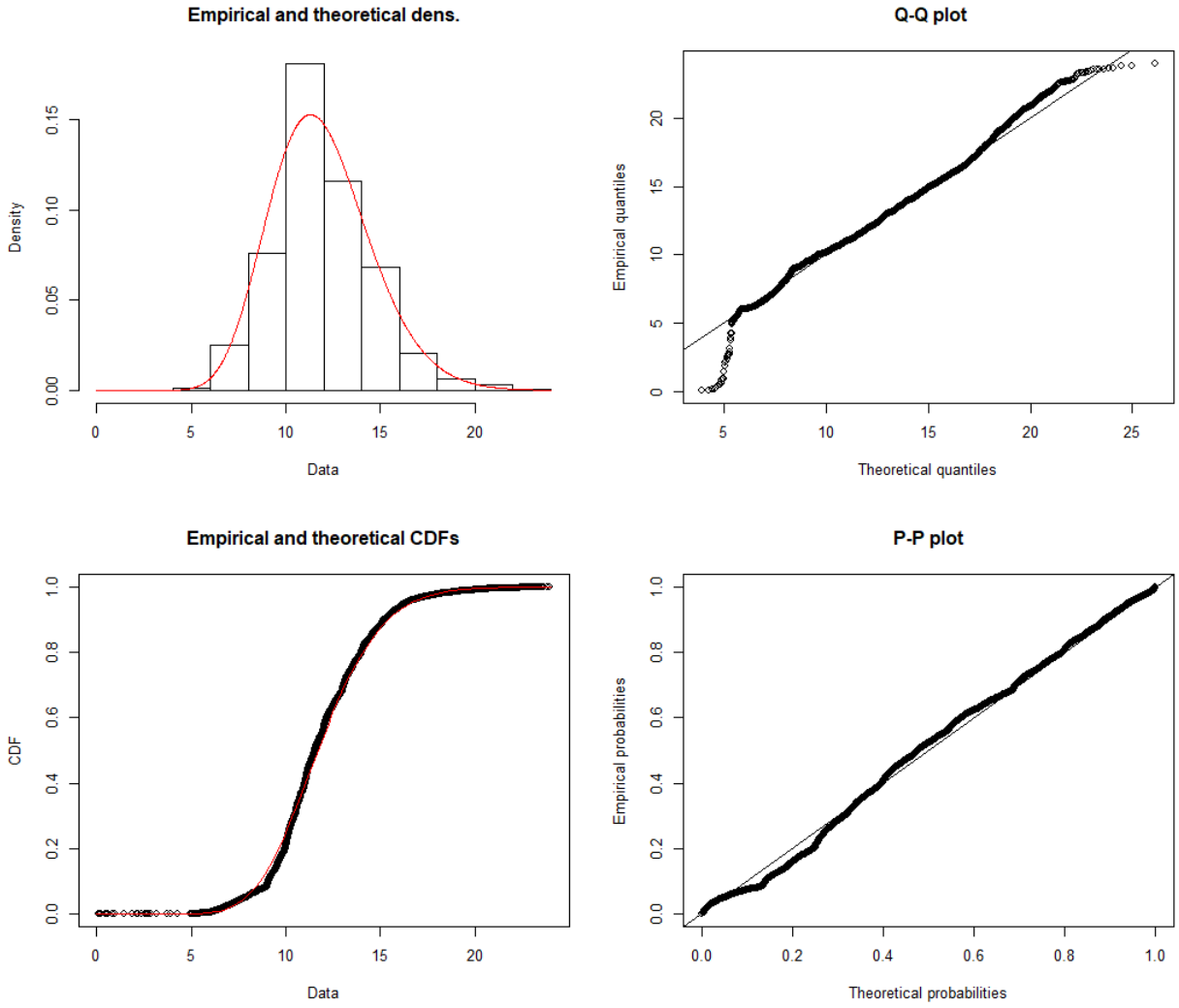

Figure 7. Fitted interpretations per hour for Gamma distribution

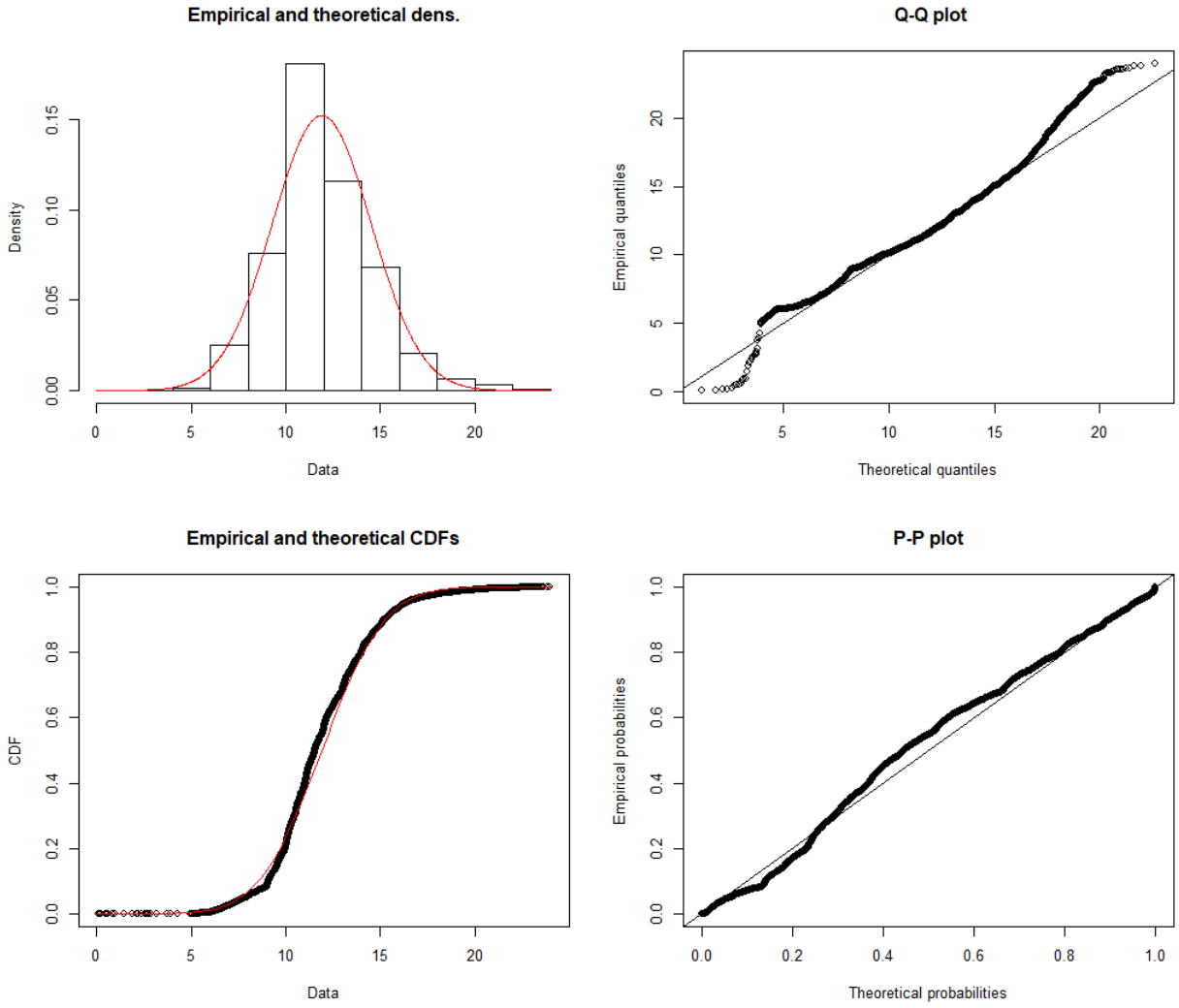

Figure 8. Fitted interpretations per hour for Normal distribution

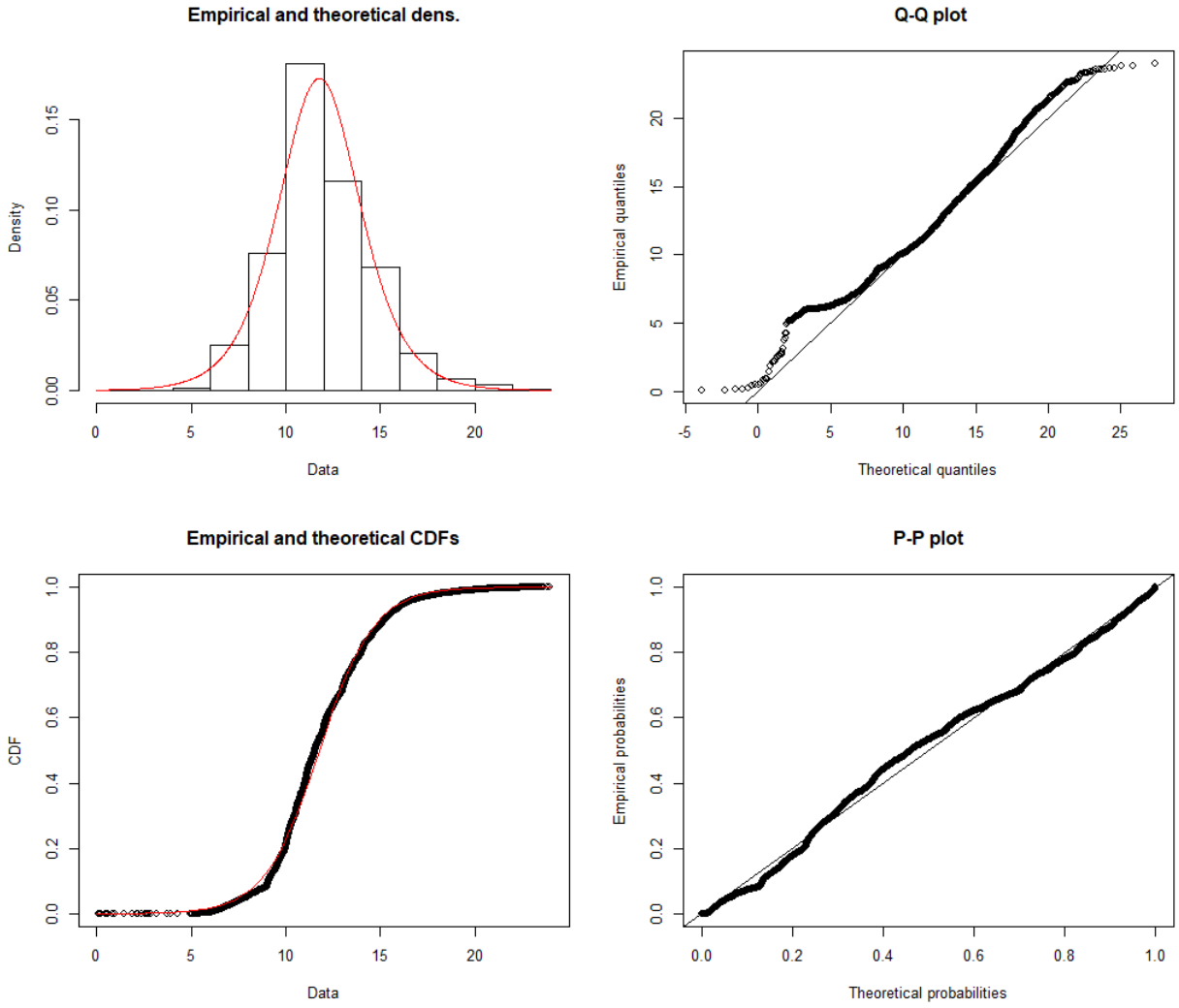

Figure 9. Fitted interpretations per hour for Logistic distribution

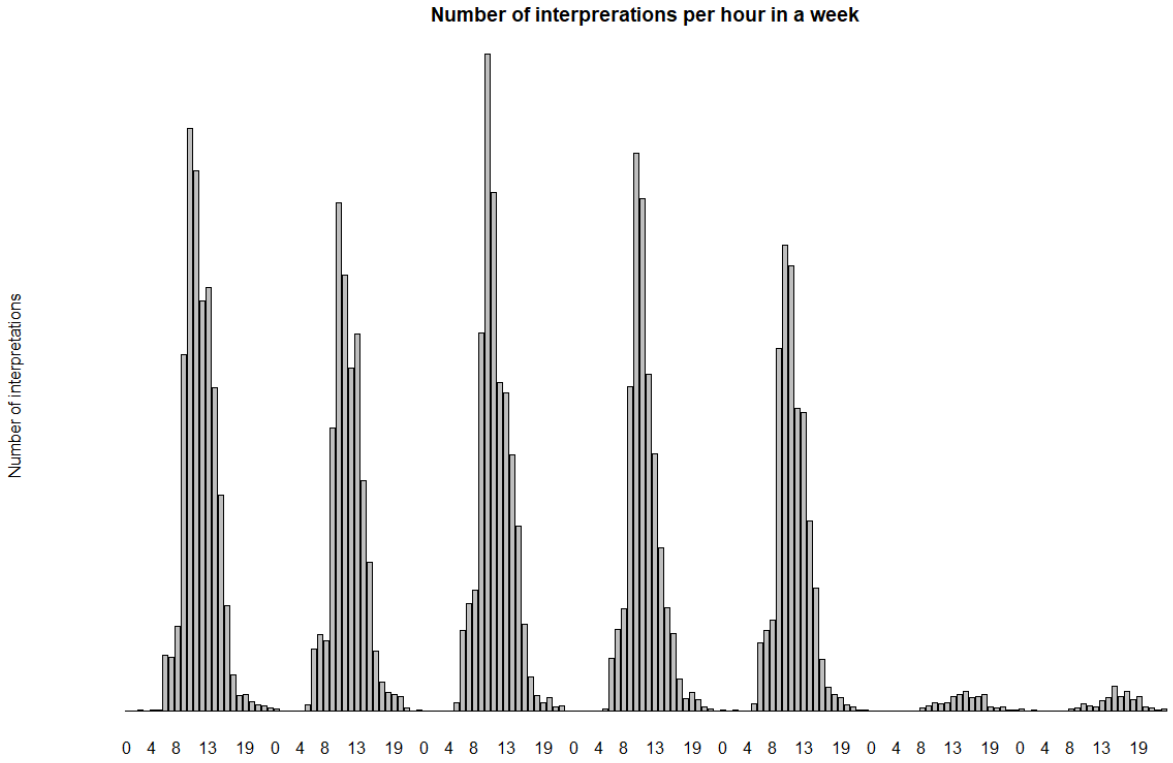

Figure 10. Demand per week day

4.5. Interpreter activity modelling

In order to model how effective an individual interpreter is, we fitted the activity of Túlka's interpreters to different distributions. Figure 11 illustrates the interpreter activity showing that majority of the interpreters respond to less than 50 requests per month. However, the most active interpreters may respond to nearly 200 interpreter requests a month. Based on our analysis the best way to model an individual interpreter is a Weibull distribution with the following parameters: scale (λ) of 27.10 and shape (*k*) of 0.76. Figure 12 shows the fitted values. Weibull distribution is a probability distribution with two or three parameters: shape (γ), scale (α) and sometimes location (μ). It is commonly used in many fields such as engineering, biology and economics. Probability density function for the two-parameter Weibull distribution is

$$f(x) = \frac{\gamma}{\alpha}\left(\frac{x}{\alpha}\right)^{\gamma-1} e^{-\left(\frac{x}{\alpha}\right)^{\gamma}}$$. (Statistics How To 2018c)

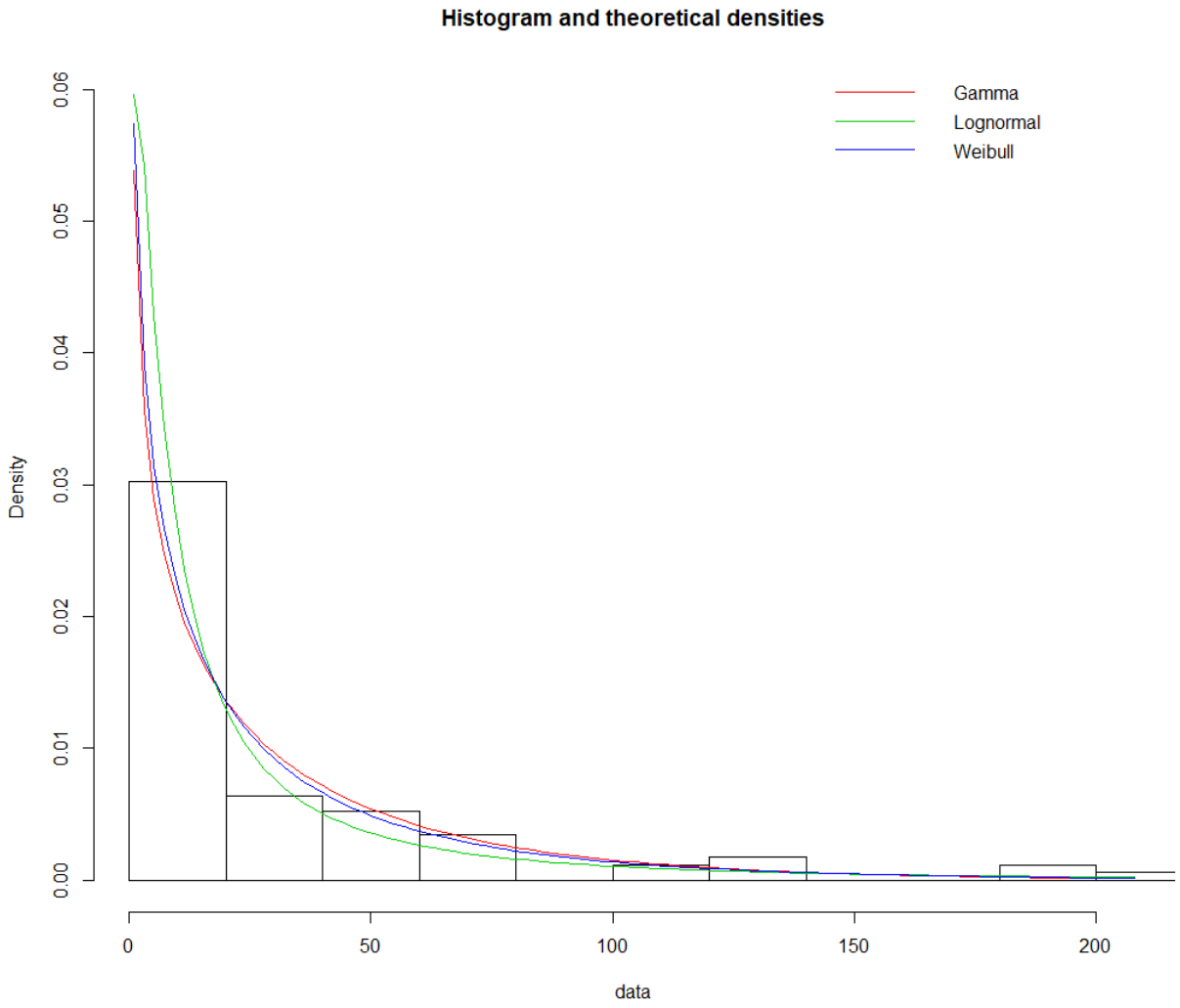

Figure 11. Histogram of the activity of Túlka's interpreters

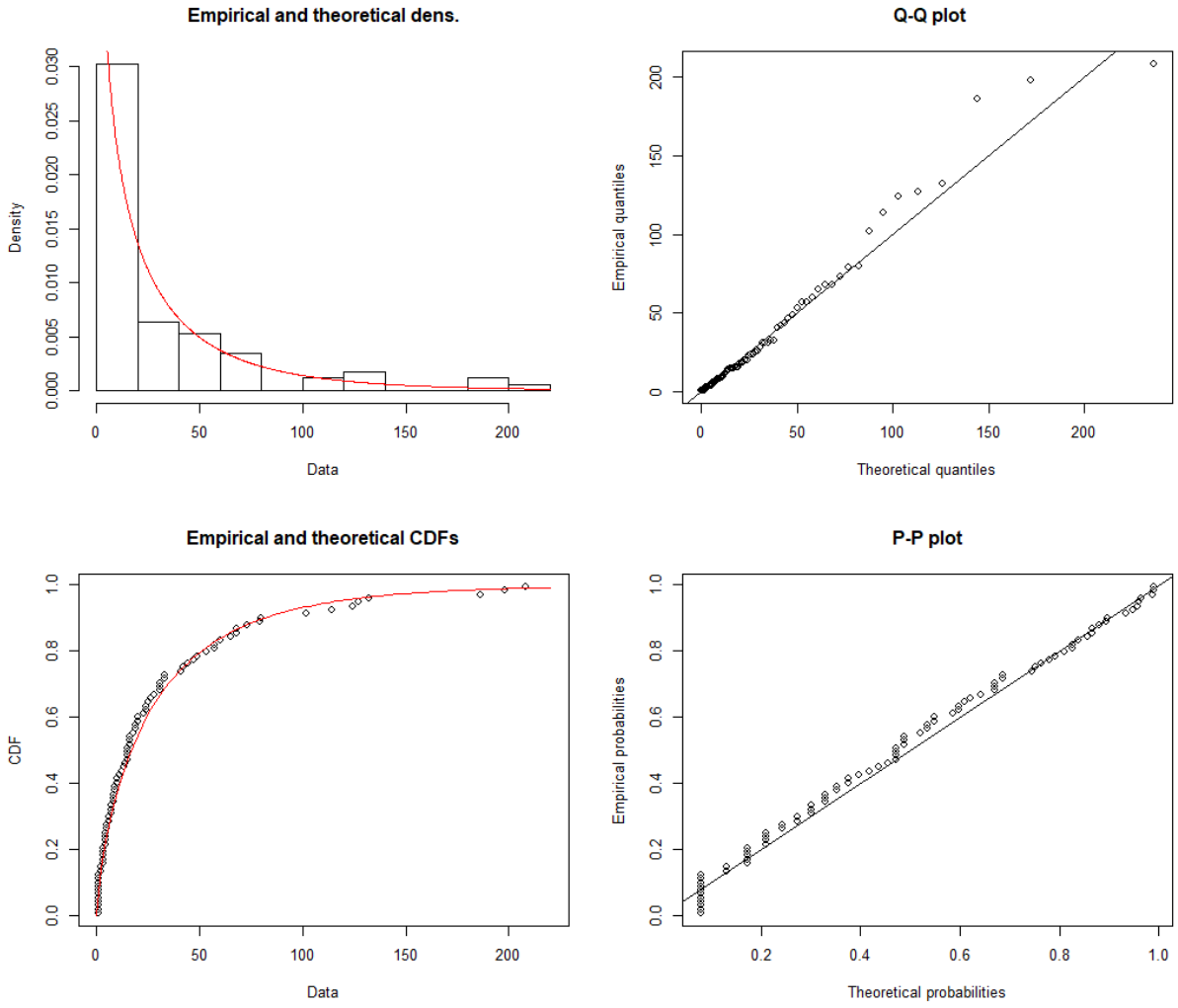

Figure 12. Fitted interpretations per interpreter for Weibull distribution

4.6. Outputs and testing the model

The model produces a P&L and cash flow statement for the next six years. It is calculated for group level as well as for the new countries only. The reason behind this is that the user can be interested in the financial impacts from both perspectives. An example of the model output is presented in Appendix 2.

We tested the model with three scenarios. Basic input parameters were selected based on the data from previous year and by asking Túlka management for their opinions and best guesses. We also had three varying parameters that were modified for creating scenarios. The parameters were price level, variable cost level and number of clients. In the first scenario we had a higher

price level but lower number of clients. In the second scenario we had a lower price level but a higher number of clients. And finally, in the third scenario we had a lower cost level. Selected parameters for the scenarios are presented in Table 2.

Table 2. Modelling scenarios

Scenario	Price level	Variable cost level	Number of clients 2023 in new countries
S1	High	Normal	Low
S2	Low	Normal	High
S3	Normal	Low	Normal

These scenarios resulted in several outputs. We were mostly interested in the group level revenue and EBITDA because those financial measures were the targets that we discussed with Túlka and the scenarios were created by trying to reach them. Group level revenue and EBITDA for next six years in each scenario is presented in Figure 13.

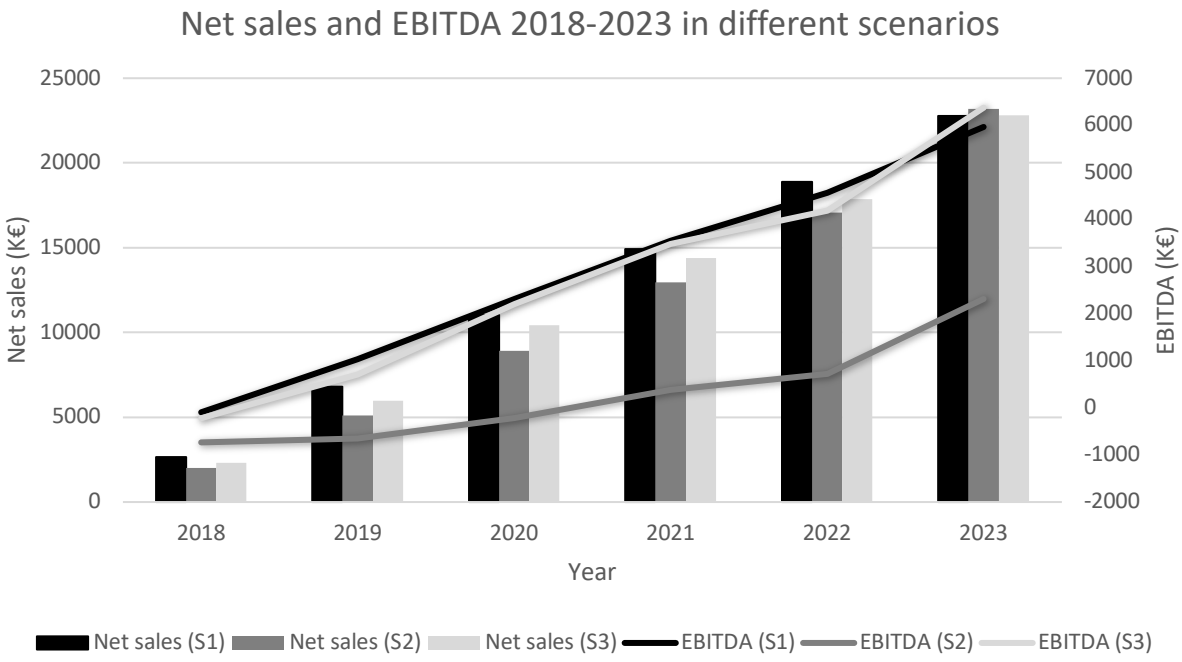

Figure 13. Group level revenue and EBITDA for three scenarios

Based on the results we can say that the early financial targets can be met with the given parameters and the business seems profitable in the future if the parameters are rational. However, the EBITDA in the second scenario is much lower than in other two scenarios and it takes more years to make the business profitable. The reason for that is the fact that the price level compared to variable costs is lower than in the other two scenarios. Therefore, it is important that the margin between interpretation revenue and variable costs remains as good as it is currently. Otherwise Túlka may find it hard to generate enough profits for the shareholders and getting the company profitable.

One interesting output of the model is also the number of interpreters required for reaching the modelled business case. The potential interpreter pool can be limited and for that reason the needed interpreter supply is an interesting measure for Túlka for evaluating if the planned expansion is feasible. The number of interpreters in our scenarios is presented in Table 3.

Table 3. Number of interpreters in each scenario

Scenario	Number of interpreters required in new countries in 2023
S1	1146
S2	1862
S3	1433

The required interpreter pool seems feasible based on our discussions with Túlka. Our scope of the project did not include any research about the size of a potential interpreter pool in new countries and we need to rely on the company's opinion.

4.7. Recommendation for the next steps

Based on our model and the scenarios described above, we can state that the expansion seems to be feasible, and business seems profitable with the given parameters. The next question would be to find out if the input parameters used in the model are feasible as well.

One important input parameter that defines whether the business can meet the targets is the number of clients in the future. Demand for interpretation platform seems to be real but there are other factors that may limit the number of clients. One of the key issues is of course the competition. If the competitors are or become stronger in other countries, the potential number of clients for Túlka can be lower than expected. This is the case especially in platform business where the strongest player can capture a major part of the market share (winner-takes-all thinking). The competition can also reduce the profitability of Túlka's operations. If the margin between interpretation revenue and costs is lower than expected, it will take more time to make the company profitable.

As a recommendation, we can say that Túlka should expand first to a few countries where they see a real demand to gain a critical mass for making the company profitable and then continue expanding. With our model they can evaluate the financial targets as well as fine-tune their operational parameters such as pricing models, price and cost levels or type of interpreters.

5. Discussion

This section concentrates on assessing the validity of the results and the impact of the project.

5.1. Validity of results

The results have been discussed with the contact person at Túlka. The deliverable model is sufficiently accurate and its use to support discussions with a possible third-party financier is being considered. The model is not exhaustive in terms of detail; however, a valuable feature of the model is its modifiability. The model could be improved for instance with Monte Carlo simulations for simulating demand and supply distributions.

In addition, new entrants in the market have not been considered, but this could be taken into account by adjusting the number of clients for both the domestic as well as foreign markets for each year. Furthermore, as the expansion of the business takes place in the future, the validation of the model is necessary for further iteration and improvements to increase the accuracy and thereby the reliability of the model. For instance, the ratios such as number of interpretations per number of clients, number of interpretations per number of interpreters and number of

licenses per client should be updated as they are currently based on the provided 2017 data. The model could be possibly modified to have these ratios for Finland and the rest of the world separately. If the accuracy is not satisfactory, the model can be modified to address each market separately instead of the current way of aggregating them.

In addition, we believe that the model will support further top-line growth as it can serve as a premise for pricing model optimization. Further research is encouraged also regarding the market specific preferences of pricing models and price sensitivity. For instance, the current 'staircase' may be less attractive than the suggested linear alternative which is also implementable in the model.

Another technical issue that Túlka should study is the optimal time duration of exclusive partner-specific interpretation requests before the request can be answered by anyone on the platform. In practice, Túlka should figure out the optimal duration of the queueing time of an interpretation requester (who gets her interpretation from Túlka or one of Túlka's partners) before the request is visible to all other interpreters in addition to the partner. The duration does not need to be fixed, but it can rather be dynamic to adjust according to the prevailing demand-supply situation. This again links back to pricing models as extra fees could allow answering requests before others.

Last, Túlka should assess whether the current license fees for the platform usage are superior to not having them and raising the interpretation transaction prices. Licenses yield recurring revenue; however, we do not believe that the subscription-based license 'locks in' partners. Rather the group of interpretation requesters available to the partners through the platform is an attractive feature where Túlka gains their current competitive advantage.

5.2. Impact of the project

We believe that the project will be impactful for Túlka as expanding to new markets is current. Still, the true impact of this project for Túlka becomes evident only once the decisions made based on the model can be assessed and their respective outcomes are compared to the predicted results. The contact person at Túlka is willing to keep us updated on the progress of the business expansion in the future.

The most valuable aspect of the project is presumably the resolved and clarified number of clients that Túlka needs to acquire in order to reach its set goals. The impact of the numbers would be higher if the model would be more exhaustive and detailed. However, we do not believe the current error percentage to be large as the number of clients is high and minor changes to those numbers would not make a large difference.

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7. Appendices

7.1. Appendix 1. Team reflection

The team consisted of four industrial engineering and management master's level students from Aalto University School of Science. Three of the members are majoring in strategy and venturing and one in operations and service management. All of the members have analytics and data science as their minor subject. The present course was chosen from this minor module.

The topic of this project felt suitable for the backgrounds of the team members as previous courses have discussed among other topics platform economics. Additionally, courses and previous work experience with financial modelling were leveraged when building the model.

The execution of this project was fluent, educational and fruitful. The team chemistry worked well, and the working habits of team members were familiar from previous group projects that have been carried out together. Furthermore, the insightful and actionable feedback and

improvement ideas from the course staff, Túlka and the opponent group assisted the progress of the project throughout the course. The timetable of this course with intermediate submissions kept the workload even and helped the group plan the schedule for the upcoming milestones.

The team successfully managed to assign tasks evenly among all members. All work, apart from writing the report, was done in pairs in order to avoid inattention and to resolve problems more effectively. The team manager was proactive in keeping contact with both the course staff, the opponent team and Túlka. Furthermore, his delegation of tasks and assignment of their deadlines maintained the progress of the team throughout the project.

The workload of the project corresponded to the 5 ECTS requirement of 5 x 27 hours for each team member apart from the manager whose workload corresponded the 7 ECTS requirement of 7 x 27 hours. The scope of the project was well defined, however, the iteration towards the final scope took some time of the allocated time. In fact, one aspect of the project which could have been done better was the decision regarding the final deliverable of the project. In the beginning of the project, the decision regarding the final output of the project changed several times as we further exchanged and polished our ideas. If this would had been locked earlier, perhaps more time would have been left for the assessment of the discussed pricing model and exclusive interpretation request duration optimizations. In the first deliverable, the project plan, the team defined the risk with high probability to be that of having too wide a project scope. Perhaps the precaution of narrowing down the scope as the project advanced should have been stricter to deciding upon the scope through an intensive brainstorming and further discussions with the company representative in the very beginning.

All in all, the team is satisfied with the final result as well as with the course overall. The members have also enjoyed the excursions and the presentations of the other 5 groups attending the course.

7.2. Appendix 2. Example of the output of the model (P&L)

EUR K	2018	2019F	2020F	2021F	2022F	2023F
Net Sales	2329.8	5960.0	10417.6	14400.0	17851.3	22804.0
Revenue growth %	*n/a*	*155.8 %*	*74.8 %*	*38.2 %*	*24.0 %*	*27.7 %*
Other Income						
Variable costs	1 104	2 909	5 155	7 213	8 953	11 350
COGS % of sales	*47.4 %*	*48.8 %*	*49.5 %*	*50.1 %*	*50.2 %*	*49.8 %*
Fixed costs	1 445	2 347	3 065	3 704	4 606	5 080
SG&A % of sales	*62.0 %*	*39.4 %*	*29.4 %*	*25.7 %*	*25.8 %*	*22.3 %*
Other Operating Expenses						
Other Operating Expenses % of sales	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*
EBITDA	-219.5	704.8	2197.5	3483.7	4291.3	6374.0
EBITDA %	*-9.4 %*	*11.8 %*	*21.1 %*	*24.2 %*	*24.0 %*	*28.0 %*
Depreciation						
Depreciation % of sales	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*
EBITA	-219.5	704.8	2197.5	3483.7	4291.3	6374.0
EBITA %	*-9.4 %*	*11.8 %*	*21.1 %*	*24.2 %*	*24.0 %*	*28.0 %*
Amortization of intangibles						
Amortization of intangibles % of sales	*n/a*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*	*0.0 %*
EBIT	-219.5	704.8	2197.5	3483.7	4291.3	6374.0
EBIT %	*-9.4 %*	*11.8 %*	*21.1 %*	*24.2 %*	*24.0 %*	*28.0 %*
Interest Income						
Interest Expense						
Net Interests	0.0	0.0	0.0	0.0	0.0	0.0
EBT	-219.5	704.8	2197.5	3483.7	4291.3	6374.0
EBT %	*-9.4 %*	*11.8 %*	*21.1 %*	*24.2 %*	*24.0 %*	*28.0 %*
Taxes						
Net Income	***-219.5***	***704.8***	***2197.5***	***3483.7***	***4291.3***	***6374.0***