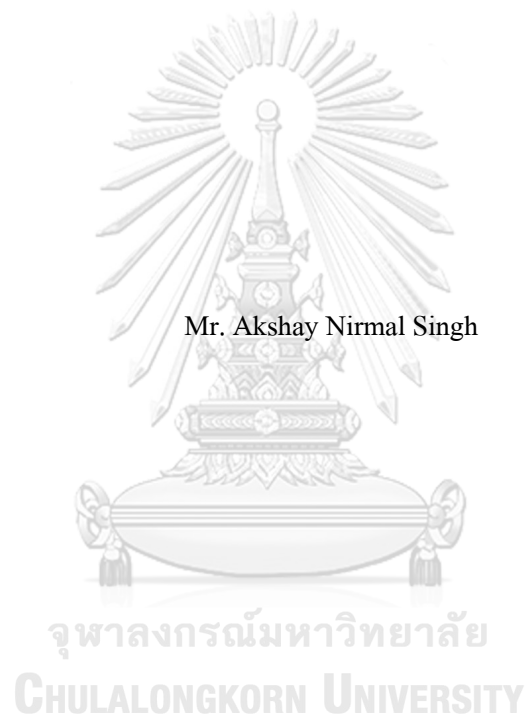


การคาดการณ์ความอยู่รอดของธุรกิจเทคโนโลยีเกิดใหม่: กรณีศึกษาระบบจรวดอัจฉริยะ



Mr. Akshay Nirmal Singh

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Engineering in Engineering Management
(CU-Warwick)

Faculty of Engineering
Chulalongkorn University

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Predictive survivability model of technological start-ups: a case study of Smart Parking



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต
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ร่วม : ชูเวช ชาญสง่าเวช

วิทยานิพนธ์จะเน้นที่การวิเคราะห์รูปแบบการทำนายความอยู่รอดที่มีอยู่ก่อนที่สามารถนำไปใช้กับธุรกิจใหม่และการเริ่มต้นธุรกิจใหม่ หลังจากศึกษาโมเดลที่ได้รับความนิยมและปัจจัยความสำเร็จที่สำคัญซึ่งสามารถพบได้ในธุรกิจที่ประสบความสำเร็จและขาดธุรกิจที่ล้มเหลวโมเดลการทำนายใหม่สำหรับ บริษัทเทคโนโลยีจะถูกสร้างขึ้นมาจากนี้กรณีศึกษาของ บริษัท ที่เริ่มต้นด้วยเทคโนโลยีที่เรียกว่า Smart Parking จะถูกวิเคราะห์ทั้งภายในและภายนอกโดยคำนึงถึงสภาพแวดล้อมที่จะดำเนินการ สิ่งต่อไปคือการวิเคราะห์สภาพแวดล้อมภายในและภายนอกจะช่วยวางแผนและกำหนดกลยุทธ์ทางธุรกิจ สำหรับที่จอดรถอัจฉริยะ ด้วยมุมมองที่สมบูรณ์ของการวิเคราะห์ธุรกิจและการวางแผนรายงานสรุปเกี่ยวกับความอยู่รอดของการเริ่มธุรกิจจะถูกสร้างขึ้น ในที่สุดหลังจากการวิเคราะห์ภายในและภายนอกของ Smart Parking ปัจจัยความสำเร็จที่สำคัญของ Smart Parking จะถูกเรียกใช้ผ่านรูปแบบการทำนายความรอดแบบใหม่เพื่อทำนายความสามารถในการอยู่รอดของ Smart Parking ที่เริ่มต้นด้วยเทคโนโลยี วิทยานิพนธ์ครอบคลุมหัวข้อที่คล้ายกันก่อนหน้านี้ครอบคลุมและช่องว่างที่ระบุจึงให้คำชี้แจงวิทยานิพนธ์และวิธีการวิธีการทำวิทยานิพนธ์ นอกจากนี้ยังครอบคลุมถึงความสำคัญของการวิจัยและสิ่งที่ส่งมอบในขณะที่คำนึงถึงข้อ จำกัด ของการวิจัย

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Akshay Nirmal Singh : การคาดการณ์ความอยู่รอดของธุรกิจเทคโนโลยีเกิดใหม่: กรณีศึกษาระบบจอดรถอัจฉริยะ. Advisor: PARAMES CHUTIMA Co-advisor: Chuvej Chansa-ngavej

The dissertation focuses on analysing pre-existing survivability prediction models that can be applied to new businesses and start-ups. After studying certain popular models and their critical success factors that can be found in successful businesses and are lacking in failed businesses a new prediction model for technological companies will be crafted. Furthermore, a case study of a potential technological start-up company called Smart Parking will be internally and externally analysed with regards to the environment in which it will be operating in. The analyses of the internal and external environments will help plan and come up with business strategies for Smart Parking. With the complete view of business analyses and planning, a conclusive report on the survivability of such a start-up will be drafted. Finally, after internal and external analyses of Smart Parking, the critical success factors of Smart Parking will be run through the new survivability prediction model to predict the survivability of the technological start-up Smart Parking. The thesis covers previous similar topics covered and the gaps identified thereby providing a thesis statement and an approach to the dissertation methods. It also covers the significance of such a research and its deliverables while keeping in mind the limitations of the research

Field of Study: Engineering Management Student's Signature

Academic Year: 2018 Advisor's Signature

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Null

Akshay Nirmal Singh



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Chapter 1 Introduction

Preface

In today's world, technology has enabled new businesses and services to be offered. Thus, was born the start-up culture of businesses. Most of the start-up businesses fail either due to a lack of original and effective idea or because of poor execution in the business start-up. There are many other reasons a start-up may fail, for example; poor execution or just launching in the wrong time. All the reasons a start-up may or may not survive can be categorized into two areas; the internal and external factors that govern the business.

There have been numerous studies that focus on the external factors in trying to reach a conclusion whether a start-up will make it. The thesis will study the different reasons start-ups succeed and fail and use its findings to build a survivability prediction model.

Part of this study is going to focus on internal aspects and the characterization and thereby the planning of such a start-up called 'Smart Parking' (a start-up that is in the idea phase, created by this study's author) which should ease the execution of the business operations in the future.

To make sure the author's business plan for his start-up Smart Parking is going to result in a successful establishment and running as a business, the activities planned, and the overall idea of the author should be correct to maximize the chances of Smart Parking becoming a real start-up in the future. Therefore, is it necessary to come up with a predictive survivability model that

can qualitatively as well as quantitatively analyse the different activities that have been planned in the author's business plan for Smart Parking; this will be done in this study. Furthermore, the newly proposed predictive survivability will be applied to the author's business plan for Smart Parking to predict the survivability of Smart Parking. Note that in this study and in the author's point of view, regarding the current 'idea' stage of the start-up, success and survivability of the start-up refer to the same objective. Thus, the phrases 'start-up success' and 'start-up survivability' regarding Smart Parking mean the same thing. A predictive survivability analysis based on business planning is required so that the author's plan does not go astray, based on the successful or failure prediction by the newly proposed prediction survivability model; subsequently adjusting the business plan accordingly before they are executed.

Smart Parking Concept

Smart Parking was an original idea that was thought of by this study's author. The basic idea was to use technology to improve correct parking systems in Bangkok, Thailand. There were two core components to the solution of Smart Parking.

The first component was using sensory technology to be able to identify vacant parking spots in a parking lot. The second component was to use the knowledge of the vacant parking spaces to improve the parking experience of the motorists. The idea of the second component was to allocate parking spaces to motorists as they enter the parking lot so that they would not have to spend a lot of time looking for a parking spot.

So far Smart Parking has only been executed in the basis of a project rather than a start-up or a company. There are two key phases that have been executed for Smart Parking. The first phase was a project conducted using Smart Parking as the subject during the authors third year in bachelor's degree. The primary objective during this project was as a proof of concept of the idea. The second phase was when Smart Parking was done as a senior project during the author's fourth year of college. The primary objective during this project was to figure out the technical (technology) side of Smart Parking.

The author believes that now it is time to focus on the business side of Smart Parking before the 'idea' should be attempted to be established as a business. Therefore, this study acts as phase three for Smart Parking where its Engineering and Business Management side will be studied.

Research Objective and methodology

The above topics brings us to the research objective of this study. The research objective of this study is to create a predictive survivability model that can be applied on technological start-ups like Smart Parking. The results and findings from the model should then be used to discuss the status of the business plans of the start-ups and how and if they should be changed.

The proposed issue of this thesis has been addressed previously by numerous scholars. These scholars include such individuals as Mary Salang (2018), Andrey Zadorozhnyy (2018) and Noah Parsons (2017). Their assessment of this topic has shown that it is crucial for a company to understand its position within its market and understand the different stakeholders in the business

such as its customers and competitors. This allows the businesses to come up with competitive strategies to increase the chance of survivability. There have also been other numerous researches done that study external factors that causes the failure of start-ups. Christensen, Raynor and McDonald (2015) talk about disruptive innovation and how that allows not only an opportunity for new start-ups to rise but also their rate of success. They also discuss about the theory of disruptive innovation which most start-ups use as a go to rule book when it comes to steering the future of the business. The disruptive theory till date is what is used to get an insight to how a quantitative prediction model of new business survival may be used in predicting survivability of a business.

However, there is little to none when it comes to studies concerning areas covering the internal factors of a business and how they will affect the survival of a new organization. An individual should be able to predict to a certain degree the survivability of a start-up by analysing the internal as well as certain external components of a business and using it to create strategies that will show the successful way into the future; through which certain internal components may be shaped based off of the chances of success or failure in the market, consequently being able to predict the survivability of a start-up.

Thus, in the thesis that follows, Chapter two will be covering the Review of literature done by other academics regarding issues related to the objective of this study including research of existing predictive models and a research as to why start-ups succeed or fail. Chapter three will then focus on the new proposed predictive model for technological start-ups This will then be followed by chapter four which takes a detailed look into the business

analysis of Smart Parking case study; which will then be applied to the new model and its findings discussed. The next chapter will be a conclusion of the study with a slight touch on the potential future work that can be carried out ahead of this study.



Review of Literature

Chapter 2 Review of Literature

Research of existing predictive survivability models

This section will first talk about predictive survivability modelling types and choose a predictive model or a combination of such to be studied in this study. This will then be followed up by studying a few real-life case studies where predictive survival models have been used to predict real life start-ups.

The following sub sections will cover the study of existing predictive survivability models and find out the different parameters used in this model; which of these parameters should be included in the new survivability prediction model proposed by this thesis and which should not. Alongside the identification of the parameters, the success and failure rates of existing predictive survivability models will be considered and try to find the reasons as to their failure in predictions so that its flaws will not be incorporated into the predictive survivability model that will be proposed in this thesis.

Finally, a study of the relationship between the existing survivability predictive models and their applicability to the type of start-ups will be studied. The different reasons why different predictive survivability models are applied to start-ups and new businesses in unique fields and industries will be noted. This is done to design the new predictive survivability model to fit and be applicable to start-ups in the technological realm.

Review of existing predictive survivability model types

Predictive modelling is the concept of using statistical data to try and predict the future results. Certain times, predictive modelling can also be used to try and predict non-existent events that may not be conducted. They can even be used in the reverse way where a consequence is fed into the model to determine the actions and parameters that could have caused the consequence in question to occur. For the purposes of this study, we will be studying the concepts of the predictive modelling that takes past actions and their consequences to try and predict how those or new actions will result in a predictable consequence.

There are different categories of statistical models that are used for predictive reasons. The two major classification of these statistical models are parametric and non-parametric. Some argue that there is a third; a hybrid between the two, 'semi-parametric'. Sheskin and David (2011) believe that a parametric model takes into consideration the very specific assumption with regards to one or more of the sample factors that will determine characteristically the base distributions. On the other hand, Cox (2016) believes that a non-parametric model would traditionally involve fewer assumptions of format and distributional forms when compared to the parametric models; containing solid assumptions about the independencies amongst factors.

When it comes to predictive modelling and subsequent data analytics, there are four major type of classified analytics. Namely, descriptive, diagnostic, prescriptive and predictive. The results of predictive modelling closely relate most to predictive analysis, which is what will be focused on in this study.

A predictive analysis primarily makes use of techniques like machine learning and concepts of 'Big data' through data mining to reasonably successfully predict future outcomes. While nothing can predict the future with a hundred percent certainty (any prediction that has been a hundred percent accurate is a pure coincidence), Predictive modelling and analysis can achieve the next best thing of determining the most probably outcome by using existing pre-historic data. Predictive modelling and analysis are not to be confused with being the same as data mining where the aim is to derive unknown relationships between parameters. Predictive modelling is a transformation process where inputs are converted to outputs; outputs being complete dependent on the inputs and the model. The inputs are the historical data and the output is the probability of the most likely outcome.

We will now look at certain types of predictive models and study their significance.

Ordinary Least Squares

Ordinary least squares (OLS) relapse is a factual technique for investigation that gauges the connection between at least one independent factor and a dependent variable; the strategy appraises the relationship by limiting the total of the squares in the distinction between the seen and anticipated estimations of the dependent variable designed as a straight line (Golub and Van Loan, 1980). OLS relapse is related to a bivariate model, that is, a model where there is just a single independent variable (X) foreseeing a dependent variable (Y). Be that as it may, the rationale of OLS regression is effectively stretched out to the multivariate model wherein there are at least two independent factors.

Generalized Linear Models (GLM)

When it comes to statistics, the Generalized Linear Models (GLM) is an adaptable specification of conventional direct relapse that takes into consideration responsive factors that have error appropriation models other than a normal distribution. The GLM sums up direct regression by enabling the straight model to be identified with the reaction variable through a link function and by permitting the extent of the fluctuation of every estimation to be a component of its anticipated worth.

Generalized linear models were figured by John Nelder and Robert Wedderburn (Hastie and Tibshirani, 1990) as a method for binding together different other factual models, including linear regression, logistic regression and Poisson regression. They proposed an iteratively reweighted least squares technique for most extreme probability estimation of the model parameters. Most extreme probability estimation stays mainstream and is the default strategy on numerous measurable computing bundles.

Logistic Regression

In the study of statistics, the logistic model (or logit model) is utilized to demonstrate the likelihood of a specific class or occasion existing, for example, succeed/not succeed, win/lose, not dead/not alive or not sick/unhealthy. This can be joined to show a few classes of occasions, for example, deciding if a picture contains a car, truck, train, and so on... Each article being recognized in the picture would be doled out a likelihood somewhere in the range of 0 and 1 and the whole adding to one.

Logistic regression is a statistic model that in its fundamental structure utilizes a logistic function to show a binary dependent

variable, albeit a lot of progressively complex expansions exist. In regression study, logistic regression (or logit relapse) is assessing the parameters of a logistic model (a type of binary regression) (Hosmer Jr, Lemeshow. and Sturdivant, 2013). Scientifically, a binary logistic model has a dependent variable with two potential qualities, for example, pass/bomb which is spoken to by an indicator variable, where the two qualities are named "0" and "1". In the logistic model, the log-odds (the logarithm of the odds) for the value named "1" is a linear combination of at least one independent variables ("predicators"); the independent variables can each be a binary variable (two classes, coded by a pointer variable) or a continuous variable (any real value). The comparing likelihood of the value marked "1" can shift between 0 (unquestionably the value "0") and 1 (surely the value "1"), henceforth the naming; the capacity that changes over log-chances to likelihood is the strategic capacity, subsequently the name.

The unit of estimation for the log-odds scale is known as a logit, from logistic unit, thus the elective names. analogous models with an alternate sigmoid function rather than the strategic capacity can likewise be utilized, for example, the probit model; the characterizing normal for the calculated model is that expanding one of the independent factors multiplicatively scales the chances of the given result at a steady rate, with every reliant variable having its own parameter; for a binary independent variable this sums up the odds ratio.

Random Forests

Random forests, also known as random decision forests are an outfit learning technique for grouping, relapse and different assignments that works by building many decision trees at

training time and yielding the class that is the mode of the classes (characterization) or mean prediction (regression) of the individual trees. Random decision forests fix for decision trees' behaviour for overfitting to their training set (Ho, 1995).

The general strategy for random decision forests was first proposed by Ho in 1995. He built up that forests of trees part with slanted hyperplanes can pick up precision as they develop without experiencing overtraining, as long as the backwoods are haphazardly confined to be touchy to just chosen highlight feature dimensions. An ensuing work along the equivalent lines by Ho (1998) inferred that other splitting, as long as they are randomly compelled to be obtuse toward some feature dimensions, act comparatively. Note that this perception of a progressively mind-boggling classifier (a larger forest) getting increasingly exact about monotonically is in sharp differentiation to the normal conviction that the multifaceted nature of a classifier can just develop to a specific degree of exactness before being harmed by overfitting.

Decision Trees จุฬาลงกรณ์มหาวิทยาลัย

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A Decision tree is a choice help tool that uses a tree-like model of choices and their potential results, including chance occasion results, asset expenses, and utility. It is one approach to show a calculation that just contains conditional control statements.

Choice trees are regularly utilized in operations studies, explicitly in decision analysis, to help distinguish a methodology destined to achieve an objective, but at the same time are a well-known apparatus in artificial intelligence through machine learning (Quinlan, 1987).

A decision tree is a flowchart-like structure in which each interior node speaks to a "test" on an attribute (for example regardless of whether a coin flip turns out as a heads or tails), each branch speaks to the result of the test, and each leaf node speaks to a class label (choice taken in the wake of computing all properties). The ways from root to leaf speak to classification rules.

In decision analysis, a decision tree and the firmly influence diagram are utilized as a visual and systematic choice help tool, where the expected values (or anticipated utility) of contending options are determined.

Neural Networks

Hopfield (1982), defines a neural network as a system or circuit of neurons, or viewed in a modern point of view, an artificial neural network, made out of fake neurons or nodes. Therefore, a neural network is either a biological neural network, made up of genuine biological neurons, or an artificial neural network, for understanding man-made artificial intelligence (AI) issues. The connections of the biological neuron are modelled as loads. A positive weight mirrors an excitatory association, while negative weight means inhibitory associations. All information sources are changed by a weight and summed. This movement is alluded as a straight blend. At long last, an initiation capacity controls the amplitude of the outcome. For instance, a satisfactory scope of yield is more often than not somewhere in the range of 0 and 1, or it could be -1 and 1 . For the purposes of this study, a biological neural network will not be considered or studied.

Not at all like von Neumann model calculations, artificial neural networks don't separate memory and processing and work by

means of the progression of sign through the net connections, to some degree similar to a biological neural network system.

These artificial networks might be utilized for predictive modelling, versatile control and applications where they can be trained by means of a dataset. Self-learning in coming about because of experience can happen inside these neural networks, which can get decisions from a complex and apparently irrelevant arrangement of information (Haykin 1994).

Multivariate Adaptive Regression Splines (MARS)

Multivariate Adaptive Regression Splines (MARSplines) is a usage of strategies advanced by Friedman (1991) for taking care of regression type, with the principle reason to anticipate the estimations of a consistent dependent or outcome variable from a lot of independent or predictor factors. There are an enormous number of strategies accessible for fitting models to continuous variable, for example, a linear regression, nonlinear regression, regression trees, Neural Networks, and so on.

MARSplines is a nonparametric regression method that makes no presumption about the basic useful connection between the needy and autonomous factors. Rather, MARSplines develops this connection from a lot of coefficients and basic functions that are totally determined from the regression information. It could be said, the technique depends on the "divide and conquer" methodology, which segments the input space into districts, each with its own regression condition. This makes MARSplines especially reasonable for issues with higher input dimensions where the problem of dimensionality would probably make issues for different methods.

The MARSplines technique has turned out to be especially mainstream in the territory of data mining and artificial intelligence since it doesn't accept or force a specific sort or class of relationship (e.g., linear, logistic, and so forth.) between the predictor variables and the dependent (result) variable of intrigue (Friedman and Roosen,1995). Rather, helpful models (i.e., models that yield precise outcomes) can be determined even in circumstances where the connection between the predictors and the dependent variables is non-monotone and hard to estimate with parametric models.

Review of predictive survivability case studies in real life

Below is a list of carefully selected case studies that will be studied. The list is a diverse list of case studies that take a different approach to predicting the success and survivability of start-ups. The importance of carefully selecting the below case studies are their thoughts and reasoning to address the issues from unique angles. All of the case studies below use some or a combination of the above discussed predictive modelling type. The section of interest of these case studies to this research lies in the factors and parameters that have been chosen to represent the variable that is to be used in deciding the success and survivability rate of the start-ups.

Predicting new venture survival: A twitter-based machine learning approach to measuring online legitimacy

This was a study conducted by Antretter, Blohm, Grichnik and Wincent (2018). The study's primary basis of research is based on the claim that research shows that social media relationships can show extremely reliable projections about potential occurrences. In the research, it was demonstrating that internet

credibility as a metric of social appreciation depending on Twitter material can be used to forecast new start-up sustainability correctly. Primarily, the study used context-specific machine learning methods to examine more than 187,000 tweets from 253 start-up ' Twitter accounts. The study's results indicate that in up to 76 percent of instances, one can properly discriminate against unsuccessful businesses from surviving companies. With this research, the study adds to the continuing debate of the significance of constructing credibility internet and provide an overview of how to use machine learning as a method to predictive the success and sustainability of start-ups.

The study acquired information on fresh enterprises from a big early-stage business base in Switzerland to empirically evaluate the predictive authority of internet credibility. The businesses were all seed or early-stage firms established between 2006 and 2018. The main database included each company's names, websites, and social media profiles. The study's initial sample included 253 companies for which the research could infer five-year survival, and which had a Twitter profile. In comparison with previous study samples, 72 percent of the study's sample projects lasted for at least five years. The study used Twitter's REST API to retrieve tweets and associated activities from the moment they were recorded on Twitter until June 2018. This process resulted in a total of 187,323 tweets, 102,501 retweets, and 441,583 likes.

The study focused on three different internet validity variables: data amount, data material and communication and confirmation metrics. The study's result factor is five-year existence. Thus, the research evaluated whether a business successfully offered a commodity or service five years after its inception. Since precise data on fresh projects is frequently hindered by irregular track

maintaining, absence of historical information, and prospective origin biases, academics have defined sustainability as the most reliable performance measure to research early-stage enterprises, which is what this study did. It evaluated longevity as a dummy variable stating whether a business has been present for at least five years (1) or not (0). To operationalize start-up development, the study pursued and conducted an interactive online business survey to determine whether each company still has a working website and, if so, what the company's site says. More accurately, when the business's page received a mistake, was empty or presented a notification indicating that the fresh undertaking was out of business, the study inferred that the firm was no longer effectively offering products or facilities in the marketplace.

The study's used artificial intelligence (data mining) as a basis for the predictive survivability of the start-up. The method used to build the artificial intelligence was random forest and gradient boosting.

Predicting the success of a start-up company

This has been a research by Shah and Mcgaugh (2019). The study claims that in the original four years, more than half of start-ups failed. Furthermore, three out of four venture-backed companies fail. The algorithm suggested in this study will assist forecast a start-up company's achievement depending on economic and organizational factors. The forecast will assist shareholders to get a concept of whether or not the investment in a company will be effective? Apart from applying a model composed of all the variables listed below and anticipating a start-up company's achievement, numerous other designs will be

developed depicting multiple milestones accomplished by the firm.

The research will assist start-ups to find out which variables are crucial to obtaining an investor. The algorithm focused on information gathered from crunchbase.com from more than 15,000 businesses. Financial factors include: equity in each funding round, valuation after each funding round, present market value, complete business assets, investments and purchases, economic history of important individuals and organizational factors include: number of staffs, customers, place, business era, history of creators, fire frequency and numerous business media papers.

A range of techniques was used to determine the optimal model such as random forest, document parsing, logistical regression, decision tree, and survival analysis.

The following table shows the different factors that was used as variables in the study of trying to predict start-up success.

Table 1 Factors taken into consideration for predictive survivability for this real life research

Seed funding	Series funding	Rounds of funding
Time to get seed funding	Valuation	Number of milestones
Time taken to achieve milestone	Time taken to achieve funding	Geographical region of start-up
Entrepreneur education level	Entrepreneur education place	Burn rate
Total funding		Start-up industry

The predictive modelling used in the study includes a variety of methods are accessible to construct a binary classifier model such as decision trees, logistic model, cellular network, etc. The predictive model will assist us know which main variables are crucial to a good business. In this research the model of neural network and logistic regression was used.

The study prepared the data for the predictive model and also found Total funds and total valuation had elevated skewness and kurtosis after performing original information exploring measurements. To reduce skewness and kurtosis, a chart conversion was conducted on total funds and total valuation. The firms that began between 2000-2014 were used for assessment. Also, only those firms that got financing for the first round were examined. A target variable was created and 1 was assigned to the companies that were either closed or acquired and 0 was assigned to the companies that were still operating.

All factors except complete financing were significant according to the logistic model. The significant variables include the following: Burn rate, total valuation, total amount of milestones, average days between each milestone, total funding cycles, average days between each funding round, time to get seed funding, domain and location.

Predicting new venture survival: An analysis of “anatomy of a start-up.” cases from Inc. Magazine

This has been a research carried out by Gartner, Starr and Bhat (1998). This study compares the perspectives and projections of enterprise success as provided by Inc. magazine journalists and professionals to the projections produced from the assessment of information from a project testing questionnaire. The project

testing questionnaire, composed of 85 pieces addressing four wide classifications: Individual characteristics, Entrepreneurial behaviours, Strategy and Environment, was used to assess "Start-up Anatomy" papers from Inc. magazine. The questionnaire development was driven by the previous grounds:

Individual characteristics - the study hypothesized that the likelihood of business survival would be enhanced if the following conditions are met: businessmen had significant expertise and capacity at the start-up scene, businessmen acquired expertise and capacity during the start-up process and businessmen went to show significant expertise and capacity at the start of the start-up story.

Entrepreneurial behaviour - the research hypothesized that businessmen who spent more time on any of the previous operations would be in new companies that lasted opposed to businessmen who spent less time: discovering and refining opportunities— consisting of nine distinct operations, such as identifying company purposes, managing, evaluating rivals; obtaining resources and help — consisting of fifteen distinct acuties such as discovering shareholders, obtaining guidance from attorneys, obtaining a mortgage, obtaining technical knowledge ; operating the company — comprising five distinct activities, such as coping with retailers, handling the day-to-day operations of the company ; defining and distributing to clients — comprising five distinct activities, such as identifying particular clients to be sold, distributing to clients ; Outside the Business Issues — including 4 distinct operations, such as coping with household issues, partner, and colleagues.

Strategy and environment - Strategy and environment variables were features requiring comparisons of the comparative performance of new firms compared to other rivals and their sector characteristics, similar to the issues used in PIMS studies: first to enter, degree of development, pace of industrial development, market volume, comparative cost, and relative quality. There were 28 issues in this instrument section. They study hypothesized that policy and economic features prevalent to surviving start-ups could be niche-oriented policies and elevated development conditions.

In sum, there were 85 issues that included the questionnaire on entrepreneurship assessment.

New Venture Survival - The metric of fresh enterprise preservation for this research was a determination as to whether the start-up outlined in each Inc. magazine article (Longworth 1991) was still in service as of January 1995. This deadline is almost 4 years after the last case study the research reviewed was released (September 1990), and almost 7 years after the first case study was released (February 1988). The research was able to determine that 17 of the 27 new ventures profiled in the "Anatomy of a Startup" series published in Longworth (1991) were still in operation.

A discriminant assessment was conducted that led to seven factors that properly categorized 85 percent of instances into start-up victims or non-survivors. New start-ups were more probable to have the following: a businessmen who acquired expertise and skills during the founding process; who dedicated more effort to negotiating with suppliers, evaluating prospective fresh competitors and devoting less effort to determining

company identities, companies that had "fundable" asset demands, concentrated on products or facilities that were specifically drafted or manufactured to order and were in extremely fast growing industries.

Although the discriminant assessment was easier prepared to forecast business sustainability or non-survival relative to the specialists, the accuracy and legitimacy of this specific model and the information collection used are significantly limited. The main importance of this practice is to make evident the factors that participants use to create decisions about anticipating start-up success. One of the problems the study encountered in evaluating the expert's projections was its failure from their findings to deduce coherent and overall "thumb rules" about start-up success.

Predicting the outcome of start-ups: Less failure, more success.

It's a study carried out by Krishna, Agarwal and Choudhary (2016). On median, 9 out of 10 start-ups failed (industry norm) was the initial claim of this research. The research studies several factors that it thinks are liable for a start-up's downfall, including bad management, absence of resources, etc. The research wanted to produce a predictive model for start-ups centred on many important factors engaged in the lives of a company at different phases. It is extremely desirable to maximize the success level of start-ups and not much research has been undertaken to tackle said issue. The study attempted to suggest a technique to forecast the result of start-ups depending on many main variables such as seed funding quantity, seed funding moment, 'Series A' financing, variables leading to the company's success and failure at every milestone.

The study could have developed several designs centred on the information that it closely placed together from multiple databases such as Crunchbase, Tech Crunch, etc. Several data mining identification methods were used on the pre-processed information along with multiple data mining optimizations and validations. The research provides its assessment using methods such as Random Forest, ADTrees, Bayesian Networks, etc. the study also assesses the correctness of its designs depending on variables such as region under the ROC bend, accuracy and recall. The research demonstrated that a company can use this research's designs to decide which variables they need to concentrate more on in attempt to reach the peak of achievement.

The research took into account four key factors it believed was directly involved in the success and survivability of any start-up.

The four factors are seed funding, time to get seed funding, rounds of funding and severity factors. The study also explains these four key factors.

Seed funding - Seed financing functions as an original gasoline for any start-up. Seed financing enables start-ups through their original hurdles and also acts as an accelerator at the same moment.

Time to get seed funding - time and cash are the two main components of any start-up. Hardly any start-up chooses to spend a huge amount of time and maybe get a product on the market that hardly anyone wants to purchase. This variable measures the number of months it requires for businesses to obtain original seed / angel financing.

Rounds of funding — Represents the amount of financing steps a business raises. This involves expenditure in seed / angel as well as venture capital.

Severity factors - these are the most significant variables adding to the validity of our predictive models. Many organizations such as S&P have used these variables and their respective results to assess organizations the study splits them into two sections. One is beneficial considerations like plenty of traction, small burn rate, good management scheme, excellent use of resources and moment, a view to monetize from the very start, cultural skills-networking with the target audience, commitment, determination, capacity to adjust to change, fund-raising abilities, unwavering faith, composition of capital structure, chances of potential income. The other is negative factors such as a tiny Identical or non-scalable concept, a lack of competitive research-false market

positioning, no go to-market strategy, no traction focus, Hardly any adaptability, lack of enthusiasm or perseverance, false or inadequate competence, unmotivated team, no role models or advisors, weak business model, high burn rate, less resources than required, no VC expertise, No lengthy-term development plan for return on investment, terrible luck or poor timing and lastly market competition.

Other minute factors used in this study are outlined in the following table.

Table 2 Factors taken into consideration for predictive survivability for this real life research

Start date	Seed funding	Total rounds of funding
Time for seed	Severity scores	Average severity score
Weighted average	Series A,B,C.. funding	Valuation
Defunct date	Months active	Market value
Total funds		Burn rate

Predicting founding success and new venture survival: A longitudinal study

This was a study held by Kessler, Korunka, Frank and Lueger (2012). Based on a model composed of the individual, resource / environment and creation method, this document examines establishing achievement and fresh enterprise success / failure. The research analyses a seven-year sample of nascent entrepreneurs found. The characteristics of the individual influence the achievement of the foundation, but not preservation. Resource and workplace have no impact on the achievement or

preservation of foundations. Aspects of the development method are used to describe the building success and sustainability.

This study used Mugler (1998) frame of reference for the VES in the configuration approach to model their predictive survivability model. This model transposes Miller's (1987) setup thoughts into the domain of tiny businesses. The model idea was specifically transmitted to start-ups and coupled with the structure created by Gartner (1985) to describe fresh enterprise development. This eventually resulted to four aspects ('imperatives'): the (entrepreneurial) individual, (creating) atmosphere, (creating) capital, and (creating) method. The resulting model is depicted below.

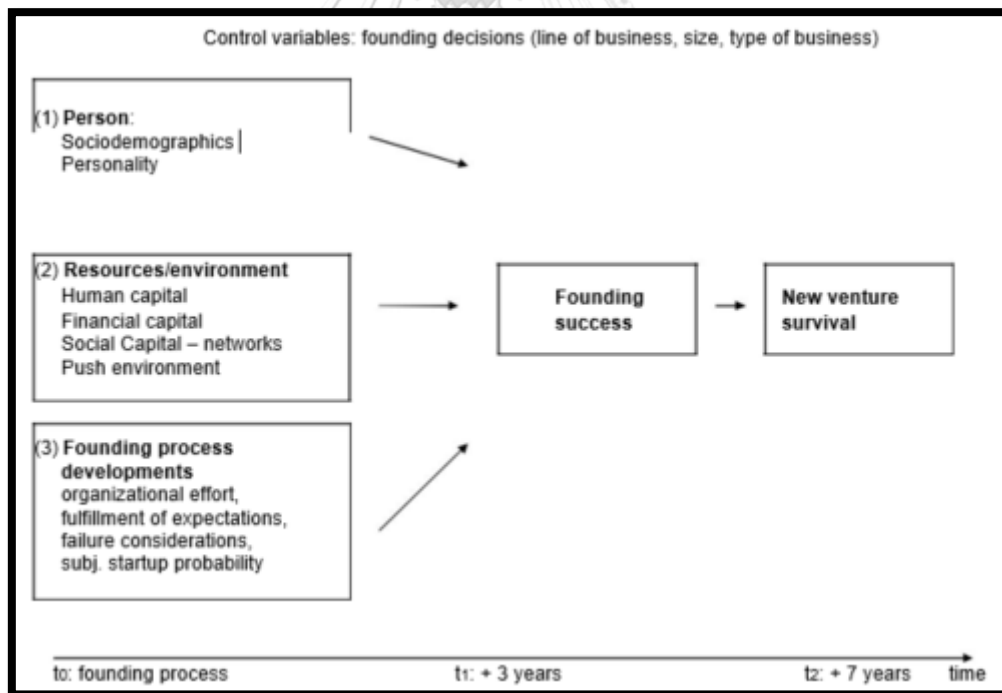


Figure 1 Model used for predictive survivability for this research

For this study, in attempt to guarantee at least partial representativeness for a sample of nascent entrepreneurs,

they had approached support organizations and projects where one would expect to meet individuals intending to begin a fresh business:

1. Overall help organizations for nascent entrepreneurs tackle a broad variety of persons at the beginning of the start-up process and in concrete measures contributing to concrete achievement. These people were reached straight through the employees of the support organisation.
2. The email database of financial aid organizations, including primarily new company owner-managers, is accessible. This band was reached through a mail poll.
3. Mostly nascent entrepreneurs in very premature phases could be expected at a 'business start-up information day' in Vienna. This group was approached personally.

This study categorized its measurements into independent and dependent variables.

Independent variable: The questionnaire used for information compilation at the start comprised of components and scales evaluating elements of the individual, resources / environment, building mechanism and control variables. The control variables (company type, i.e. full-time vs. side-line start-up companies and employee vs. group start-ups; company size, business line) were evaluated using single objects. Internal focus of control need for success and chance-taking tendency were evaluated with scales commonly used in German-speaking countries. Finance capital, the presence of household role models, and the drive atmosphere were evaluated using single objects. Measurements were created specifically for this research for human resources and channels. All multi-item scales were converted into a comparable spectrum of 0-100.

Dependent variable: Founding achievement is evaluated as the completion of the scheduled undertaking using the individual variable of ' first earnings' (depending on a stage in moment) in attempt to have a similarly true reference point for all start-ups. Other terms mentioned in the literature, such as private engagement, outside financial assistance, first purchase was either considered harder to assess (e.g. engagement) or faulty owing to sector or magnitude impacts (e.g., outside economic assistance, first recruit). In specific, the elevated percentage of very tiny companies and sole-person start-ups prevented the use of indicators involving size implications. Since the information is focused on a stage in moment during the preparing and start-up process, we did not have access to the information needed for a time-based concept of start-up realization such as the incident history. The second conditional factor, new business sustainability, was evaluated by straight questioning entrepreneurs whether their company was in effective company at the moment of the study.

The table below contains a list of factors and parameters used in the predictive model of this study to determine the success of the start-up.

Table 3 Factors taken into consideration for predictive survivability for this real-life research

Full time or Part time business	Analysis of the team of founders	The size of the business and its capital requirements
The industry of the business	Entrepreneur Age	Entrepreneur Sex
Internal focus of control	Need for achievement	Risk taking willingness

Financial capital	Human capital	Social Capital (Networks)
Family role models	Environmental Drive	Organizational effort
Realistic expectations	Business establishment chance	Plan for start-up failure



The business model DNA: Towards an approach for predicting business model success

This has been a review by Bohm, Weking, Fortunat, Muller, Welpé and Krcmar (2017). The study claims that over the past century, business models (BM) have acquired a lot of concern in analysing the possibilities of fresh company projects or prospective development routes of current companies. The business model idea, however, has only occasionally been used as the grounds for quantitative empirical research.

The study indicates a Business Model DNA idea to explain the features of particular business models. This idea enables business models to be analysed in attempt to recognize groups of business models that outperform others and calculate potential opportunities of particular business models.

The study used 181 start-ups from both the United States of America and Germany and implemented data mining methods, i.e. cluster analysis and support vector machines to categorize unique business models in terms of their effectiveness.

The study's results indicate that there are 12 separate business model nodes with different development requirements and survival opportunities. The study could forecast a company's existence with a precision of 83.6 percent.

The data and methodology of the study was to evaluate BM trends of prosperous start-ups, the study depends on the Matter mark dataset, which is a compilation of start-up companies' data. To prevent a bias towards US or German companies, the research took a random sample of 75 US and 75 German start-up

companies. The study gathered extra data for this study to define the BM by digitally scanning the internet. Additional sources of data included company blogs, media releases and publicly accessible meetings with creators. As the Mattermark dataset is heavily oriented towards promising start-ups, the study has recognized extra unsuccessful projects from Crunchbase-Insights, Deadpool and autopsy.io. The study sent a questionnaire to a sum of 210 companies and 309 founders requesting for extra information to suit the data accessible in the Mattermark dataset. In this manner, the study prepared to include 31 unsuccessful start-ups with adequate data on the product's funding, revenue, rivalry and innovation. The BM DNA is constructed for each of the 181 companies in the first phase of the assessment. A BM defines the nature of a company in an accurate manner that enables contrast with other BMs.

The sample size used by the study includes a total of 181 companies, 31 unsuccessful companies from the study and 150 current companies from the Mattermark dataset. Eighteen of the 31 unsuccessful companies were established in the United States. The databases were obtained in May 2015. The bulk of companies were established between 1999 and 2015. Nearly all companies implement the BM model Digitalization, which accounts for electronic goods or services. The dataset, however, was not concentrated on digital sectors.

The table below shows the business model clusters that have been used in the study to predict the success and survivability of start-ups using their BMs.

Table 4 Factors taken into consideration for predictive survivability for this real-life research

Freemium platforms	Experience crowd users	Long tail subscribers
Affiliate markets	Mass customizing Orchestrators	Innovative platforms
E-commerce	E-commerce affiliates	Add-on layers
Crowdsourcing platforms	Customized layers	Hidden revenue markets

The study described two data mining methods to classify enterprise BMs considering their achievement by constructing on a fresh idea called BM DNA. The first outcome, resulting from a cluster analysis, demonstrates presently successful or not sustainable BM nodes. As portion of the second consequence, an SVM is implemented to classify BMs as effective or ineffective.

In this research, the k-means clustering algorithm was used as it has been shown to be very efficient. The algorithm, however, demonstrates some downsides. The number of nodes is an entry variable, the result is dependent on the original method, it is susceptible to outliers and can wind up in ideal local alternatives instead of worldwide ones. Additionally, the Euclidian distance to use with binary data may be seen as problematic. That iterative use reduces these drawbacks. The study stated that alternatively a hieratic agglomerative clustering algorithm would have proved useful.

Predicting start-up survival: The antecedents and consequences of a normalized “burn rate”

This research was carried out by Berman and Lagosy (n.d.). This research explores and argues that even though a common metric among entrepreneurs and shareholders, recurrent cumulative spending also known as the 'burn rate' doesn't reveal the important monetary distribution choices. The study argues that an equally simple metric, expenditure per worker, rejects important aspects of entrepreneurial choices such as investing in human and non-human components and the poor understanding of the entrepreneur about the genuine complementarities (between those inputs) needed to minimize the risk of failure.

The study contends that the business's existence relies on the business's expenditure per worker, and empirically demonstrate that there is a U-shaped connection between expenditure per worker and the likelihood of loss. Based on the literature of entrepreneurial human capital, the study claims that the amount of schooling, experience and views of an entrepreneur about having a competitive advantage captures portion of the understanding of the entrepreneur. The study tries to correlate that education and values have a favourable connection with healthy expenditure per worker, which is connected with reduced likelihood of business loss.

This study hypothesized that the entrepreneur dictates the likelihood of loss by choosing how much to invest on payroll compared to other variable outputs. However, such a choice is doubtful to be ideal owing to confusion about the model's real comparative productivity of labour. An entrepreneur with an elevated standard of education or experience may have more

accurate data or stronger understanding about the marginal productivity of each contribution relative to other less trained and skilled entrepreneurs.

We now take a look at the data set used by this research. The research information is obtained from the Kauffman Firm Survey (KFS) confidential dataset. The observer system in our research is a new organization in the United States established in 2004. The Kauffman firm survey gathered longitudinal data from 4,928 fresh businesses that began in 2004. The businesses are a random sample of about 250,000 businesses opened in the United States during 2004 listed in the business database of Dun and Bradstreet (D&B). In quarterly follow-ups up to and including 2011, the businesses responded concerns. The issues focused on business features, proprietor features, business financial position, organizational information, place and environmental features.

The study used a single dependent variable, 'Failure event'. The study also used explanatory variables (factors and parameters) such as spending per employee, human capital, beliefs about competitive advantage and entrepreneurial control over decisions (Growth, firm positioning and employment).

The study used an empirical estimation approach by using a predictive model that combined concepts of log-log link and linear probability model.

The research's analysis isn't without constraints. Using start-up information, particularly one that was gathered through studies, increases several prospective constraints including selection bias and lacking information. The study even carried out the same

hypothesis using various empirical designs to check the robustness of the results. The study also emphasized the out-of-sample predictive capacity of the burn rate to reduce information overfitting issues and absence of external validity. Issues of indigeneity and choice in specific places were addressed mainly by monitoring for conventional option procedures outlined in the literature.

Research of critical success factors for start-up success or failure

This section is a research about how start-ups perform in their initial period as a business. It is important to study the majority reasons start-ups fail or succeed because only through that will we be able to identify the key parameters that need to be included in the new predictive survivability model.

The section will firstly outline the different start-ups that have been chosen and their importance of being studied with regards to this thesis. These start-ups will then be studied and their reason for demise discussed. The next part studies why these chosen start-ups have succeeded or failed as a new business. Finally, we realise the actually reasons and critical success factors of why start-ups fail and how these can be incorporated into the new predictive survivability model for this thesis.

Chosen start-ups (and their reason) to be analysed

Anki – A robotic start-up: Anki is a robotic start-up company from San Francisco. They are responsible for the creation of artificial intelligence incorporated robotic toys like the Overdrive, Cozmo and vector.

Anki has been chosen as one of the case studies because it reflects a technological start-up in the 21st century. While the actual product being delivered by Smart Parking and Anki differ, it will provide an interesting insight to the technological acceptance in the free markets of the current time. Anki will also teach a good lesson about start up technology being launched at the right time.

Shyp – an international logistics company: Shyp, similarly to Anki is using technology as its core to solve an important pain point. Through its mobile app, people could ship things all over the world. The company just as it launched got coverage by the New York times which caught the eye of many investors.

However, the reason for Shyp being of interest in being analysed is because of the rapid growth of the company. By analysing the case study of why Shyp failed as a start-up, it may be possible to determine if growth is always the best for the business.

Beepi – an online used car marketplace: Beepi's solution of an online second-hand motor vehicle marketplace was right on time for the demand of the consumer market. The company's future looked bright and it was well received just as it was widely used. They even had a good funding situation.

The interest in Beepi is not because of its similarity to Smart Parking but because of one of the main problems start-ups fail. That is burning through cash. By further studying the root causes of why Beepi ran out of cash, we could reasonably guess if other start-up will face the same fate as Beepi.

Yik Yak – an anonymous chat app launched in 2013: Yik Yak was initially a widely successful chat app that was used by colleges. They had so much success financially that they were once valued at over 400 million dollars during their highest evaluation.

There are only so many things a business and entrepreneur can control. While Yik Yak could not prevent competitors from arising, they could have controlled things internally that would not give their competitors an edge over them. Analysing Yik Yak and their failure can reveal a lot about how competitors are also responsible for the failure of start-ups.

Fab – a gay social networking site: once known as the world's fastest growing start up and being valued at over a billion dollars. Fab actually only started off as a gay social networking site, since then it has been the likes of a daily flash sales site and a world's design store. Fab as a start-up has pivoted a lot with its products and services.

Being able to pivot is a trump card for start-ups that can miraculously save a start-up from dying. But the same thing is often true for start-ups that pivot all the time and end up never reaching their potential and generating stable revenue to support themselves. The study of this case study is going to shine light on the possibilities of pivoting and its usefulness in trying to keep a start-up alive.

Doppler Labs – A wireless earphone product: while they would hate to be called a product rather than a business, that is what they eventually became. Their moto was to put a computer speaker and microphone in everybody's' ears.

Distinguishing one's self from being a business and a product is crucial. An organization must not become the product it is trying to bring out. Unfortunately, the focus of Doppler labs was just that and now all they can do is call themselves a hardware business. This would be a good case study to make sure many of the technological companies in the future (like Smart Parking) do not focus too much on their products that their entire start-up fails.

The Young Professional – an online business platform helping female entrepreneurs: developed by four colleagues and friends, as a spinoff of the muse it's an online tool that is dedicated to helping female entrepreneurs by offering mentorship, advice and even career opportunities. The start-up was lucky enough to have forgiving external factors that allowed it to prosper. The internal factors are what led to this start-up's failure.

It has always been an age-old debate whether a company has more success being run by a single entrepreneur with their singular focus and vision and capacity to make quick decisions or is it better to have a team of entrepreneurs that will run the business by sharing ideas and being cautious when it comes to the direction the organisation is headed too. The case study of the start-up called 'The Young Professional' will give interesting insight into how the human resource management can affect the success rate of a new organisation.

Analysis of failed start-ups in real life

The chosen start-ups will be studied with a bit more detail to find out how they failed and what can be learnt from their failure.

Anki

Anki was a top toy like robot powered by artificial intelligence. This was a high technology start-up that had high tech products to offer to the market as. These products were inevitable in today's market (West, C. and Gates.,1996) Anki was definitely not the first home robot in the market (Ohno, 2018). While Anki was certainly ahead of its time in terms of technology, the market did not have a need for it as the robot did not have any specific job that it did. Therefore, it had an innovative solution to a problem that didn't exist; didn't sell as well as it expected to and thus began its journey to failure. It wasn't that the market was not ready for such technology. This is proven by the successful acceptance and success of the 'Roomba' the automated vacuum cleaner bot (Jones, 2006).

The primary reason Anki failed was due to its acceptance in the market. There were simply not enough sales. Without sales the company couldn't continue sustaining itself even though it sold 1.5 million robot units to date and has also raised more than 200 million dollars in venture capital funding. Some believe that it was outcompeted by other home robots such as Alexa that make use of the concept of artificial intelligence to help make human life easier. This is not true.

To be able to compete with something, there must be common grounds on which similar actions must be done to be able to compare and contrast which does what better. In the case of Anki it wasn't meant to be a digital assistant to a household like Alexa; well not exactly. Most of Anki was made to be a proper robot butler that could physically and dynamically navigate through your house and get stuff done for you.

The key point being that the robots Anki sold has motion as one of its key technologies (Sofge, 2015). The cost of the technology needed was significantly high enough to question the worthiness for the price of the robots sold by Anki. Just like any business, lack of sales brought down the start-up.

Lessons learnt:

1. Make sure there is a market need
2. Be specific about what your product solves



Shyp

During its release, the hot topic for the free market was 'on-demand'. The 21st century trend has come to a point where people are not required to leave their house to be able to purchase commodities rather it be delivered to their house. Shyp was one of the start-up companies that realised this and took advantage of it early on by creating an on-demand shipping concept where the user would no longer have to use the traditional method of going to the post office to get something shipped (Fitzgerald, 2015).

They developed a mobile application where with as little as a few taps on the screen, you could achieve your goal to ship something across the globe. Shyp capitalising on the trend and a real pain point was very successful in raise up to 62 million in funding to be able to continue its expansion; due to how quickly its user base grew.

The company was successful in obtaining funding and users. What should it do next? Naturally a company must expand when it has enough resources and a prospective future (Kupp, Marval, and Borchers, 2017). Shyp decided that it should expand. Certain businesses need to expand to be able to efficiently deal with logistics (Biggi and Tretola, 2015) Moving into territories like New York, Los Angeles and Chicago. With this their operation grew. Unfortunately, Shyp's targeted customers being individuals who are technically users but also rarely use the service; an individual doesn't need to ship something around the world that often.

This was an unseen problem in their operating model. It wasn't a subscription service but rather a pay per use type of deal. Therefore while Shyp's customer base did grow fast initially, that customer base was now stagnant and didn't provide sufficient revenue to this fast-growing start-up; causing the business a challenging situation (Zhang, Kolte, Kettinger and Yoo, 2018).

Shyp was able to realise its mistakes. They started to roll back operations and become smaller. They had to reorganize and refocus in order to be able to survive. Shyp even had to lay off employees and close off their expanded territories in New York, Los Angeles and even Chicago. Now operating as they originally were, Shyp also acquired different customer segments. Small business customers were now their target.

These types of customers could go under a new operating model and also use the services more often translating into higher revenue for Shyp. These corrective actions were correct. However, by growing too fast and being unsuccessful, they had burnt through most of their funding (Cauley, 2005). This left them with too little of a runway to watch the new operational model succeed.

Lessons learnt:

- Don't grow too fast unnecessarily
- Have a tested operating and business model
- Always keep an eye out for the remaining funding

Beepi

The biggest trends when it comes to the start-up ideas as already seen are the 'On Demand' culture. It offers the convenience of shopping from virtually anywhere and at any time. The online

market place industry is one such 'technology' that allows for the on-demand habits of the market. Beepi was truly a disruptive start-up in this category. While the term 'Disruption' is often and incorrectly used by the start-up industry and is a cliché, there is a true and clear need for a market of new products and services that have the ability to offer the much needed good and services in a way that's far convenient and cost effective. That's the reason why a lot of start-ups readily jump at a chance of disrupting the market; just like Beepi. The market that Beepi disrupted was the used car marketplace (Remane, Hanelt, Hildebrandt and Kolbe, 2016). Beepi's mission was to improve the activity of buying used cars better not only for the buyer but also the seller. Beepi did this but being able to match buyers and sellers together online.

They also offered a 'for sure' price to the sellers that partook in the business. The company went as far as to buy the car from the sellers themselves if it failed to sell within a month. Beepi offered value added services like inspection and delivery, getting all the paperwork together and guaranteeing the quality of the sold cars. A business such as Beepi with the external factors like the market and competitors being on their side surely could never fail; then why did they?

Beepi did very well in raising capital for itself (Klein, 2016). It also had a humungous customer base and its operating and business model had no major flaws. They were able to raise up to a 150 million dollars while being valued at over 550 million dollars at their peak. The major and primary reason of the downfall of this fast and successful growing start-up was actually the way things were run internally (Täuscher and Kietzmann, 2017). It was a classic case of 'Good idea, poor execution'.

The problem in Beepi's case was the weak execution on the entrepreneur's vision combined with the lack of a strong and efficient operation of the organization. Beepi was confirmed to have been burring through money like paper. It reached upwards of seven million dollars per month during certain stages (Lee, 2017). This meant that the start-up Beepi had a very high 'burn rate' which translate into the real-world business processes of lacking fiscal discipline. There could be a legitimate reason for a new organization to have a high burn rate as they could be rapidly expanding to meet the demands or simply stocking up in inventory or acquiring new intellectual property as a part of the business strategy. However, this was not the case with Beepi.

The fiscal discipline that Beepi lacked was through the extremely high salaries for the leadership and executives of the organization. The heads of the organization were not rather conservative when it came to their spending. Lunden (2018) reported that executives were spending ridiculous amounts for unnecessary things; an office executive sofa for ten thousand dollars. They were even paying for their personal life partner's motor vehicles and mobile phone charges. It wasn't just the absurd spending by these entrepreneurs but also their lack of management skills. They were often found micro managing their teams and had blurry visions for the company. This unsurprisingly led to the business operations being handled so poorly that it started affecting the consumers of the business.

There were even administrative issues that caused getting new titles and registration plates for the cars a hassle. They would sometimes arrive late, and other times would consist of incorrect information or be expired. The company was over funded. Beepi

raised too much too fast. The entrepreneurs made the mistake of evaluating the company too high. Once an organization is evaluated too high, obviously a lot will be expected from such a company. By over advertising itself in its worth, the later stages of funding were unsuccessful, and the credits of the organization were so high that the company had to be dissolved to pay them off.

Lessons learnt:

- Use the funding carefully
- Have a strong management team
- Don't over value or over evaluate yourself
- Make sure the credit stays at a reasonable level
- Money should only be raised when absolutely needed

Yik Yak

Most of the time when a trend becomes so popular it creates a vacuum of problems that are left unfulfilled in the market on the other end of the spectrum to what the original trend focuses on. It is an opportunity for some alternative to be offered in the unpredictable and unwanted consequences of larger trends (Juetten, 2018).

The trend in rise in smartphones and the adoptions of internet for mass communication was the start to the misuse of the people's privacy. This in turn created the opportunity for mass communication through the internet with the utmost anonymity. Thus, was born the idea of Yik Yak, one of the more popular anonymous online messaging applications of 2014. It gave user the opportunity to be able to post content anonymously (Yan, 2015). This content would then be shared with other uses who use Yik Yak nearby.

This application was a great hit and success among high schoolers and college students. The reason being the outlet the application allowed for this particular user segment to share interesting gossip while not having to disclose their identity. Yik Yak, due to its popularity with the youth quickly became a widely used application with a gigantic and active user base. This in turn caught the attention of many potential investors in the start-up circle. Yik Yak successfully raised 73 million dollars; being evaluated at 400 million dollars (Lee, 2017).

How did Yik Yak fail then if it was successful financially and the market liked it? It wasn't a single point of failure for Yik Yak but rather many smaller connected factors that eventually lead to its failure in early 2017 (Williams and Mahmoud, 2018). The primary reason Yik Yak is believed to have failed is because of a lack of growth. Growth in this instance is not necessarily in terms of size. Lack of growth for Yik Yak was in terms of being able to respond to the external threats to the start-up. More specifically, Yik Yak failed to act quickly to the problems it faced as well as its competitors.

The applications success was all because of how famous and in trend (or countertrend thereof) the application was. Once the application reached its peak and had its fifteen minutes of fame and the always changing minds and hearts of the type of users of this application have. Youth are quick in changing trends just as they are in abandoning something for something else that's currently hotter; an alternative, a competitor perhaps. Yik Yak fell into the case of where the ease of adoption that allows for the rapid early growth is what in the end sees the consumers migrate to newer technology just as conveniently.

While there was a huge rise in the number of alternatives and competitors for the type of products and services offered by Yik Yak, there was also a rise in the amount of usage problems for the organizations. Cyberbullying, online harassment, targeted hate speech and racisms flooded the contents of Yik Yak due to its anonymity (Chandrasekharan, Samory, Srinivasan and Gilbert, 2017).

The competitors also faced similar issues but not to this degree because the competitors weren't focused on anonymity and could hold individuals accountable for their content. The failure of Yik Yak to be able to come up with an innovative solution to combat cyberbullying, online harassment, targeted hate speech and racism eventually led to a decrease in excitement of its user to consume the product losing momentum and ultimately a huge chunk of their user base. This in turn hurt the revenue and therefore the profitability of the organization and it as forced to lay off more than half of its human capital.

Towards its end, Yik Yak was able to put in a last hurrah to try and capture back its users by offering new features and functionality like group chats and converting their anonymous approach to be more that of pseudonymous. But all of this was for naught. They eventually failed in getting back their users and had to be sold off at a fraction of their once high evaluation.

Lessons learnt:

- Be prepared for a few scenarios of unintended or unseen consequences. Plan long term
- Act quickly in a market with lot of alternatives.
- Keep an eye out for competitors and their strategies.

Fab

Fab was originally a gay dating site. Then moved to become a sales and daily design inspiration because of the entrepreneur's business strategies. Not long after that it became an electronic commerce website. Fab has pivoted one too many times (Bajwa, Wang, Duc and Abrahamsson, 2017).

Fab as a start-up grew extremely fast that it was even able to surpass Facebook's record of the first one million subscribers subscribed to the products and services offered by the organization. Fab was able to achieve this milestone within a very short period of time of six months. The "Inspiration wall" was an extremely successful concept developed by Fab. It was an interface that enabled users to post their purchases they made on the website of Fab (Fab.com). This was a social concept similar to that of Facebook that skyrocketed their sales and exposure.

Before the later months of 2012, the company was already well enough established that the employees felt Fab's working environment were comparable to that of Google. Fab raised 336 million at a valuation of three times that (Austin, Canipe and Slobin, 2015). Fab was so popular and successful all around the world that there were knockoffs of Fab. The knockoffs were also doing successful enough to get the entrepreneur of Fab worried about market cap. This caused the executives in Fab to acquire other start-ups in the region and expand to Europe to increase their market share.

The decision to expand to Europe would have been a good one, if executed at a more stable and ready time. Fab was not even fully established in the US before it began the fight for the European

market. There was an estimated loss of between fifty to a hundred million dollars due to the hasty decision of trying to capture Europe. From another direction, due to the many pivots of the start-up, its business operation of Fabs final form of being an e-commerce site weren't at peak performance. Fab had a very slow delivery rate. To overcome this the entrepreneur of the organization decided to purchase Fabs own warehouses in the US. It was a questionable decision that had their own advantages and disadvantages. The clear and quickly realised advantage of this decision was that the delivery time was improved by three hundred percent to that of only five days worldwide.

However, there was a disadvantage that was initially unforeseeable. By purchasing the warehouse, it was the perfect opportunity for Fab to significantly increase their product inventory. This was an opportunity Fab quickly cashed in on. Subsequently their sales rose exponentially. However, this also brought Fab to realise that they have slowly lost their core competency and competitive edge over their customers.

Fab when it was an e-commerce website, was known for being able to provide the much needed personalized and intimate design to their consumers. By scaling up their inventory they were behaving opposite to their focus. This forced the entrepreneurs to spend too much cash on the many marketing campaigns done initially that resulted in consumers buying products as a one-time thing but were not repeat customers; a big rise in the customer acquisition cost was seen. This was counterintuitive to the plan of developing the customer purchase patterns Fab was wanting to depend on.

By pivoting from a personalized and intimate products and service design offer provider, Fab turned itself into a generic e-commerce website. Once this happened and Fab had unknowingly changed its focus, Fabs customers fled to other generic e-commerce websites that could provide the same products and services at a much cheaper and faster rate. After the catastrophic failure, Fabs leadership decided to salvage what was left of the organization to only a small portion of what it was once worth.

Lessons learnt:

- Don't pivot unnecessarily and too often
- Don't make strategic business decisions without keeping in mind the focus of the organization.
- Focus on the core competency of the business and the pain points the organization solves.

Doppler Labs

Doppler Labs established back in 2013 were with an ambitious vision of squeezing a computer, a microphone and a speaker into a wireless earphone. Their product was called the 'One smart earbuds'. They were battery powered earphones that were developed and manufactured by the company. The entrepreneur's idea initially wasn't to be a company that sells earphones (as a hardware).

The one smart earbuds were to be accompanied by a smart application. The idea was that users should be able to use this application to control the equalizer of the sound quality of the earbuds. Its aim was to be able to do everything from minimizing the overwhelming bass frequencies in any concert to reduce the chitter chatter of people nearby.

The company in 2016 announced the new version of its earbuds and were now called 'Here one'. These earbuds were known as an augmented reality earbuds because they allowed for streaming audio frequencies through the Bluetooth technology while combining it with the equalizer tools offered with the 'One smart earbuds' (Kraft, Lanman III, Baker, Klimanis, Parks and Wiggins, 2017).

The product was truly a first of its own. It offered the best of both worlds. It allowed for music to blend music with the external environments noise with the ability to adjust the noise level to be truly noise cancelling. Doppler Labs was able to coup up 50 million dollars in capital raised (Ryan, 2017)

Doppler labs unlike the other start-ups studied did not get a chance to become very successful before it failed. Nevertheless, it still gives an opportunity to study what killed the company even before it got the chance to explore its potential.

While 'Here one' was a good product had had successful credit amongst the industry consumers, its manufacturing had caused some problems. A manufacturing change delayed the launch of 'here one' to early 2017 (Deahl, 2017). For a technology to be delayed is a death sentence because it allows competitors to rapidly close the gaps in their technology. On top of the manufacturing problems, the product development was also poor (Weinberger, 2017). The batteries in the 'Here ones' we supposed to last up to five hours in theory but only manage about a single hour of operation with one charge.

There were also other performance issues related to unstable Bluetooth connections and a lag when certain audio filters were

used. This drove down the popularity in the market and sales took a hit. Doppler labs were only able to sell 25000 units of the “Here ones’ while 15000 were stuck in inventory. Its initially sales projections were much higher.

The product issues were not the only problems that caused the failure of Doppler labs. While Doppler labs were busy with their manufacturing problems causing a delay in launching the product and being a market first, other giants were already in the game (PIERCE, 2017).

Companies like Google and apple came to the market to compete with their own Bluetooth audio solutions were their own platforms and features. Apple came out with their Air Pods which is known to have fast pairing capabilities and an extremely reliable Bluetooth connection. Google came to the market with their version of the Bluetooth audio solution, the Google Pixel Buds which is technologically by far superior, offering features such as real time language translations built in. This was actually an idea Doppler labs had synthesized but failed to bring to market before Google.

Once it was clear that Doppler labs were not going to be able to compete with these other giants in product or price, investors started to become reluctant to continue supporting the start-up which ultimately caused the organization to disappear.

Lessons learnt:

- Technology moves quick, get to the market as soon as possible.
- Work on the product, don't over promise and under deliver on the products performance.

- If you're going to compete with the giants, the product and price better be competitive enough to survive.

Pretty Young Professional

The Muse is an online business platform that focuses on helping female entrepreneurs to achieve their true potential by giving mentorship, guidance, and different opportunities to advance their career. Pretty Young Professional is the successor of The Muse. It was brought to life by Kathryn Minshew and her co-workers (Wang, 2013).

They noticed the lack of resources that are available to the women youth of the nation especially in the circle of entrepreneurship and start up culture. Pretty Young Professional has a simple focused vision. It was to just provide young and independently strong women with newsletters weekly that would help bring about and shape a community of such ladies who wanted to be successful entrepreneurs.

The founders of Pretty Young Professional were friends and knew each other quite well. They even shared the same vision and passion; they put their heads together to form the start-up 'Pretty Young Professional' (Bartolone, 2017). The process that started the company was not very formal. There was a meeting in which all four of the co-founders decided each other's positions and shares. This was simply written on a note and forgotten about. Perhaps this was the start to the start-up's failure.

Being straightforward, the start-up was doing well. It had proper funding, proper customers. It was even solving important pain points and capitalized on the market opportunities. The trouble sprouted internally. A disagreement amongst the entrepreneurs of

Pretty Young Professional about where the company should be headed caused turbulence within the organization; something that should have been discussed during the initial stages of the organization's growth. The co-founders found that mixing business with casual friendship is not a good idea. Regardless of how close the founders of the start-up were, when it came to business strategies, they each had their own opinion and couldn't come to a unison decision.

Pretty Young Professionals let emotions dictate the fate of the company rather than logic and facts. Within a year, the original co-founders broke into two different groups because of their difference in opinions. After this everything went down a dark spiral. The legality of the original draft of the agreement was now in doubt. This subsequently turned to a lawsuit and the cause the original founder to step down as CEO of Pretty Young Professional.

Due to this poor cooperation between the executives of the company, it came down and collapsed promptly. This happened even when investors were still interested in funding the start-up unlike the other start-ups studied in this thesis.

Lessons Learnt:

- Don't let emotions and friendship mix with business.
- All agreements must be legalised and binding by law
- Keep everything formal even if it's a business run my friends
- Poor leadership and disagreement between management can bring down the organization just as quick as running out of cash.

Factors which have significant impact on start-up outcomes

In this part, we will take a closer look at others research as to why start-ups succeed or fail. We will firstly be looking at why start-ups succeed; what is the secret ingredient. Secondly, we will also look at why start-ups fail; are they avoidable? We will try to study the similarities and differences between failed and successful start-ups while try to find a pattern amongst them. We will also look at observations made by lee (2001) on the start-up performance based on different parameters to assist this study's literature review.

A study of successful start-ups factors with real life examples**External factors****Globalize but personalize**

Most start-ups goal in the long term is to grow, just like any other organization. Sometimes, the growth is in terms of the size of the company; measured by the revenue, employee size or total worth (Bartlett and Ghoshal, 2000). A start-up growing in size has its own advantages and disadvantages.

However, a key point to remember when a company is growing globally is that the consumer significantly differs in different geographical regions. Customers may have the same or similar pain points, but certain factors such as culture, technology capability and economic power will cause the end-user to pursue a slightly different solution than being offered elsewhere (Kuemmerle, 2005). In the end, if the customer does not find the provided product or service to be the ideal solution, the acceptancy rate of the product or service drops, and the consumer simply moves on to the next best available solution that fits their needs and requirement.

When a company scales internationally, it is the entrepreneur's duty to make sure the products and services offered by their start-up company adheres to the local population and end-users. This may require additional business operations such as new customer survey and hiring local experts to help design and tweak existing products and services. "Gett" is a start-up company that understood the importance of not delivering the same set of products and services all around the globe. Gett is an online platform in the form of a mobile application that allows an individual to book a cab or a limousine (Cohan, 2018). Gett was originally a company founded in Israel but quickly expanded to other major continents like Europe and America.

Gett now operates in more than a baker's dozen of major cities around the world that include huge cities like London, New York, Moscow and Tel Aviv. Transportation is a different business at different corners of the world. The personal preference of travel vehicle in the majority of different localities are very different. Some end-users prefer luxury travel at a premium cost, other require a cheap mode of transportation. Gett did not make the mistake of ignoring this and successfully studies and implemented the local preferences into their application and business when launching in different parts of the world.

Thanks to the success of scaling hugely yet being able to capture new customers wherever it expanded, Gett now has above a million frequent users and about a thousand enterprise customers. Gett's capital raised accumulates to forty plus million, exhibiting its success (Maune, 2017).

Allow the customer to improve your products and services

Entrepreneur's and their start-ups are the designers and builders of products and services, the customers and the people who purchase and consume said products and services. This is an important distinction. During the designing and building phase, most of the ideas and concepts that are developed are based more on theory and less on practical application. This limits the capability of the product or service from being its ideal self from the perspective of the end-user.

The end-users are the true primary source where ideas for improvement can be harvested from. Through frequent and natural use of the products and services by the consumers, they have the hidden advantage of gaining true insight of the product/service (Müller and Thoring, 2012). In other words, the customer has the opportunity to identify the components of the product and services that are working well and should be maintained as well as components of the product and services that are not working as well.

The customer would always have some or other feedback about the products and services they use. Usually these feedbacks are on the negative aspects of a product or service that need to be removed or improved to enhance the overall experience and customer satisfaction with the products and services. It is gold for start-ups that pay attention to their customer's feedback and use it to implement changes to their products and services to better fit the needs of the market and solve important pain points (Jespersen, 2008).

Certain start-ups and its entrepreneurs went the extra mile and tested giving control to the end-users themselves to help contribute in the workings of the products and services they offered. It turned out to be a great idea to give limited control to let the users control certain elements to promote end user experience and subsequently their satisfaction level with the products and services used. This was the case with 'Taboola', a provider of recommendations to content that the end user may prefer to read such as news and articles (Lunden, 2017).

With only a hundred and twenty employees, how is Taboola able to generate revenues in hundreds of millions? Brilliantly, Taboola used the concept of using its customers to do some of the work. The work in question relates to improving the accuracy and precision of its services by allowing user inputs to be considered when offering its services. The main service from Taboola is providing recommendations, they then allowed users to suggest and control the recommendations for other customers if this service.

Since the customer knew what would be the best recommendations that they would enjoy, it allowed a majority of its user base to benefit from likeminded users who collectively improved the experience for the entire community. Taboola succeeded by successfully 'Democratizing' its core service components.

Targeting the niches

The entire idea of disruptive innovation originates from the concept of using innovation to conquer initially tiny market needs that are not being met. When we look at some of the most successful organizations today with a wide range of customers,

we see that they were not always that big. In fact, they usually start small and focus on a small market segment.

It is very important for an organization to be able to correctly identify and target its market segment (Weinstein, 2013) This not only acts as a proof of concept of their products and services to their consumers, but also guarantees a sustainable market share for the survival of the business in its early stages; provided the organization is providing a suitable solution to the problem faced by the small market segment.

Targeting niche markets have their own unique strategies and therefore start-ups targeting niche markets may not have as heavy a competition as compared to generic situations in a start-up world (Day and Day, 1990). When start-ups are too concerned and focused on trying to get everyone to use their product they build functionalities that accommodate everyone's needs. This makes the product not very user-friendly. The entrepreneur ends up making something for everybody that is used by nobody.

A start-up that can target the niche market and capture the entire market has a very high chance of success provided there are no other major parameters that would cause the start-up to fail otherwise. A start-up can take advantage of this phenomenon of niche market strategy with many niche markets by customizing and adapting their products and services to those markets.

We see an example with the start-up 'Kaltura' who successfully targeted many niche markets. Kaltura was founded to be an open-source platform in the form of videos that allowed its user to manage, publish and share content in the form of a video (Lardinois, 2019). The start-up was able to successfully tailor

their products and services to target the niche markets in the enterprise, education as well as the media industries.

They made different functionalities available to these different niche markets according to their very specific needs and requirements. Kaltura is now actively being used by about three hundred thousand companies in the educational, media and enterprise sectors. HBO, Bank of America, Harvard and Groupon are just a few of the high grade and noteworthy companies that use Kaltura's products and services.

The start-up's business model created and captured value (Kohler, 2015). Kaltura successfully raised over twenty-five million dollars for its capital and funding; an example of the prosperity targeting niche markets brings along. The important lesson that Kaltura teaches is that it's a better strategy to target a few than the masses.

Other external factors contributing to start-up success

1. Mentorship
2. Political
3. Valuation
4. Social and cultural

Internal factors

Team harmony is crucial

A start-up is like a project that started off because a bunch of people were passionate about solving an important problem. Therefore, it is of utmost importance that the people who work in the project to not only be passionate about what their working on, but also be collaborative with one another. In projects where there is small team of people where their position and title don't

stop them from speaking out and sharing ideas and who work in an agile fashion, progress is often shunted when there are disagreements and misunderstandings within the team (Park and Lee, 2016).

Stunned progress is not an acceptable situation in the fast-moving world of start-up. Which is why it is not enough that the start-up has the right team members but also additionally the team harmony must be high, and their collaborative effort should be progressive, not the other way around. When teams work together in harmony, they work faster and get a higher quality of output. This is the competitive edge that will allow a start-up to outshine others when it comes to the success of the products and services in the market; so much so that there are different techniques and methodologies that try to maximize collaboration (Huxham and Macdonald, 1992).

Let us take a look at 'Prismatic', a digital newsreader that makes use of its own proprietary algorithms to draft personalized content that will be to the end-users liking and need. Prismatic does this by simply and innovatively by combining the customers reading style and preferred as well as most read content to be able to recommend other similar content in its application platform (Lawler, 2013). A primary reason for the start-up's success was due to the start-up team's collaborative efforts in designing and building the products and services; also running other business processes efficiently.

Prismatic was able to construct a harmonious working environment where the organizations engineers, designers and researcher could all collaboratively work on solutions hand-on. The perfect working attitude and environment was created and

improved because of the leaderships decisions to learn and share their inputs in the designs of the product itself with the rest of the team; depicting teamwork, harmony, leadership and collaboration in from the top down.

If it's working, don't change it

It is very hard an unlikely that a start-up will provide the free market with products and services that are accepted and doing well. This is mainly due to the number of start-ups as well as the availability of alternatives for most of the products and services offered in today's world. When an entrepreneur and their start-up is lucky enough to have their products and services be successful in the market without any major changes, they should take extreme caution in making any significant changes that could directly or indirectly affect their products and services. They should take the opportunity to milk the products and services as much as possible until it reaches a level of saturation in the market (Kotler, 1978).

The start-up and its entrepreneur should not let their thoughts dwell on the possibility of making changes to the product or services in an attempt to try and improve it or capture new markets when the products and services are doing just fine on their own. A start-up does not have the luxury of trying and testing different variations of their products to achieve its potential and ideal stage. Instead the start-up, usually lacking money, should try to make as much of it possible as it will not be possible to do so if the product or service has been changed and they market does not accept this new product and service.

Learning about their product's and service's life cycle gives would give the entrepreneur a better idea on what stage a current

product or service is and at which stages it is safest to make changes in order to try and improve it is (Gecevska, Chiabert, Anisic, Lombardi and Cus, 2010) When a start-up has a product or service with a proven business model that generates enough revenue and profit to allow the survival and better yet the growth of the company, it is noxious to try and improve the business model as a majority of the time it results in a failed business model (Picard, 2003).

At this point in time, the start-up may not be lucky enough to have a runway long enough to reintroduce the proven products and services in an appropriate period of time making sure they don't burn out of cash.

Taking a look at a start-up called 'ShoeDazzle' we can see how valuable it is to let a concept remain unchanged if it is already working. This start-up is a customizable online styling program that assists in discovering and buying apparel, shoes and other accessories; specifically targeted at the female population. The company was running successfully due to its innovative subscription business model that brought in significant revenue and higher profit margins (Lim, 2017). It was able to hoard a user base that was just shy of fifteen million regular users. The company's success was reflected in the north of sixty million dollars in funding that it received.

How do we know that making changes to the proven subscription model is a bad idea? We learn this from ShoeDazzle doing exactly that. The start-up retired its trusted and working subscription model for another model to try and improve revenue generation. This immediately caused the start-up to incur huge financial damages as the new models were not generating enough

sales and there were no successful working models to absorb the damages.

Luckily for ShoeDazzle, they were quick enough to realize their mistake and reintroduce their unchanged proven and revenue generating models back into the market (Lawler, 2013). This allowed them another chance to grow, which they did thanks to not interfering with concepts that are currently and successfully working.'

Prioritize, don't do more than can be handled

An entrepreneur must have clear vision and mission statements for their start-up business. This means the entrepreneur must also know the exact core competency and deliverables of their organization.

Often times it may seem like a good idea to use the intellectually property and underlying technology of the start-up to increase the range of products and services offered. This could be an attempt to increase the customer base through which the organization may scale up. However, scaling and growing the organization doesn't mean that the company is going to be more successful than it was at a point in time in history; it all depends on the business strategies (Rumelt, 2012).

Start-ups must refrain from doing too many things just because it can. These things can include a wide range of business operations such as research, design, product development, service delivery etc. The start-up should only engage in such activities when it is opportune; and it is guaranteed to a reasonable amount that these additional activities will help the start-up in the long run. Otherwise, it can result in unnecessary

spending and a loss of confidence in investors from the vague vision of the entrepreneur (Wiklund and Shepherd, 2003).

With the limited resources a start-up has, it needs to focus these valuable and scarce resources at its core competency as well as products and services that are at their highest performance. Deviating from the best performing products and services to do other activities will significantly affect the success of the product and service causing a loss in sales and possible profit damages also may be observed. This is because the previously allocated resources that were in charge of focusing on the operations of the winner products and services are now deviated and redirected to other activities.

It's always a safe bet for a start-up to continue to target their most important business process that bring maximized value to the organization. They should not try to explore new areas just because they have the capability to do so; it is only sensible to explore new concepts when an opportunity is identified or presents itself. We look at 'Voxy', a start-up company that created a mobile application that helps its users learn languages.

It was primarily being used for (at a targeted niche market) Spanish speakers that wanted to learn English. The application provided small lessons on a frequent basis based on real-life scenarios. The product or service solution offered by Voxy was were specific as just described (Tsotsis, 2010). With their state-of-the-art progressive technology and collection of intellectual property, the organization could have easily decided to add more content and different languages in an attempt to broaden its customer base and potentially increase revenue (Heil, Wu, Lee and Schmidt, 2016). Instead the entrepreneur decided that they

will continue to focus on their very specific solution because it was successful and there was no clear indication of an opportunity that would be beneficially for the company to scale, expand and/or grow.

Because of the entrepreneur's decisions, Voxy now has a great reputation for doing what it does and how well and specifically it does it. They now have just over three million persistent users. Their success has helped the establishment procure a funding of about five times that of their user base.

Other internal factors contributing to start-up success

1. Proper and timely prototyping
2. Efficiency of business operation
3. Establishing an organizational structure and a code of conduct

Factors that are a mix of external and internal

Do what you can, have others do what you can't

A start-up usually is the outcome of an opportunity to solve a very specific problem. Often, the entrepreneur who thinks of an idea when presented with the opportunity, also has the skills necessary in the related areas of the development of the products and services that are to be the solution. Sometimes the entrepreneur may hire additional technical support to focus and build the solution if the solution is a technical one. A start-up as the name suggests is an organization that is just starting out and hence may not be a perfect reflection of an established business.

Most of the supporting activities are given little to no priority. The primary priority of the entrepreneur is designing and building the solution by being able to identify their core competency (Snyder

and Ebeling, 1992). Because of the limited resources available to a start-up, the resources have to be utilized on the core competency of the organization which is usually the product/service/solution. The non-core business processes and supporting functions should be outsourced whenever possible (Linder, 2004).

If these limited resources are evenly spread across all business functions found in a typical organization then the start-up will never lift off; by bringing their products or services to the market in the appropriate time period. In today's digital world with advanced and wide range of available technology, the entrepreneur's idea may not even need development of new technology. It could simply be integrated into existing technology to bring new applications. For this reason, most entrepreneur's and their start-up team have no need to build everything themselves.

Focusing on their core competency and partnering with other parties that can help bring the supporting infrastructure to complete the product or service package is what all entrepreneurs should do. Let's take an example of 'Apartment List', a start-up whose birth originated from the idea 'let's use technology to help people find apartments more efficiently'. The start-up company provides a solution for renters (the consumers and customers) a means and platform to quickly browse through tons of apartment listing and connect them to their interested properties landlords.

Their web application held millions of apartment records in a single and effortless online search map (Glasner, 2017). This solved the pain point of the traditionally painful process of home hunting; converting it to an easy and problem free process. The

entrepreneur did not want to build everything from scratch because they realised that it would be a waste of resources and an infeasible approach to launch their organization. Instead of going against other companies like 'Craigslist' or coming up with something entirely new like the company 'Zillow', the start-up Apartment List simply decided that they would focus on their idea and partner with many progressive real-estate marketplaces to use their vast database of apartment listings in Apartment List's web application. This business strategy execution was a success and the start-up successfully cooped up fifteen million dollars in seed money (Brooke, 2013).

Use and offer the best technology

Technology is a primary driver of the start-up culture. Technology hasn't only made it easier for organizations to conduct their business but has also been responsible for the origination of many start-ups that use technology as their frontier solution (McKendrick, 2017). There are more technology-based start-ups than their counter-parts (Mansfield, 2019).

Technology is so important that even non-technology-based start-ups could harness the power of technology by implementing and incorporating tech into their products and services. With the wide range of technologies available today at different costs, it is a headache for an entrepreneur to choose the technology which best fits the needs, visions, culture and requirements of their start-up (Stayton and Mangematin, 2016).

Due to the rapid change in technologies and their capabilities, it is very easy for an entrepreneur and their start-up to make the wrong decision when it comes to choosing the technology to be using for their start-up. These bad decisions could be the result

of the chosen technology becoming obsolete in the near future or having to spend too much money in acquiring or building such technology that the value it provides is just not worth it.

Therefore, a start-up must always aim to use the best available technology for themselves as well as implementing the best technology in their products and services so that the end-users may also benefit from them. In the 21st century, the market prefers products and services that have a technological touch to them as technology just increases accessibility and functionality. With this, start-ups that are able to use as well as provide products and services with incorporated technology within them certainly have a competitive edge over others.

The significance and power of the competitive edge depends on the difference between their own technology used and the technology used by their competitors. A start-up that proved that better technology provides an advantage that translates in a higher change of start-up success is '2U'. 2U is a company that harnesses the power and capabilities of technology to provide its customers with a virtual learning platform by partnering with top universities. The company allows students to study virtually from anywhere and at any time to obtain their university degrees.

The company offers state of the art technological infrastructure, its marketing and software in an 'as-a-service' model (Empson, 2012). This helps universities to take advantage of the technological abilities of 2U to digitalize their study programs and scale without having to expand geographically. The primary reasons for 2U's success was not that they were the first to the market or that they have successfully targeted a niche market;

there are many alternatives and competitors that provide the same solutions.

The key factor in 2U's success has to do with their technological capability. They provide technology that is rivalled by none in the industry (Lunden, 2019). 2U uses its proprietary and highly advanced machine learning management software and a suite of other great technical products and services to support not only the students but also the entire teaching staff, faculty and generally all other parties involved in the university learning process. The entrepreneur's decision of wanting to hire the best technical minds is what allowed the start-up to achieve its success. The company has raised just shy of a hundred million dollars in venture capital funding, a clear illustration of its success.

Offer individualization

A well-established business may have a wide range of products that generally appeal to the masses because of its value when comparing its functionalities to its cost. By producing in mass quantities, big and established corporations are able to produce products and services that are seldom distinctive from the point of view of its end-users and yet able to attract a large enough market segment to continue the generation of revenue (Sikhwai and Childs, 2017).

However, that is not the case with start-ups. A start-up will usually try to start off by solving problems faced by a tiny and almost insignificant market size. Therefore, to be able to survive with a business model that operates in the niche, it is crucial to be able to capture almost the entire market. To be able to capture the entire niche market, the customers in that niche market need

to feel as if their needs and wants are understood and valued by the start-up. This is the reason the niche market does not comply and adhere to the mass market in the first place. Start-up must make their end-users feel unique and special. This is possible by offering individualizations as part of their solution by incorporating customizability into their products and services (Slama, 2019).

When a user believes that they have the power to customize and have a personalized feel for the products and services they use, their perceived value proposition of the product or service increases, eventually translating to increased brand loyalty (Cuia, Rajagopalanb Wardc, 2018). If an entrepreneur fails to see the importance of individualization in their targeted market segment, their start-up will not focus on product or service customizability. This will then result in them being outcompeted on a pricing level by other bigger existing corporation who exploit the advantages of economies of scale.

We can take a look at a case study where the start-up 'Pandora' successfully incorporated and implemented customizability in their products and services as well as their platforms, enabling and offering individualization to their customers. Pandora is a global music discovery platform which offers personalized experience for each and every one of its consumers in many different forms. Contrary to the traditional radio platforms that broadcast content that cannot be controlled by the user, Pandora allows it's an on-demand model for audio content. The users are also able to create their own playlists from thousands of available audio content on Pandora's database (Perez, 2019).

Pandora also increases its offered individualization by relying on the end-user's feedback on the audio content and its creators to enhance and further personalize the experience for its customers. This allowed Pandora to quickly grow its reputation and brand loyalty. All they did was offer personalization to their users and made them feel like they mattered (Shieber, 2019).

This successfully strategy of Pandora's entrepreneurs has allowed the start-up to now be only of the most advanced and globally recognized audio content platform. The company was so successfully that investors funded the organization a total of just about two hundred million dollars.

Other external and internal factors contributing to start-up success

1. Positive company positioning
2. Establishing a suitable support system

A study of failed start-ups factors with real life examples

External factors

A lack of market need

As obvious as it sounds, a business needs to build a product or offer a service to the market that is actually in demand. This is what will keep the business from failing in most cases as the market accepting the product is what generates revenue and in turn profit for the company.

One of the primary mistakes entrepreneurs in their start-ups make is that they spend too much time trying to design the perfect product for the market. Only to soon realize that the market didn't have a demand for such product. When an organization works on a product the market does not need or want, valuable capital is

being wasted just like the company's and entrepreneur's time (Feinleib, 2012). Many startups are never truly able to achieve their right product-market fit which causes them to eventually run out of business.

We see an example of this over at the failed start up 'Patient Communicator' who spent a significant amount of time trying to perfect the more efficient office for doctors the world has ever seen (Saseedharan, Karanam and Lewis, 2019). But they soon found out that what doctors really wanted were simply more patients, not an efficient office.

Another great example of a startup that has failed to find its market product alignment is 'Treehouse logic'. This organization had a great database of shopping behavior as their analytics (Klotins, Unterkalmsteiner and Gorschek, 2018). They even had other factors crucial to a successful startup in order such as reputation, leadership, expertise and mentorship. What they lacked was the technology that was able to solve a pain point of the market and that lead to a lack of sales and eventually killed the company. A start-up not being able to build a product or service that the free market needs is the primary reasons start-ups fail.

Market competitiveness

Competition has its own advantages and disadvantages. While some believe that the best competition is no competition at all, this is untrue. Competitions can be categorized into good competitions and bad competitions (Blumberg, 2013).

Good competitions allow you to be on your toes by continuously improving aspects of your business. This improvement can come

in terms of making business processes more efficient and therefore cost effective. It can also be in the form of innovation to the products and services offered by your business. However, sometimes there is just too much competition, or the limited competition is too good

. While a start-up can try its best to outcompete its competitors, the competitors may have the competitive edge of being the first mover with a more innovative product or service; possible with a cheaper solution as well. Not being able to catch up to their competitors will result in the market opting for the competitor's products and service. When enough of the market chooses to go with the competition, the original organization fails to meet its revenue targets and is eventually run out of business.

Therefore, it is crucial that start-ups always keep an eye out in the market for competitors and what they are doing. While focusing too much time and effort into competitor analysis is unhealthy, too less focus will lead to the organization's failure; as seen with the case of 'Wesabe'. Wesabe was a budgeting application that lost its business to another startup called 'Mint' (Ammirati, 2016).

Wesabe was trying to implement a customer first approach by incorporating many functionalities that would help the user better use their applications service (Tungare and Perez, 2008). While Wesabe was doing that, Mint just launched another application that did the same things Wesabe's application did but in a much simpler and quicker way. This caused the market to choose Mint's application over Wesabe's application. Losing the market share, Wesabe had nowhere to go except out of business.

Other smaller external factors that cause start-up failures

1. Government and policies
2. Poor supplier relationships
3. Long term poor weather conditions

Internal factors

A lack of strong marketing

A successful start-up recipe consists of a good idea coupled with perfect execution (Wilson and Wilson, 1970). However, if the market doesn't know about your idea and the outcomes of your business execution (products and services), people will not be able to purchase the offerings of the start-up. Marketing could be considered a part of business execution, but still forgotten or poorly executed by many a start-up (Davicik and Sharma, 2016).

There is a very important process that is common to all businesses. It's called customer acquisition; how does a business do this? Businesses first need to know their target audience. They should then focus on methods of getting their attention (this is usually through advertising). The target audiences should be interested enough to become classified as leads. The final step is for the business to then convert them into their customers. Fail in any one of these key links of the process and that's an indirect hit to the organization's revenue.

Inexperienced entrepreneurs are at an understanding that the product or service offered account to everything and ultimately the success of the business (McGrath, Mac Grath and MacMillan, 2000). Most startups are now powered through and by the abilities of the internet. The start-ups products or services are primarily in the form of a software. The entrepreneurs find a pain point and focus most of their attention into coding a solution.

They spend too much time perfecting the software they forget to get people to notice that there is a digital solution for their pain point.

Such was the scenario for a failed start-up called 'Overto'. Overto was a start-up that provided various internet-based services to its customers. During their solutions launch, there was a gradual growth of users of their platform. The entrepreneur thought that since the customer base is growing on its own, they would not have to do anything about customer acquisition. One day their market users plateaued just as it does for any start-up let alone any company or organization.

By this time, it was too late for Overto to start a marketing campaign to try and acquire more users. This was a major reason that eventually lead to the death of Overto; a simple lack of a marketing (Brodzinski, 2009).

Issues related to pricing and costing

Cash is very important for businesses; especially start-ups who have a whole lot to prove with limited budget (Cressy, 1996). Therefore, a key challenge for most if not all entrepreneurs is being able to price their products and/or services correctly. This is a decision that is based on many factors such as product quality, demand supply, competitors etc.

The entrepreneur must be able to pick a price for their product or service in a way that it is high enough to bring in enough revenue to cover the business costs and make some profit but at the same time it should be low enough to grab potentially customer's attention and build a user base. We can learn how important the

pricing and costing can be in a start-up from a company that failed due to this very factor, 'Delight IO'.

Delight IO is a company that offers the tech savvy developers that chance to gain insight on how their users use their applications through a screen recording. Delight IO's entrepreneur confessed that they had initially priced their product wrong (Pun, 2014). They were pricing it based on the number of recordings that their customers used. It was found that the customer was therefore hesitant to on using up the recordings. Customers did not really have a problem with the price, the problem was with what was offered with the price. Delight IO's leadership now believe that a time-based price model for the recordings would have had the customer's interest and kept the business afloat.

Running out of cash

Cash is king. Without cash it is not possible to move forward. Same is the case when it comes to any organizations, especially start-ups because they have limited capital and a lot of upcoming growth (Patwardan, 2001). Cash is more or less binary when it comes to businesses; either their flowing into the business or out of the business. A successful organization has more cash coming into the business that going out (with the exception of investments and inventory).

When a business find itself with a constant pattern of more cash going out of the business than into the business, they will eventually run out of business. There may be different reasons that affect the cash coming in and going out of the business. A business may want to pay its creditors, employees, marketing,

general expenses, taxes and even fines; causing money to go out of business (Berry, 2017).

A business may call upon its debtors, get sales money, royalties, or even tax returns; bringing money into the business. Therefore, the while running out of cash may be what killed the start-up, its root cause may be some other factor. Nevertheless, this shows the importance of money within the business. When a business runs out of money, its game over for them. It was game over for a start-up called 'Flud' when they ran out of cash. Flud, a start-up that offered its customers a 'Social news reading' had enough customers to just break even in business.

The company was one that could have done well if it wasn't for the fact that they couldn't get enough cash coming into the business. The way Flud ran out of cash was by not being able to close in capital financing from venture capitalists (Empson, 2013). When there was no more financing put into the start-up, their runway was cut short and eventually ended.

Not utilizing the proper networks and channels

As an entrepreneur, business networking is a very worthy method to increase the entrepreneur's ideas and vision for their start-up. It's a great opportunity to learn not only from other people's failures but also their successes. Business networking also enables you to obtain potential new clients while advertising through word of mouth for absolutely no cost.

Most of the successful entrepreneurs of today are where they are because the utilized their networks and channels appropriately (De Klerk and Saayman, 2012). A strong professional network of other parties in the ecosystem of the start-up culture will allow an

entrepreneur to reach and complete objects that they would not have otherwise been able to achieve on their own. Gilmore and Carson (1999) believe that through business networking as a tool, there is nothing more efficient in achieving advertising in the form of word of mouth.

Most importantly, while business networking doesn't cost the entrepreneur any money; but the downside is that it costs the only other valuable this the entrepreneur has, which is time. Nevertheless, if entrepreneurs fail to utilize their networks and channels to their benefit, it will cost their start-up the much-needed opportunity to boost the company.

We can see the example of a start-up called 'Kiko' that failed due to one of the major reasons being their reluctance in seeking help from their business and professional network. Kiko was in its simplest terms a calendar application that gave users advanced features related to managing a schedule (Atterer, Wnuk and Schmidt, 2006). One of the key reasons Kiko's entrepreneur believe the start-up failed was because they were too shy to reach out for the help of their investors, industry colleagues and even their own mentors.

It may have been due to the team's insecurity of wanting to reach out for help that Kiko never properly made use of its team's professional network. The team was trying to do everything themselves, learning everything scratch. Simply reaching out would have save the start-up much of its valuable time and maybe could have spent it more wisely; in such a way that would result in its downfall.

A lack of proper financing

We previously studied how running out of cash is a death sentence for a start-up. In the same way, it is very bad news for an entrepreneur and their start-up if there is a lack of proper financing. Financing is like fuel for start-ups. Especially during their early stages, without the proper funding, the start-up is destined to fail even before it starts.

Therefore, it is important for an entrepreneur to not only secure the proper financing for their start-up but to also explore many backup channels for financing their start-up. This can be useful when the initial investors pull out at the last moment or the start-up needs a rainy-day fund for any disasters.

Sometimes start-ups need to have 'quick money' to seize certain opportunities such as filling purchase orders or funding research and development for the competitive edge of innovation (Rose, Marquis and Lu, 2009). It is crucial for an entrepreneur to think about the financing of the startup when it is actually 'Starting up'. Additionally, entrepreneurs must also take in account the different stages a typical start-up goes through and at which different stages the start-up will be requiring funding (Paschen, 2017).

An entrepreneur must be prepared to have financial backing plans that go at least a few years into the future. A draft predicted cash flow cycle of the start-up could help the entrepreneur in planning ahead financially. Without proper planning for financing at different stages the entrepreneur inevitably is going to fail his start-up organization. A failed startup is a failed startup regardless of whether it failed during its first year or the second.

We take a look at the start-up 'DineIn'. DineIn is a technological startup that focuses on the very traditional problem of logistics. A platform through which food can be ordered and then subsequently delivered is the service offered by DineIn. During one of their financial rounds to raise money, they had actually successfully tied down the financing.

Unfortunately, at the last moment due to unforeseen circumstances and scenarios, the financiers backed out leaving DineIn with no funding (Calhoun, 2017). DineIn had no backup financing channels setup for a case just like this. This caused them to dry out of money and were forced to close down.

Not having a plan to pivot or a failure in pivoting

Pivoting is the act of changing directions. For start-ups this could mean changing their vision to something more appropriate for the current challenges faced by them (Mathews, 2012). Far too often, start-ups volunteer to pivot by themselves, in other cases there are forced to do so because they were not doing so well in their current strategy (Nobel, 2011).

When a start-up decides to pivot, usually their business strategies also change. As a matter of fact, a change in business strategy is what causes a start-up to pivot (Müller and Thoring, 2012). During a pivot of a start-up, it usually means that the start-up is going to use the underlying technologies of its current products and services to deliver a modified or completely new product and services that the start-up believes will be in higher demand and more beneficial to the market.

It is advisable to keep pivoting in a start-up to a minimum and ideally none. A pivot is sort of a last chance at trying to keep the

start-up afloat or recovering from the saturated market of the current products and services offered. There are two ways a start-up can fail when pivoting. First is when the start-up does not even have a plan to pivot in the first place. A start-up must be ready to pivot before it needs to, if not then it will be too late to make the necessary changes needed to be able to perform a successful pivot.

The second way a start-up can fail when it comes to pivoting is in the execution of the pivoting. There are many factors involved that need to be taken care of when it comes to a start-up pivoting such as reshaping the marketing strategy, rethinking the pricing and costing issues, changing the organization's vision and many other business processes.

Enough resources must be allocated to ensure all these business processes are ready to change in order to support the pivot of the start-up. We can take a look at an example where the start-up 'Imercive' failed due to a failure in the execution of pivoting. Imercive was a social media marketing company which enabled branded quick messaging applications as an innovative way to promote consumer engagement. In the case of Imercive, their initial technology was not feasible enough to continue business at a survival level. When the entrepreneur saw that there are other products that could be offered with their existing technologies, the entrepreneur decided it was time to pivot (Nowak, 2014).

The company then started the process of pivoting when suddenly the leadership identified another opportunity and strategy. Now that Imercive was mid-pivot, there was a dilemma on whether or not they should pivot again to the new opportunity. Being stuck in

thought and not making a decisive action caused a failure in the original pivot of the startup. The company could not go back to its original position because certain business processes were already in the midst of change.

The company could not move forward either because they ran out of valuable resources in the delay to pivot. This made sure that the company was stuck in the middle of nowhere and starved causing a disaster. Which is what happened to Imercive and caused them to go out of business. We can take a look at another example to learn about a lack of plan or hesitation to pivot at the right opportune moment, from 'Flowtab'. Flowtab as the name might suggest was a digital platform that allowed its users to book a queue at bars and other venues of hospitality. Flowtab initially had a horrible business model due to which they were barely able to make any money (Wilhelm, 2013).

The entrepreneur of Flowtab decided that they should pivot just for the sake of pivoting with not much planning. This was a mistake the entrepreneur soon realized. It was realized that pivoting must be a calculated move where changes and its consequences and predicted and its outcomes analyzed. Failure to do so caused Flowtab to spend too much money of the pivot without a successful pivot eventually causing the business to run out of cash and going bankrupt. Flowtab learnt that not having a plan to pivot and making a pivotal decision spontaneously is a recipe for disaster.

A lack of a business model

A business model is the go-to living document for any organization when it needs to get a big picture of how and why the business operates. A business cannot be without a business model (Chesbrough, 2010). For start-ups, the business models

tend to change a lot because of the agile nature of the operations of start-ups. However, it is important to understand the 'living' part of the business model.

A business model dictates how different factors such as customers, partners, cost and revenue are interrelated to one another. Therefore, for businesses, especially for start-ups, where these factors tend to change frequently, it is crucial to have the business model updated as often as necessary. An outdated business model is an incorrect business model which is as good as classifying it as 'a lack of business model'.

The business model is not only a piece of document that allows an individual to understand the business but also a means of helping the entrepreneur explore and understand new opportunities within the market for the long run (Zott and Amit, 2010). When a business does not have a business model, it limits their ability to understand their own business in the big picture and prevents the exploitation of new opportunities.

When an entrepreneur is not a hundred percent sure of what their business is all about, the business has a low probability of success. Drafting a business model for the sake of drafting a business model will also prove pointless unless utilized properly. There are businesses that do not focus enough resources onto the business model. These businesses will also suffer in the long run. This is because a business plan shows the weaknesses and strengths of the business.

It could also potentially show the growth opportunities and whether or not the business is scalable by studying the relationship between the different factors involved in the growth

of the business such as the customer channels and the potential revenue streams (Zott, Amit and Massa, 2011). 'Tutorspree' is a great example of a failed startup where they were unable to realize scaling problems due to the lack of an informative business model.

Tutorspree is a digital platform that acted as a broker between tutors and students online. The main problem with why Tutorspree failed was that it was never planned and visualized through a business model to be able to drive the growth of the company since the start. The entrepreneur believes they forced the company into its existence and that it just couldn't be forced. Because of the lack of a strong business model they could not foresee the challenges of generating constant revenue against the scalability of the business (Shontell, 2013).

They grew too big and were too dependent on factors such as search engine optimization that they forgot about their customer channels and the customers themselves. This resulted in Tutorspree being too big for the small amount of cash they were generating. A lack of profitability caused the company to die in the end.

Lacking the proper team

A start-up usually starts out with only a couple of people in it. These people are known as the founders of the start-up, who will soon recruit a few more people into the team during the very early stages of the start-up. The entrepreneurs (founders in most cases) must be very cautious and precise in deciding the right people to recruit into the team. One of the primary reasons is because the resources are very limited in a start-up and they

cannot afford to recruit the wrong people and waste their time as well as money.

The right team for a start-up is defined as being able to run the core competency of the start-up all by themselves to at least be able to prototype their products and services to the market (Blank and Dorf, 2012). If a start-up company does not have the right team, there will be a great amount of valuable resources that will not be utilized to their potential because of the overall team efficiency dropping.

For a technological start-up the right team would consist of tech savvy engineers as opposed to art graduates for an example. It is important that the diversity and experience of the entire team is broad enough to cover all the challenges faces by a typical start-up company (Baloff, 1970). Having the wrong team has been one of the reasons many start-ups have failed even though they had the right ideas. We can see the example of the start-up 'Standout jobs'.

Standout jobs is a digital platform that connects employees with employers online. The problem with Standout jobs was that they did not have a team that could even deliver a minimum viable product on their own skills and expertise (Yoskovitz, 2010).

This dysfunctional team cost the start-up a lot of money and time that could have otherwise been used more efficiently by a more synchronous team to run the start-ups schedule faster. Standout jobs even had the financial assets and equity leverage to bring on more experienced mentors into the start-up to help build the right team; but did not do it purely because they did not know what they did not know. Subsequently in the bloodthirsty world of start-

up, standout jobs not performing at their peak caused them to eventually fail as a business.

Mismanagement of the team and/or investors

Even though a start-up has the right team to bring the organization to success, mismanagement of this right team is still going to result in the same failure. Similarly, since the investors are the ones pouring money into the business and directly responsible for the survival of the business, it is important to be on the same page and side with the investors (Oukes, von Raesfeld, Groen and Consortium, 2017).

When there is no harmony between the team members of between the team and the investors, things can go badly very quickly. With divided team members within a start-up, progress will be stunned, and the end result of any project would not be ideal. It's much worse to be up against the investors who could at any time cut of the funding and leave the start-up to dry.

We can take a look at 'Arsdigital' as the perfect example of what happens when there is a mismanagement of teams and investors are not happy. Due to disharmony among the founders and investors of Arsdigital (a software tech company), the start-up had to incur huge financially damages and lost many potential opportunities.

The investors and executives ran the business in a different way to what the founder would have wanted and this disharmony did not play out well (Greenspun, 2001). The efficiency of the company dropped and eventually became so low that the company had to force its gates shut.

Lacking focus and passion

For an organization the size of a start-up, the success of the organization is directly proportional to the amount of work and its quality put in by the entrepreneur (Murnieks, Mosakowski and Cardon, 2014).

Therefore, it is of utmost importance for the entrepreneur to focus all of his efforts into building and growing the start-up successfully. The quality of work an entrepreneur delivers into his start-up is directly proportional to the passion they have for their company which is again directly proportional to the success of the start-up (Drnovsek, Cardon and Patel, 2016).

This means that when an entrepreneur is less focused or suddenly less passionate in his work, the start-up is not going to be as successful as it once was. When the leader (entrepreneur) is not focused and passionate, the vibes are resonated from the rest of the team and employees of the business as well (Yozgat and Kamanli, 2016). There are many internal and external factors that could affect the entrepreneur in such a way that their focus decreases along with their passion for their ideas that built the start-up. These factors are mostly unpredictable and therefore makes this a very dangerous and unforeseeable way start-ups die.

We will be taking a look at the start-up 'MyFavorites' to better understand a real-life example of the damages an entrepreneur losing focus can cause. Myfavorites was a simple app that allowed you to see what your social circle likes, it could be books, movies, food or even furniture. The entrepreneur initially believed that this idea was pure gold and was definitely going to

be a win. But during the initially development of the products and services offered by the organization, the entrepreneur started second guessing themselves.

The confidence that the entrepreneur once had was starting to disappear. This was then reflected on the team that was working together with the entrepreneur. Eventually the entrepreneur and their team lost interest and hence focus on the company and it slowly started to die from within (Poland, 2011). It started off with the progress being slow to then having many mistakes made during the build of the product and services. Eventually without a focussed mind the entrepreneur decided that it's best to shut down the business than to continue without any focus.

Another example we can take a look at where a lack of passion was the killer is 'Newstilt'. Newstilt was a media start-up that provided news to its users. For this start-up, there was little to no passion since the start. Any passion that was there during the start quickly vanished as soon as the idea became a start-up.

The lack of passion was due to a lot of internal factors that did not provide anybody the satisfaction of working in this start-up. A lack of passion could be a quick and silent death, so much so that the company shut down within 3 months of official launch. Neither the entrepreneurs nor the team working in the organization had any passion for the project (Ingram, 2010).

A demotivated environment brewed in no time and progress was a myth in this company. Eventually the entrepreneur saw no reason to continue fighting for this start-up and announced the closing of Newstilt.

Other smaller internal factors that cause start-up failures

1. Unsuitable company culture
2. Failure to identify value proposition
3. Failure to protect intellectual property

Factors that are a mix of external and internal

Poor timing of the product/service launch

Timing is a really critical factor when it comes to start-ups and the launch of their products and services (Moorthy and Png, 1992). Ideas are usually generated as a solution to pain points currently faced by people in the world, why then would timing be an issue?

A lot of parameters need to align in order to guarantee the success of the launch and acceptance of the product or service in the free market. These parameters may include the availability, cost and feasibility of technology or could include factors like lifestyle of the targeted market segment and its current trend. Poor timing of product/service launch is similar to an air conditioner seller opening shop during the winter.

If an entrepreneur decides to release their start-up product too early then this may cause the market to not accept the product because there is no need for the solution in the market yet or the market is not capable and skilled to use a product of such sort (Lee, Smith, Grimm and Schomburg, 2000). It may also become difficult to then delay the launch of newer versions of the products and services because the market now had a negative reputation of the start-up.

On the other hand, if the entrepreneur decides to launch their product or services too late the market may already be

accustomed to other similar products and services from competitors that solve their pain points. It may even be late enough for the pain points to not exist at all at that point in time. Therefore, it is very important that the entrepreneur recognize the perfect time to launch that will maximize the success rate of the products and services offered by their organization.

'Blockbuster' while not a start-up company is the perfect example for not moving into the right market at the right time. Blockbuster a movie rental store went out of business a long time ago because they were too late in bringing out solutions to the new pain points of the market (Davis and Higgins, 2013).

When this happens, competitors like 'Netflix' an on-demand movie service provider will come in at the right opportunity to solve the newer problems. Now that the market has moved and is accustomed to the new organization, it will be extremely hard for Blockbuster to catch up. This caused blockbuster to go out of business.

We also take a look at the start-up called 'Calexda'. A start-up that was too early to the market with their strategy on the computer chip to be manufactured (moving faster than the customer) (Clark, 2013). Coming in too early caused their products to not be accepted by the market. The organization couldn't survive long enough to fight other giant computer chip manufacturing organizations, eventually running out of resources and then closing their business.

Unfriendly user product/service

Certain times, entrepreneurs can get too focused on their vision of what their product or service should be and offer that they

forget if the average user in their target market segment will be happy with the product or service. User functionality is more important the features offered by products and services (Hassenzahl, 2003).

An entrepreneur must be mindful and design the products and services in such a way that would allow the user to utilize the product to its potentially in the easiest and quickest way possible. Even if this means sacrificing some advanced features that provide a competitive edge over others (Goodwin, 1987).

Sometimes, entrepreneurs tend to subconsciously fall into the trap of designing an un-friendly product. This is why there must be constant minimum viable product testing done on the market. A continuous improvement approach must be used when building the final products and/or service. Other times, entrepreneurs purposefully design products and services that are not user friendly in an attempt to create what they feel the ideal version of their product or service looks like; a clear start to failure of acceptance of the product or service in the market.

We shall take a look at 'GameLayers', a start-up company that focused on making social games that can be played online. The mistake entrepreneur made was focusing too much on the core game mechanics and forcing the direction of the game with too many hard to understand and use features (Hall, 2012). This caused a drop in the enthusiasm of players to try and play this game in the long term.

The entrepreneur and the team implemented features that were too complex for the majority of the gamers. The executives of the start-up now realize that they should have just limited showing off

their abilities in creating the perfect product or service and instead focused on making something with which the user could have fun with immediately when consuming.

Ignoring the feedback from customers.

Whatever entrepreneur's and their start-ups produce, in the form of a product or a service is ultimately going to be consumed by the end user. This means that the end user would be the only one to truly use the products and services in the natural environment it is supposed to be used in. This gives the end user the advantage of being able to realize the advantages and disadvantages of the product; the overall satisfaction in using the product and service (Gerson, 1993). Most of the time, the customer always has something to say about the products or service that they consume.

While most of the reviews are going to be negative, there will always be something that is constructive and could help improve the product or service (Barlow and Møller, 1996). It is an entrepreneur's job to listen to these critics. More importantly, the entrepreneur must develop the skill to be able to filter the positives amongst the majority of negative feedback that they will receive about their products and services. However, the most important part lies after gathering the feedback; implementing them in the next revision of the products or services. What an entrepreneur receives from the consume feedback is generally free and accurate advice on how to improve their products and services. Only narrow-minded entrepreneurs with an ego boost would ignore such opportune events. It is a fact that is a tried and tested way ignoring users is a clear way to failure. It might be tunnel vision or the lack of gathering user feedback in the first

place, but both of these are lethal and will overturn a start-up in no time.

'eCrowds' is a start-up that failed because of their reluctance to listen to and implement customer and end user feedback. eCrowds was a web content management system that had the capability that included community functionality within the entire platform. The entrepreneur's mistake in this start-up was that too much time was spent on trying to design and build the product to a specification that they saw best fit without paying attention to what the end user and customer want and need (Cummings, 2010).

The eCrowds team now believe that it would have been best to implement changes on their products and services once every quarter based on their consumers constructive feedback. We also look at 'VoterTide', another start-up that died because of ignoring the feedback from its customer. VoterTide was a start-up that focused on providing its consumers with the ability to track social conversation that was based on politics. This start-ups entrepreneurial and team mistake was that they were too focused on rolling out features that they believed was best for consumers without taking into consideration the views of their customers. Their lack of input gathering from their clients didn't give them a chance to design and launch products that were actually wanted by the market (Pascale, 2014).

The team at VoterTide did not realize their mistake until it was too late, and it killed the company. They later found out that they let their egos get the better of them by convincing themselves that what they were building is the best thing ever; they now urge

to pay more attention to the end users and adapt products and services according to their wants and needs.

Not able to face legal challenges

The primary role and focus of a start-up are to fill the gaps of demand that are not being filled by other existing organizations. During the process of filling such gaps, these start-ups may have to use and mimic certain functions and behaviours of other existing organizations. This brings up an ethical dilemma on where the border ends when it comes to knock offs and similar products and services being offered into the same market. A legal fight for organizations can be very expensive (Linna Jr, 2015).

Existing and established companies in a defensive and reactive move, throw lawsuits against these start-ups in an attempt to 'kill' the competition (Armitage, Frondorf, Williams and Feldman, 2016). Regardless of whether the lawsuit claims are true or not, the start-up now has to defend itself legally. As a start-up, money is already tight, spending too much on the legal affairs might pull money from other core business operations that would eventually lead to the company's demise.

We take 'Decide.com' as an example of a start-up that tied up all its money in legal fees that the company had to shut down. Decide.com was aimed at being able to predict the price of consumer good in the near future. The start-up caught the attention of e-commerce players whose entire business models depends on the selling of products. 'Amazon' threw a lot of legal threats at Decide.com when the start-up decided to use amazon's pricing strategy as a part of their algorithm in predicting the price of consumer goods in the near future. Decide.com wasn't making a lot of money to fight the e-commerce giant.

Taking away amazon's pricing strategy from their own technology just wasn't feasible for the company to continue. The company was eventually sold off to another e-commerce giant, 'eBay' (Ooi, 2013). We also take a look at start-ups that have to use others intellectual property as part of their solution incorporated into their product or service. These types of start-ups have an especially higher probability of being sued.

Point in case is 'Turntable.fm', a virtual DJ platform that allows its users to create music (the intellectual property that is to be challenged). By using tiny bit and parts of music created by other artists, Turntable.fm still had to pay the full licensing fee to the original artist. This was a very expensive legal expense. Turntable.fm's entrepreneurs realized that their business model is not feasible with their revenue stream compared to their legal expenses (Newton, 2013). Therefore, the business had to eventually close its doors and end their business.

Other smaller mix of external and internal factors that cause start-up failures

1. Bad reputation
2. Poor physical assets (not the right machinery available or poor maintenance of existing equipment)
3. Lack of adequate research and development

Compilation of factors that are significant towards the success or failure of a start-up

The author has done the above research to study all the different factors and parameters that have an influence on the performance of start-ups. These factors are now going to be graphically depicted to get a clearer big picture analysis.

Found below is a summary of the factors and their level of significance within a start-up based on the above research. The significance level is determined by how many start-ups researched above report one of the below factors to be one of the causes of start-up failure or success

Internal factors

Table 5 Table showing the internal factors and the number of times they were mentioned in the autopsy of a start-up

Number	Factor	Percentage of studied start-ups that quoted as a reason for success or failure
1	Core competency alignment to pain point	25
2	Growth and scalability	20
3	Business model	40
4	Cash in hand	65
5	Inventory	15
6	Debt	10
7	Team, management and leadership	20
8	Entrepreneur characteristics	45
9	Planning	10
10	Pivot	10
11	Business strategies	20

12	Product and/or services	40
13	Marketing	15
14	Pricing and costing	25
15	Income vs expense	30
16	Networking	15
17	Prototyping	30
18	Operations	20

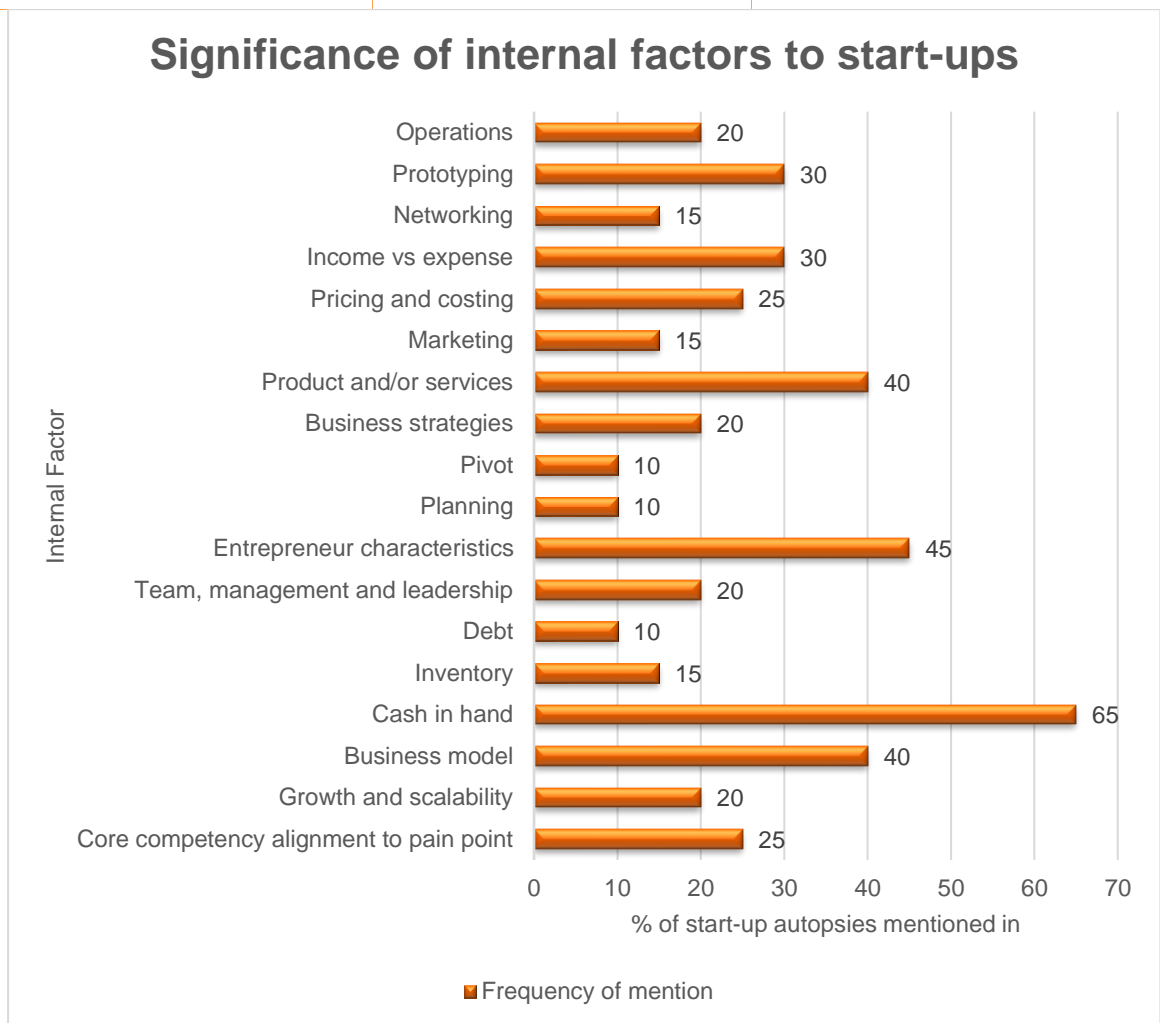


Figure 2 Bar Graph representation of the significance of internal factors with regards to start-ups.

External factors

Table 6 Table showing the external factors and the number of times they were mentioned in the autopsy of a start-up

Number	Factor	Percentage of studied start-ups that quoted as a reason for success or failure
1	Market need	30
2	Competitors	40
3	Economy	20
4	Customer feedback	15
5	Market research	25
6	Government and policies	10
7	Mentorship	28
8	Political	5
9	Valuation	10
10	Social and cultural	8
11	Environmental	5

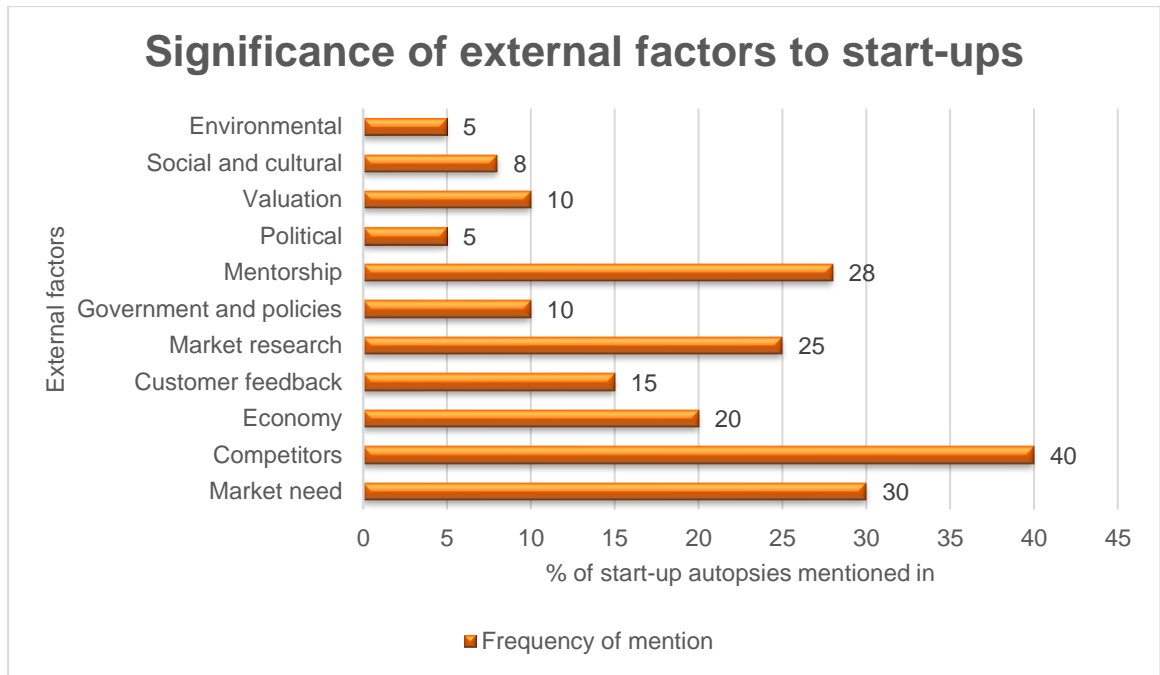


Figure 3 Bar Graph representation of the significance of external factors with regards to start-ups.

Mix of external and internal factors

Table 7 Table showing a mix of external and internal factors and the number of times they were mentioned in the autopsy of a start-up

Number	Factor	Percentage of studied start-ups that quoted as a reason for success or failure
1	Outsourcing	10
2	Technology	25
3	Individualization and personalization	15
4	Timing of products and/or service launch	20
5	User friendliness	10

6	Legal	10
7	Company positioning	10
8	Support systems	5
9	Intellectual property	10
10	Reputation	10

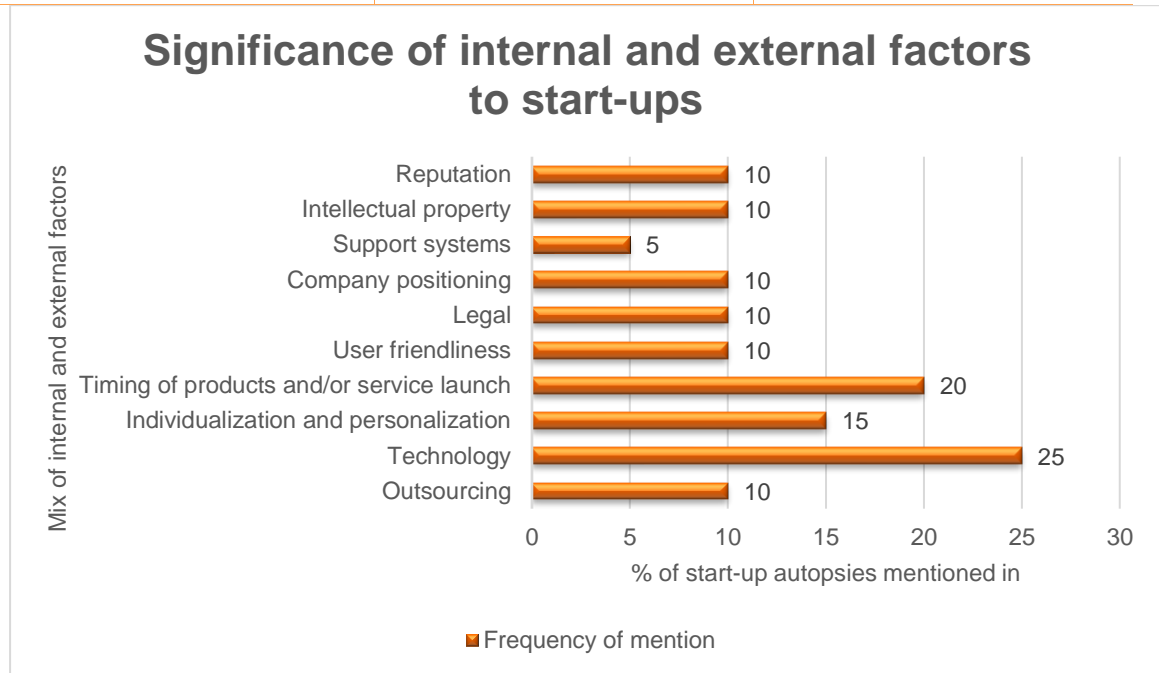


Figure 4 Bar Graph representation of the significance of internal and external factors with regards to start-ups.

Review of Literature

A big picture summary of the factors

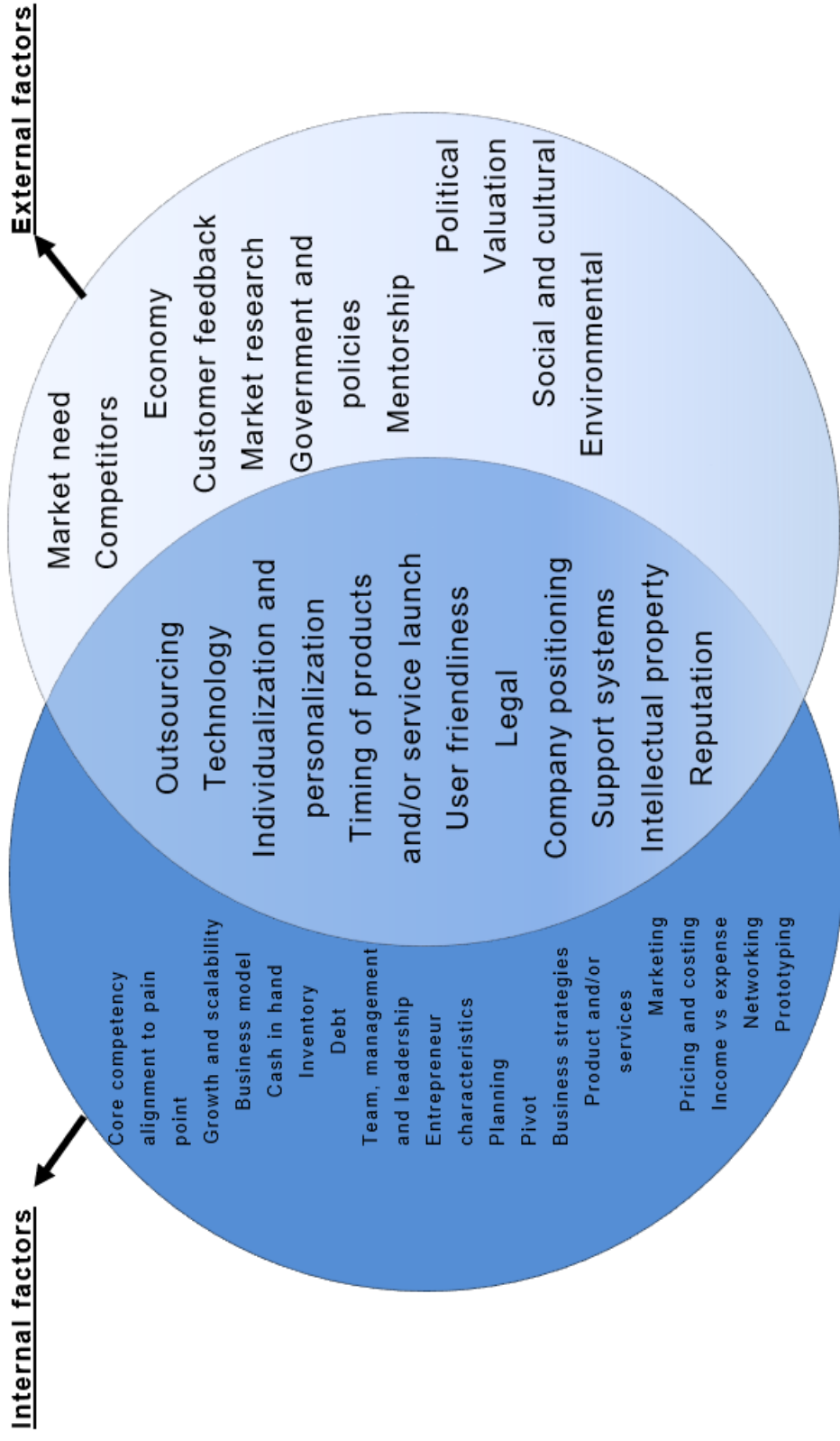


Figure 5 Venn diagram representing internal and external factors



Review of Literature

Statistical analysis of the researched factors

Let's look at some statistics to further understand how the significance differs for internal factors compared to external factors when it comes to start-ups.

Table 8 Table containing comparative information about internet, external and mixed factors

Statistic	Value
Number of internal factors	18
Number of external factors	11
Number of mixed factors	10
Average % mentioned for internal factors	25%
Average % mentioned for external factors	18%
Average % mentioned for mixed factors	12%

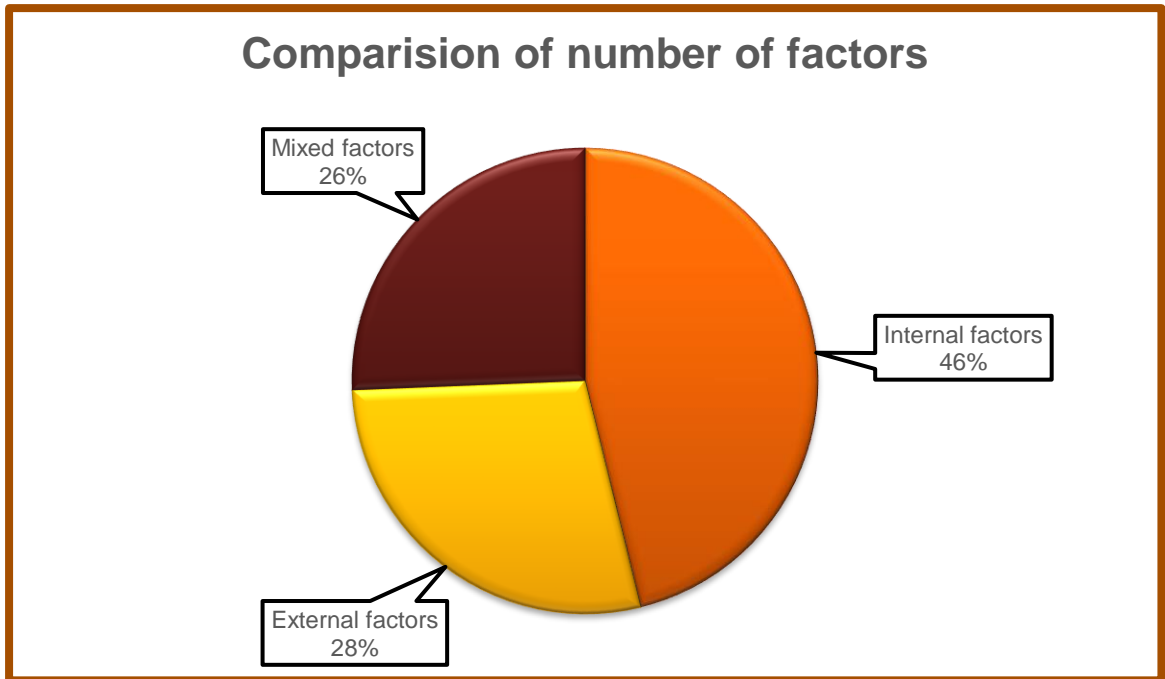


Figure 6 Bar graph showing the comparison of number of factors between internal, external and mixed factors

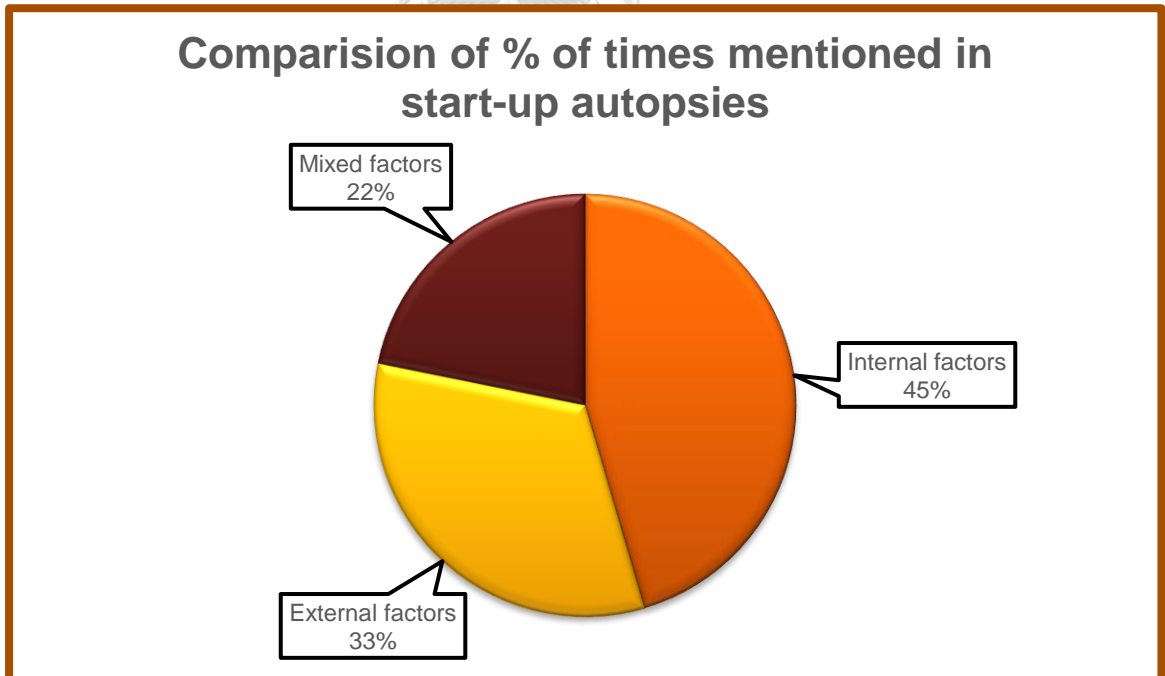


Figure 7 Bar graph showing the comparison of % times factors between internal, external and mixed factors were mentioned in start-up autopsies

We can observe that based on these statistics, the significance on internal factors to external factors to mixed factors are in the approximate ratio of 4:3:2 respectively. If we assume that the mixed factors be equally divided into internal and external factors, then we can conclude that the significance ratio of internal factors to external factors is approximately 5:4



New proposed predictive survivability model for technological start-ups

Chapter 3 New proposed predictive survivability model for technological start-ups

This section has 4 parts and will cover the overalls of the creation of a new predictive survivability model that can be used to predict the chances of success or failure of new technological start-ups. This first part of this section mostly focuses on a draft version of the predictive survivability model.

This new predictive survivability model will be built based off of the findings and research of the previous section. It will also include the reasons as to why the draft predictive survivability model contains what it contains. The second part of this section will include the additions that are to be made to the draft predictive survivability model to better fit the prediction of technological companies.

The justification for adding these new parameters will also be discussed. The third part is a result of the combination of the first two part of this section. Its contents will include the entire new predictive survivability model for this thesis and its working methodology.

The final part of this section will discuss the limitation of the new predictive survivability model. It would also include the limited usage scope in terms of the environment in needs to be used in along with the assumptions that must be made in order to use it.

Base model used and its reasoning

The predictive survivability model built for this study would be in the form of a questioner that is designed specifically for an

entrepreneur to answer by him or herself. The model uses a combination of the ordinary least squares, logistic regression and decisions trees predictive modelling. The questionnaire can also be used by other to predict the survivability of other start-up companies but due to the questions being personal and having some variables that may be confidential and only known to the entrepreneur, it will be difficult for others to utilize the model to its potential.

Reasoning behind using the questioner is primarily for the convenience of use and a bigger picture understanding of individualized parameters that affect the business. Other researches that were studies used a lot of data points and had huge amounts of data that was then fed to a machine learning algorithm that spits out a decisive quantitative analysis with high precision on whether or not the start-up will be a successful one. These case studies and their models are completely result oriented with little to none of insight provided to the entrepreneur on why their company was given such a rating. This study focuses more on having the entrepreneur understand the different reasons that would cause their organization to potentially fail.

Taking a personalized questionnaire approach allows the entrepreneur to better understand his or her company while answering the said questionnaire. More than a quantitative result-oriented model, the model proposed in this model allows combination of quantitative as well as qualitative analysis to be done through the use of the model. During the process of the entrepreneur filling up the questionnaire, the entrepreneur gets an opportunity to dynamically understanding which of the processes within his business help the success of the business and which of them don't.

It also gives the entrepreneur an idea of how efficiently these business operations are taking place and how significant of an effect improving the business operations will have on the quantitative analysis gathered at the end of the application of the model. The quantitative result is just a basic summation of the points gained by having variables that contribute to start-up success according to their importance. The qualitative approach is enabled through the careful wording and approach to the questions in the questionnaire. The questions have also been conveniently categorized and subcategorized to help the entrepreneur identify which section or function of their business needs improvement.

The questionnaire is divided into three main categories, external factors, internal factors and a mix of the both. These categories will have sub categories that are related to a certain portfolio of business operations. Under each of these sub categories there will be questions related to these subcategories. Each of these questions will be quantitatively answerable between a scale of 1 to 100 (in the points column of the model), 100 being the ideal case (a positively inclined answer to a question should score higher) that would maximize the success of the start-up and 1 being its counterpart. If the answer to the question is a strong yes, it should be awarded around 100 points, a somewhat yes should be awarded around 75, a maybe should be awarded about 50, a probably not should be awarded around 25 and a strong no should be awarded about 0.

During the application of the model, an individual needs to try to answer the questions in a way that are closer to the ends of the spectrums of the yes/no decision (try to avoid answering as

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perhaps); however, if a certain question is not applicable to the entrepreneur or his start-up, a score of 50 will act as a neutral answer having no positive or negative effect on the quantitative analysis..

Through this mathematical mechanic enforced into the point system, it is evident that the question asked, if positively supported, result in a higher success rate of the start-up. Each of these questions will be given an importance rating (in the importance rating of the model) compared to how much impact it would have on the success of start-up compared to other questions within the same sub category. The importance values are speculatively calculated by the author based on the research done on the previous sections. The last column would be the 'value' that the factor or variable in the question contributes to the success of the start-up; higher the better (recorded in the value column of the model). Each of these categories will then also be assigned an importance rating compared to how much impact they will have on the success of the start-up with regards to the other sub categories within the same category.

Finally, each category itself will be assigned an importance rating with regards to the depth of influence is has on the probability of success of the start-up whilst running up against the other categories.

Note that the quantitative analysis will have a mathematical rule governing it; the sum of importance of any category must total a 1 (or 100); a rule of percentage where the sum of all individuals must total its universe.

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If in case one want to ensure that an entrepreneur is not biased, the individual can request that the entrepreneur share the business information with that individual and have that individual fill in the model.

Factors to be considered in the new model

Below is a list of factors that the author believes should be involved in the model due to its significance and controllability by the entrepreneur. Note that not all the factors that were studied in chapter two may be exposed below and involved in the new model. This is because certain factors that have minor significance have been merged into other factors that are similar and have a higher influence on start-ups.

The author assigns each of these factors an 'importance' level using an analytic hierarchy process (Saaty, 1980). The analytic hierarchy process uses information from the literature review in chapter two and the author's speculations based on other research and experience to drive the decision making for appointing an 'importance' level. Additionally, a statistical analysis of all the below mentioned factors will then take place to be able to justify the author's reasons for choosing these factors based on the literature review in chapter two.

External factors

The external factors that are going to be analysed include factors such as Economic status, Technological, Mentorship, Competitor analysis, Political, Valuation, Market analysis (customer), Social and cultural and Legal.

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These are the sub-categories that are external to the start-up but at the same time have some significance towards providing success towards a start-up if handled correctly. Due to the fewer number of sub-categories (compared to the internal factors) and the small level of influence an entrepreneur would have when it came to change these factors the author believes that the external factor is only one fourth the importance of its counterpart; internal factors. In the light of the research of why start-ups fail or succeed and the authors' knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor value of 40 for its 'importance'.

Economic status

The current economic situation in a nation or region refers to economic circumstances. The economic situation of a country at a certain moment. These circumstances alter over moment alongside the financial and business cycles, as an economy passes through phases of growth and decline. Their use is based on statistics concerning, inter alia, unemployment levels, market data and GDP.

Economic circumstances when an economy is growing are regarded as noise or beneficial and when the economy contracts they are deemed adverse or bad. The author decided to offer this factor value of 11 for its 'importance' based on the research of why start-ups fail or succeed, and the writers understand how impactful this specific factor is in choosing the destiny of start-ups.

Technological

Impacts that affect the way an organisation works linked to the machinery employed in the setting of the organisation. Due to an enhanced dependency on the machinery, technological variables now have a significantly higher impact on a company's achievement than they did just one hundred and fifty years ago.

Technological changes influence how an enterprise operates. Because of modifications to the technological setting, a company may have to dramatically modify its working policy. The technology has a significant effect on the company. Many internal technological variables have an enormous effect on company activities.

It impacts the chances of company, reduces earnings and pushes managers to modify the path of their activities.

Technological modifications influence the way a company is going to operate. Every second technique changes — fresh and enhanced technique is published every day. As the technological change shifts working habits, techniques and structures, a company could need to shift its business strategy dramatically due to technological modifications. It impacts operational velocity and boosts manufacturing units ' efficiency.

On the basis of the study of why start-ups fail or prosper and the authors ' understanding of the effect of this particular factor in determining the destiny of start-ups, the author chose to give this factor value of 13 for its 'importance'.

Mentorship

A business community has many participants who all contribute to the effective development of large start-ups from the concept point.

One of those participants is the mentors. Experienced mentors are entrepreneurs or shareholders who add money, energy, and knowledge to start-ups voluntarily. The mentor is someone that gives and has no clear results or economic rewards before he is received.

A mentor can prove worthy in the following aspects:

Outlook and involvement — to talk with someone to help people reflect and learn.

A history—a process you want to share.

Reality and focus—counterbalance the cognitive inclinations of entrepreneurs.

Connections — access to important networks of society and business Indeed, start-ups agree upon the value mentors provide.

The author decided to offer this factor value of 13 for its 'importance' based on the research of why start-ups fail or succeed, and the writers understand how impactful this specific factor is in choosing the destiny of start-ups.

Competitor analysis

A competitive analysis is an essential component of the entrepreneurs marketing plan for the start-up business. This assessment will allow an entrepreneur to determine what is unique to their organization or business and therefore what

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characteristics the entrepreneur is using to reach their target market.

The rivals are assessed by putting them in strategic organizations to determine how they perform immediately for a proportion of the dollar. Listing their brand or service, profitability, development model, market targets and expectations, present and previous policies, organisational and price composition, characteristics, weaknesses, and (in-sales) scope of the company's enterprise for each rival or strategic group. It is helpful for the entrepreneur to try and answer questions like:

Who are your competition? Who are your competition?

What are they selling for goods or facilities?

What is the business value of every competitor?

What are the approaches of their future?

Which approaches are your present?

How is their goods or facilities sold in what kind of press?

How many hours a week do they buy in this industry to advertise via the press?

What are the advantages and faults of every competitor?

What are your rivals' prospective hazards?

What are their potential opportunities for you?

The author decided to offer this factor value of 21 for its 'importance' based on the research of why start-ups fail or succeed, and the writers understand how impactful this specific factor is in choosing the destiny of start-ups.

Political

The company political climate is the political variables that can influence the manner companies' function, the companies that are active, the barriers facing a company, and the chances that

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distinct kinds of companies succeed. According to the Business Dictionary, public activities affecting the activities of a company or business are the political setting. These measures can be taken at various concentrations, including local, state, regional, national and global. These variables are often dealt with by businesspeople to deduce how public activities impact their company.

In the discussions with global companies, the political climate of company is often important. The business ' political climate often impacts a company's choosing the overseas industry. That's because it can influence the regulation that the company is facing, the level of interference that a company can receive from govt, the profitability of the decision to join this industry and more. Furthermore, the sustainability of the state and economic system of the country is often very crucial.

The author agreed to give this variable value of 3 for its 'importance' based on the research of why start-ups fail or thrive, and the writers understand how impactful this specific factor is in choosing the destiny of start-ups.

Valuation

Valuation assessment is mostly science (cutting amount), but it also involves some art because the researcher is obliged to create statements about model outputs. The valuation of an asset is essentially the actual valuation of all potential cash flows expected to generate. A countless statement concerning development in revenues, profits, funding decisions, capital expenditure, tax levels, etc. are inherent in the business estimate model. The researcher can experiment with the factors, after setting up the model, to see how the value varies with these

distinct expectations. For different property categories there is no one-size-fit-all system.

In the absence of a multi-year DCF system and a property company's finest example of present gross working revenue and capitalization (cap level) for an industrial firm, commodity products like steel oxide, steel or gold will have a system based on worldwide supply and demand predictions. There can be many types of valuation assessment production. The value of an asset may depend largely on one variable that often fluctuations, such as a long-term corporate bond, which have a value between par and 90 percent par, depending on the return on the 35-year Treasury bond. The number could be a single number, like a company having an estimate of approximately 6 million. Assessment may be articulated as a various cost.

In attempt to create more educated business choices, an assessment is essential to shareholders to assess the intrinsic values of the corporate stocks. Fair bond values, if any, are not very different from intrinsic values, but occasions arise occasionally in case of a heavily indebted company's financial stress. Assessing is a helpful instrument for the comparison or estimation of investment returns over a specified span of moment between businesses within the same domain. The author decided to offer this factor value of 4 for its 'importance' based on the findings of why start-ups fail or succeed, and the writers understand how meaningful this specific factor is in choosing the destiny of start-ups.

Market analysis (customer)

The systemic, quantitative compilation and assessment of information on a particular target market, rivalry and climate are

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market research. Market research is the collection of information through both main and secondary research is market research.

Market research is a key instrument to help organisations plan and make their decisions. It can validate important statements depending on the intentions of the company. Market research may be used by start-ups to enhance safety for a variety of choices. In various phases of the product life cycle, market research can guide choices:

At the point of the concepts (idea stage): What thoughts to follow?

On the design phase: Is the industry going to embrace this idea?

At the point of growth: can the item intended succeed in the industry?

In the start-up or establishment phase: What is the most appropriate marketing strategy, selling outlets and delivery schedule?

Post-establishment: What path should be taken to further product development and business growth?

Since the study of why start-ups fail or succeed and the authors' knowledge of the impact of this particular determining factor the destiny of start-ups, the author gave this factor significance of 23 for its 'importance'.

Social and cultural

The cultural, cultural, sociocultural or cultural environment relates to the instant physical and social context in which individuals reside or where there is something. It basically occurs in a population of several convictions, customs, methods and

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behaviours. The culture that the person is trained or works with and the individuals and organizations they interact with.

The relationship may be in person or through communication channels, even private or one-way, but may not involve an even levelling of social status. International firms are often examined for social / cultural environments before joining their destination countries.

The social environment is therefore a more comprehensive notion than the cultural or social class.

A determining element for active and healthy elderly living is the physical and social environment that is a key variable in environmental gerontology research.

A range of convictions, cultures, procedures and conduct in one demographic. International businesses often examine the socio-cultural landscape before joining their destination economies. Businesses influence their operating environments, and in fact, social and economic changes influence them. Businesses also have a duty to the culture in which it works as well as a socially influential one. Society members are stakeholders and should be handled appropriately (have a stake in how the company works). On the basis of the research of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor value of 6 for its 'Importance'.

Legal

The state controls the company according to its specified objectives in every nation. The state encompasses the legal

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system of a nation. Legal environments are called the rules that are enacted by the state for company. The state controls company operations in every nation. These public rules are regarded to be legal. Law and regulations go hand in side in theory.

The legislative climate determines the boundaries for enterprises, and this is also known as the legal setting. The legal climate in a nation dominates all organizational choices. As all corporate strategies are extremely government-influenced, the organisation needs a thorough understanding of these strategies because failure to implement legal measures leads to high fines, penalties and penalty.

Based on the research of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor of 6 for its 'Importance'.

Internal factors

An inner assessment examines the skills, the price situation and commercial viability of the entrepreneur's organization on the market. Internal assessment often involves actions to provide helpful data on the weaknesses, weaknesses, possibilities and dangers of the entrepreneur's organization—a SWOT analysis. Data produced through an inner assessment are essential because the entrepreneur can use it to create strategic planning goals to keep the entrepreneur's company growing.

In an inner assessment one significant metric is to determine the power and competence of the entrepreneur's organization. To carry out their job, a powerful organisation employs state-of - the

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art technologies and devices. Its economic objectives are achieved, and strategic planning goals are achieved. A firm brand identity based on skills, skills and assets within the organisation is also a powerful organisation with powerful competence.

A fragile organisation utilizes obsolete technologies, lacks knowledge or works with poor resources. A well-orchestrated inner assessment should highlight any organisational faults—regions which need to be improved and goals not achieved. the entrepreneur can review the entrepreneur's strategy, resolve and solve unsuccessful goals and enhance or eliminate faults once the entrepreneur's assessment has shown the entrepreneur's shortcomings.

An inner assessment should identify the entrepreneur's organization's price stance in the entrepreneur's sector and the entrepreneur's ability to create fresh company possibilities and exploit them. Cost position means the ability of the entrepreneur's business to acquire and manage resources and to provide the entrepreneur's customers with exceptional value in a manner that competing companies cannot match.

Business development opportunities may include enterprise investment associations, overseas investors relations, and the takeover of rival enterprises. the entrepreneur's readiness to use company possibilities is revealed by an inner assessment.

It is a continuing challenge to place the entrepreneur's firm at the forefront of the entrepreneur's sector. New businesses always enter the market with new technologies and possibilities to overcome the entrepreneur. the entrepreneur needs to stay conscious of the industry, economic, technological and business shifts in competing businesses that may jeopardize the

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entrepreneur's business viability. Internal assessment offers significant data to construct on the entrepreneur's weaknesses and ready the entrepreneur for dangers and to continue to develop the entrepreneur's company.

Internal assessment can assist the entrepreneur to determine the entrepreneur's industry's competitiveness. A competitively feasible company forces competitors to live up to the service or item it provides, particularly with state-of - the-art proprietary technology. A sustainable company has strong intellectual natural resources—the finest and most brilliant workers contribute their knowledge and inventions to everyday company. The most feasible businesses steadily increase sales and use effective production lines.

An inner assessment will investigate the efficiency of the entrepreneur's provider network, client allegiance and revenues, offering the entrepreneur with significant metrics to modify the entrepreneur's company strategy and strengthen the entrepreneur's industry. On the basis of this research and the study of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor value of 60 for its 'Importance'

Entrepreneurial characteristics

An entrepreneur is the founder of the company, which successfully identifies opportunities, assembles skilled personnel and resources necessary for the company's functioning, attracts individuals and financial institutes and assumes psychological responsibility to manage the company.

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Entrepreneurs are people that take difficulties, focus development output, watch over success and failure during normal risk planning and take careful and important stove circumstances into account in advance of any decision-making. The concept has led us to the idea of initiatives and initiatives that will add to the emergence of facial advancement related to human welfare. An entrepreneur is an individual that is action-oriented and extremely driven for taking a danger and for this purpose, a shift in the method of producing products or facilities or re-establishing advances in the development of fresh organisations.

Therefore, entrepreneurs' characteristics contribute to the success of a start-up. Based on the research of why start-ups die or succeed and also the author's knowledge of the influence of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor of 15 for its 'importance'.

Product and services

A product can be defined as everything we can provide for a market that can satisfy a need, acquisition, use or consumption. However, not only concrete products such as a vehicle, a refrigerator or a telephone are defined in the item. The item concept must be expanded to include immaterial items, as they can also be provided to a sector. Consequently, the wide item concept involves facilities, activities, individuals, sites, organizations and even thoughts. The concept of the item therefore brings us to a wide spectrum, which can include a vehicle, a telephone and a coffee.

But this is how you can go to Paris with your doctor's guidance. The concept of utility should also be provided special thought. What is a service? What is a service? And where is the distinction if the item concept already contains facilities? In fact, utilities

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constitute a unique product form consisting of intangible and not owned operations, advantages and satisfactions for purchase. This is significantly narrower than the item concept.

Thus, banking, flight transport, interaction, accommodation facilities and so forth can form part of a business. hence the need of studying the products and services of a start-up and its effects on the chances of success of the start-up. On the basis of the research of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author decided to offer this factor value of 14 for its 'importance'.

Start-up Leadership

The globe is at a constantly growing rate and is in the middle of a temporary stage. Very few will contest you if you claim the environment seems to change more and more quickly. Technology is accessible to many individuals everywhere.

Everybody with a good sense of business and a powerful understanding of the potential developments can translate entrepreneurial concern and minimal business possibilities into a flamboyant currency. Technological progress, worldwide inclusion and the pace of up and down everything require us to operate organisations. And yet, government or personal companies are still not simple to operate in fundamental, not just gradual, methods.

Most management and alter surveys examine how rulers understand the shift. But the reason for management inability may very well be a distinct element. In other words, to what extent rulers and management can transform themselves and

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demonstrate the required management. This is how leadership plays an important role within the start-up culture and needs to be analysed.

Based on analysis as to why start-ups fail or survive and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author agreed to give this factor of 4 for its 'importance'.

Human capital

What really is human capital?

Human capital is an incorporeal asset or value not on the balance sheet of the company. The value of an employee's experience and skills can be considered as economic. It involves the importance of employees, for instance allegiance and punctuality, such as practice, education, information, abilities, safety.

Human capital acknowledges that not everyone's work is the same. However, companies can enhance the performance of that assets through investments in employees— all staff have a financial significance for workers and for the industry. Human capital is essential because productivity and therefore profitability are seen to boost. The more a business invests in its workers (i.e., teaching) the more efficient and lucrative it may be. Often, an organisation is just as great as its people. Directors, staff and politicians who form the human capital of an organization are crucial to their achievement.

Human capital is generally handled by the HR department of an organization. It supervises the procurement, governance and implementation of employees. The other guidelines include

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scheduling and policy of employees, recruitment, preparation and preparation of employees, documentation and analysis. Based on the research of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author has chosen to give this factor value of 4 for its 'importance'.

Financial

The financial analysis is an element of the general task of corporate finance involving the examination of historical data for information on a company's present and prospective economic wellbeing. Financial analysis can be used to offer corporate managers the data they need to take critical choices in a multitude of circumstances. Every entrepreneur must be able to comprehend economic information. Finance is an enterprise language. The business objectives and objectives are financially defined, and the results are financially evaluated. Flexibility in the finance language, ability to read and understand financial data as well as information in the form of financial reports, is one of the skills needed to understand and manage a business.

The business finance role consists of the evaluation of economic developments, the establishment of financial policies and the establishment of long-term company intentions. The implementation of an inner insurance scheme for money processing, revenue appreciation, expenditure disbursement, inventory valuation and authorization of capital expenditure also includes. Moreover, the economic service records of the internal control schemes, such as income statement, balance boards and cashflow statements, are prepared by way of financial statements.

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Finally, finance includes analysis for useful information in leadership choices of the information found in financial statements. Thus, economic analyses are just one component of the general economic feature, but they are very essential. There is a lot of data in a company's reports and statements. The complete significance of the accounts is the focus of the financial analysis.

The financial analysis includes an understanding of how accounting is related. The use of the numerical data in company statements to uncover patterns of activities that cannot be seen on the ground is also component of the financial analysis. Because of these clear reasons and the significant effects on the success rate of start-ups, they must be considered. Based on studies of why start-ups fail or succeed and the author's knowledge of the impact of this specific factor in choosing the destiny of start-ups, the author has given this factor score of 21 for its 'importance'.

Business planning

A business plan is a published paper that details how a company, normally a fresh one, will accomplish its objectives. Then, click the "Quill It" key to paraphrase it. In terms of advertising, economic and functional a company strategy establishes a published strategy.

Business plans are essential for an enterprise to set its objectives and generate capital. It is also a tool for firms to maintain track of themselves. Every company should have a business plan, although they're particularly helpful for fresh businesses. Ideally, a business would periodically review the scheme to check whether objectives have been achieved or

altered and have developed. Sometimes, for a proven company, a fresh business plan is ready and is going forward. A business plan is a key instrument for any start-up company to have before it starts operating. Banks and venture capital companies generally render the purchase of money in an enterprise a prerequisite for a feasible business plan.

Even if it works, it is not a good idea to operate without a business plan. Very few businesses can last without one. There are certainly more advantages in generating and adhering to a company strategy, including the ability to talk about thoughts without spending too much cash—and eventually dying. All the expenses and losses of each company choice should be set out in a healthy business plan. Even in the same sector, business intentions are usually identical amongst rivals. But they are all subject to the same components, including a company management overview and a comprehensive overview of the company, utilities and/or goods. It also outlines how the company aims to accomplish its objectives.

At least an outline of the sector to which the company will participate and how it will stand out from its prospective rivals should be included in the scheme. Because on the study as to how and why start-ups fail or become successful as well as the author's knowledge on the effects of this specific factor in choosing the fate of start-ups, the author has chosen to give this factor rating of 7 for its own 'importance'.

Future planning

Planning is essential for every company in its entirety. Each good company checks its company strategy frequently to guarantee that it remains to satisfy its requirements. It is important to

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regularly evaluate present efficiency and define the most probable development policies. Most prospective buyers want an enterprise scheme before considering financing your enterprise. Although many companies are encouraged to use their company intentions for this intent alone, a healthy strategy is expected to shape the life of a company.

In assigning funds throughout a company, a business plan performs a main position. It's an instrument you can use as a strategic paper or draw fresh resources. A healthy business plan shows how you can use your bank loan or equity. Ongoing business planning implies you can monitor whether you achieve your corporate goals. A business plan can be used to determine the way in which you are now and the manner in which you want to develop your company. A business plan will also guarantee that certain main objectives have been met and company goals managed.

By implementing a periodic ongoing business plan process that holds the schedule up to date, you can maximize your likelihood of achievement. This should include periodic business planning sessions involving important company individuals. Based on the research of why start-ups fail or thrive as well as the author's knowledge of the effect of this specific factor in choosing the destiny of start-ups, the author has chosen to give this factor rating of 3 for its own 'importance'.

Business Model

A business model is a high-level scheme for a certain company's profitable operation in a market. The value proposition is a main part of the business model. This is a summary of the products or facilities offered by a business and why they are suitable for

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customers or customers, properly describing the products or facilities differently from their rivals.

An entrepreneurship business model should also contain predicted start-up costs and forms of funding, a destination company client base, marketing strategy, competitive assessment, and revenue and expenditure estimates. The cost of financing the company is underestimated until it is rentable as a prevalent error when establishing a business model. It is not enough to count the costs of introducing a product. An enterprise must remain in operation until earnings exceed costs.

A business model can also identify partnership possibilities with other companies. An instance is a publicity firm that could profit from a referral agreement to and from a printer. Successful companies have embraced business models to meet customer requirements at competitive prices and cost. Over moment, many companies review their business models occasionally to represent evolving company and industry requirements.

The company's gross profit is one route experts and shareholders assess the achievement of a business model. Gross profit is the total revenue of a company minus the price of marketed products. Comparing the gross profit of a company with that of its principal rival or sector shows how effective and efficient it is. A strong business plan is a decent gross profit. If costs are unchecked, the management can be in error and the problems can be corrected. As many experts suggest, businesses running on the finest business models can manage their company. Based on the research as to why start-ups lose or win and the author's knowledge of the significance of this specific factor in choosing

the destiny of start-ups, the writer has chosen to give this factor priority of 9 for its 'importance'.

Prototyping

The trip to construct an item includes several measures in order to achieve the manufacturing stage for the public. Each item has a certain target group and somehow resolves its pain levels. A nearly operating model called a prototype is developed and evaluated with potential customers and stakeholders to assess whether the item actually solved issues for its customers. To understand your target audience's precise requirements and aspirations, you need to first get a mock-up, receive shareholders' approval, gather feedback, advise your colleagues, make adjustments and then redirect the method to clearly visualize what you have to construct on as your final product. Feedback and modifications to your item can be more easily collected at an earlier point than when the item is prepared.

This helps to save money, price and guide the item in the correct way. A premature sample of the item we want to make is a prototype. A prototype is a fast model that explains the real final product intentions. This could be something as easy as a hand-drawn sketch (lo-fi prototype) incorporated to show the item to an entirely usable product (hi-fi prototype). An initial iteration of the item shows its key features in a nutshell prototype.

Prototyping has the following advantages: better conception, early suggestions, early modifications save time and expense, Verification before implementation and customer study and customer tests. Prototyping is a critical factor in the success of a start-up. Based on the research of why start-ups suffer or survive and the author's knowledge of the impact of this specific factor in

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choosing the destiny of start-ups, the author has basically given this factor value of 9 for its 'importance'.

Marketing

The method of distributing goods and facilities is marketing. Marketing strategies generally include identification and then proof that a specified business fulfils that requirement.

It can be achieved through internet, print, TV, or radio ads. marketing can be performed. Billboards and flyers are also for marketing reasons as they can be used to meet mouth to mouth (the kind of meetings carried out by gate to gate vendors). Marketing is a key element of every corporate strategy. Below the entrepreneur can clarify the significance of marketing for the entrepreneur's company and outline the advantages and benefits that marketing can deliver. For any company, marketing is of essential significance. It is the main method to research, promote and sell the entrepreneur's target market products or facilities. Profit is the essence of every company. The outcome of good purchases is in large part profit. Marketing is an significant business process in which the entrepreneur educate, encourage and persuade individuals to have importance for the entrepreneur's products or facilities.

Many companies would not survive without marketing. The best product or service, the entrepreneur can have, but the entrepreneur won't create a single selling if no one knows or understands the significance. To support the entrepreneur's company, brand, and products, it is essential that the entrepreneur use marketing. On the basis of an analysis of why start-ups fail or success, the author has chosen to offer this

factor importance of 5 for its 'importance' and understands how important this specific element is in choosing a start-up destiny.

Company positioning

Market position: The market situation relates to the consumer's view of a brand or a service with respect to conflicting brands or products within the marketing and business strategy. Positioning on the market relates to the method by which a brand or service can be established in order to make the consumer view it in a certain manner. Positioning of the market relates to the capacity to impact customer perception of the competitor's brand or item. Market positioning is aimed at establishing a brand or item picture or identity in a manner that customers view it in some manner.

An automaker, for instance, can place itself as a sign of luxurious rank. A battery manufacturer can make its batteries the most stable and durable. And a fast food chain can place itself as a inexpensive and fast uniform food supplier. A coffee business can be a cause of upscale specialty coffee drinks. A dealer could also place himself as a location for the purchase at small rates of family items. And a software business can offer hip and creative, user-friendly products for its technology. Create a statement that identifies your company and how you want the brand to be seen by customers. The writer chose to offer this price of 3 to its 'importance' relying on an investigation of why start-ups try and thrive, and the writer understands how impactful this specific element is in choosing on a destiny for start-ups.

Support systems

Entrepreneurs, just like everybody are social being. We reside in a globe that is interconnected. The significance of collaborative networks has not dwindled even in today's information age but has altered its shape simply. The universe of business is no distinct: it operates on personal connectivity, networking and connection-building. At a time when the latest iPhone is our Event Planner and driver, the design of the cooperative setting remains highly appreciated.

So where do businessmen plug into it? All in all, businessmen are the lifeblood of a constantly increasing economy. This is a blessing because youthful businessmen and their creative forms of reasoning are necessary to the globe. However, they also need our assistance as much as the earth requires them. Without reviews and help, no excellent businessman of the last ever failed. Successful entrepreneurs encircle themselves with colleagues of the same mind that fight, press and brainstorm them with. Through collaborating with others and constantly developing fresh thoughts, anyone who has made his company known has performed so.

It requires ride, bump and the intention of participating in a dynamic system of assistance. This is where mentors outside the organization can jump in and guide youthful entrepreneurs, so they can grow into well-rounded employees. These mentors may be members of sector, colleagues or even previous customers! In startling forms connections shape. The author has decided to provide this factor a 2 for its 'importance' on the basis of his analysis of why start-ups fail or succeed and of the author's

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understanding how important this factor is in determining the destination of the start-ups.

Business operations

Everything in a company that keeps it going and earns cash is jointly linked to as business activities. Business plans often include a chapter devoted to activities to ensure creators know the organization's systems, machinery, persons and procedures. Due to its effect on productivity and effectiveness, the process is essential. Hand-made processes that can be accomplished faster with software or which can price company and cash to replicate job performed in other agencies. Department-by-department business procedures should be recorded to allow operational management to look at them to identify fields for enhancement, strengthening or cost savings. Documentation also assists businesses in training fresh staff.

The achievement or inability of a company depends largely on operational efficiency. But for what purposes are these procedures? What can participants benefit from the correct scheme and from the correct measures? For one, you can assume to boost the importance of your company. This is achieved by profiting. The rise in price is determined by the financial performance of a company, i.e. by dividends, profit and revenue. If the yield exceeds the expenditure, profit is recorded. If a business succeeds in turning its profit over a long span into a steady, its valuation will increase exponentially. A business needs to evaluate the industry correctly to record a profit.

Often the company that outlines its rivals is that with the inferior item or utility. It is also necessary to consider the company's stake in its item or service. If supply is large, if the investment

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can afford, if the productivity matches requirement, then a company can really succeed. The writer has decided to give that factor a 4 for 'important' based on an investigation into why start-ups are failing or succeeding and an understanding of how impactful that factor is in decide the fate of the start-up.



The new predictive survivability model

Table 9 Table one of the new predictive survivability model focusing on external factors for technological start-ups

External Factors			
Question	Points given	Importance (%)	Value
Economic status			
How well is the economy in the region of the start-up doing compared to the past five years (GDP, Inflation etc)?		13	
How well is the economy predicted to do in the next five years?		16	
Is the average customer's buying power high?		7	
Buying power of the currency of the region the start-up is based in?		6	
Are the availability and cost of resources needed by the start-up are high and low respectively?		43	
Is the economy in a situation that is a start-up friendly one?		15	
Technological			
Does the local region have a rapid development of technology?		12	
Is there a high supply of related technology that can be utilized by the start-up (instead of having to build everything from scratch and in house)?		22	

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Does the government policies affect technology in a positive rather than negative way (use of technology, laws, licenses etc.)?		16	
Is the level of technology utilization in the local region high?		8	
Is the cost of technology (in every regard) cheaper locally and in the region when compared to other places?		16	
Can the existing technology be improved or outcompeted by the start-up?		26	
Mentorship			
Does the entrepreneur have a mentor or mentorship that is experienced and in the same field as the start-up?		26	
Is the entrepreneur going to listen to most of the mentors teaching?		17	
Does the mentor have networks and channels that could benefit the start-up?		38	
Is the mentor going to focus a majority of his time on the entrepreneur and start-up?		19	
Competitor analysis			
Is the entrepreneur going to carry out competitor analysis?		17	
Are there going to be a diverse range of methods used to conduct		9	

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the research?			
Is the start-up going to spend a relatively higher amount of money on competitor analysis?		13	
According the current knowledge, are there little to no competitors in the market?		21	
Is the potential for new entrants low?		13	
Does the start-up have a competitive edge over the competitor?		27	
Political and government			
Does the local government provide positive support or subsidies to start-ups (as a result of law, policies, regulations etc.)?		39	
The start-up will not be facing any negativity politically or through government policy because of its idea and operations, right (the start-up is not going to be of much interest to political parties and government heads in a negative way)?		27	
Does the entrepreneur or the start-up or the products or services have a positive reputation in the society?		34	
Valuation			
Is the entrepreneur going to try and get a valuation for his company?		16	

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Is the valuation of the company high?		38	
Are business operations and activities going to be focused on improving the valuation?		46	
Market analysis (customer)			
Is the target market going to be identified and researched?		22	
Is there going to be a lot of survey method (interviews, questionnaires, feedback etc)?		13	
Is the customer the same as the consumer?		4	
Is there a niche market or pain point in the market that the start-ups products will solve (a potential demand for the products and/or services offered by the start-up)?		28	
Will the customer research will be conducted quarterly?		16	
Will the start-up spend a relatively higher amount of cash in customer research?		17	
Social and cultural			
Is the average customer or consumer educated enough to use the start-ups products and services with ease?		34	
Is most of the population (and their culture, trend and fashion) prospective to the use of the		34	

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products and services offered by the start-up?			
Are the start-ups products for a population group that is the majority?		28	
Is the start-up in any way going to do minimal damage to the environment through its products and services or business operation causing environmental concern (is the start-up going to help more than damage the environment)?		14	
Legal			
Are the laws in the local region going to friendly to setup shop (legally setting up a business)?		37	
Are the laws in the region going to make it relatively easy to conduct business (operations)?		29	
Is it going to financially cheap to fight the law in the local region?		34	

Table 10 Table two of the new predictive survivability model focusing on internal factors for technological start-ups

Internal Factors			
Question	Points given	Importance (%)	Value
Entrepreneurial characteristics			
Is the entrepreneur going to be spending most of his time working on the start-up?		16	
Does the entrepreneur have a lot of		11	

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experience with the start-up culture?			
Is the entrepreneur young enough to work hard and old enough to have relevant experience?		8	
Does the entrepreneur prevent unnecessary risk taking?		6	
Is the entrepreneur's motivation primarily monetary compared to emotional?		7	
Does the entrepreneur have a bachelors, masters or a doctoral degree?		8	
Does the entrepreneur's educational background relate to the core competency of the start-up?		4	
Does the entrepreneur have a diverse range of skills and talents that will help the start-up?		7	
Does the entrepreneur persevere or give up easily due to lack of focus or passion?		14	
Is the entrepreneur ethical to prevent scandals from affecting the business?		5	
Is the entrepreneur opportunistic and resourceful?		10	
Is the entrepreneur reasonably optimistic or pessimistic?		4	
Product and services			

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Is the product and/or service going to be made up of a non-renewable resource?		5	
Is the product and/or service going to be easy to understand and use?		10	
Does the product and/or service take a small time to research, design and develop?		13	
Does the product and or service cost logistics and inventory the minimal by having a high turnover rate or little to no need for inventory space?		9	
Can the product and/or service easily integrate with other related technology?		10	
Are the range of products and/or services provided by the start-up narrow?		5	
Does the product or service solve specific problems more than a variety or problems?		4	
Is the market situation the correct time for the launch of the start-up's products and/or service?		7	
Is the product and/or service better than that offered by the competitors?		10	
Is the product and/or service going to offer personalization?		4	
Is the improvement process of the		7	

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products and services going to be done only if required based on customer feedback and analysis rather than improvement being compulsory based on the entrepreneur's opinion?			
Is the product and/or service going to be individually tailored for each of the start-up's customer and/or consumer?		5	
Can the products and/or services be priced in such a way that customers will be willing to pay for it and it generates enough revenue to keep the company running?		11	
Start-up leadership			
Is the entrepreneur going to invest in an experienced senior management team?		31	
Is there going to be a low barrier between the leadership and other team members (in terms of visibility, communication, voicing concerns, sharing ideas etc.)		33	
Will the senior management team be given little to no power on dictating the direction of the start-up?		36	
Human capital			
Is the start-up going to hire employees as needed in a slow and		21	

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steady way?			
Is the average cost of a suitable team member (for the core competency) going to be cheap?		29	
Does the average team member require a high education, skill, knowledge or talent?		34	
Is the average team member easy to hire and keep for the long term?		16	
Financial			
Does the company have a low burn rate?		18	
Does the entrepreneur and executives take little to no salaries?		11	
Does the start-up spend the minimum amount of cash on business expenditure that are not core to the business?		11	
Does the start-up pay its employees the bare minimum salary compared to industry standards?		8	
Will the start-up have enough financial capital to start the business with enough money left to run the company for another 6 months?		11	
Does the start-up have backup plans and reliable channels of financial aid?		12	
Is the entrepreneur going to try and secure free funds through		8	

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competitions and grants?			
Is the entrepreneur going to use a cash flow statement to monitor the financial status of the start-up?		8	
Is the start-up going to be run on a minimum amount of debt?		13	
Business planning			
Does the business have a vision and mission?		17	
Are the vision and mission clear, concise and easy to implement and follow?		16	
Does the entrepreneur have clearly set operations and activities for the company?		21	
Is the entrepreneur willing to give up a lot of equity in exchange for capital in the long run?		9	
Is the entrepreneur going to create and follow specific strategies for business (market, product, financial strategies etc.)?		19	
Are these strategies in line with the organizations vision and mission?		10	
Is there a rush for scaling or growing the business?		8	
Future planning			
Does the entrepreneur have a short-term and long-term goals clearly identified for their start-up?		14	
Are the goals SMART (Specific,		19	

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Measurable, Attainable, Relevant, Timely)?			
Is this plan going to be documented and visualized using the correct methodologies (milestones, road mapping etc)?		24	
Does the entrepreneur have an exit plan in case the start-up is not doing well?		9	
Does the start-up have a pivot plan?		34	
Business model			
Does the business have a business model?		37	
Is the business model treated as a living document?		19	
Is the business model a feasible one?		25	
Has this or a similar business model been tested or proven to work?		19	
Prototyping			
Is the entrepreneur going to build a prototype?		30	
Is it easy to build a prototype?		15	
Is the prototype going to cost a lot of time to build?		11	
Is the prototype going to cost a lot of money to build?		11	
Will the prototype shown to the customer/consumer and their feedback taken to improve the		18	

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prototype?			
Can the company save money by building a specific prototype that covers the entire range of its products and services?		15	
Marketing			
Is there going to be an online presence through digital marketing?		13	
Is branding cheap or relatively not a priority?		8	
Is there going to be direct B2B marketing?		36	
How much of the marketing is going to be professionally outsourced?		21	
How much capital is going to be spent on marketing?		22	
Company positioning			
Is the company a first mover into the industry?		41	
Does the start-up have any intellectual property?		36	
Does the company have a good name with a suitable slogan?		23	
Support systems			
Does the entrepreneur have relatives that could support the entrepreneur emotionally?		19	
Does the entrepreneur have relatives that could support the entrepreneur financially?		21	
Does the entrepreneur have friends		19	

that could support the entrepreneur emotionally?			
Does the entrepreneur have friends that could support the entrepreneur financially?		21	
Is the entrepreneur going to limit the support system's unnecessary input into the business (is the entrepreneur going keep emotions and business separate)?		20	
Business operations			
Is the business going to be located at a suitable place?		13	
Is there going to be outsourcing of basic operations when time comes (HR, accounting, IT support, Legal etc)?		27	
Can the start-up make do without an elaborate and complex supply chain?		23	
Is the company going to operate in an agile fashion compared to a traditional working methodology?		37	

Table 11 Table three of the new predictive survivability model focusing on accumulated value of external factors sub-category and its respective success rate for technological start-ups

External Sub-Category	Accumulated Value	Importance (%)	Success Rate
Economic status		11	
Technological		13	
Mentorship		13	
Competitor analysis		21	

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Political		3	
Valuation		4	
Market analysis (customer)		23	
Social and cultural		6	
Legal		6	



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Table 12 Table four of the new predictive survivability model focusing on accumulated value of internal factors sub-category and its respective success rate for technological start-ups

Internal Sub-Category	Accumulated Value	Importance (%)	Success Rate
Entrepreneurial characteristics		15	
Product and services		14	
Start-up leadership		4	
Human capital		4	
Financial		21	
Business planning		7	
Future planning		3	
Business model		9	
Prototyping		9	
Marketing		5	
Company positioning		3	
Support systems		2	
Business operations		4	

Table 13 Table five and the final table of the new predictive survivability model focusing on accumulated value of external and internal factors sub-category and its respective success rate for technological start-ups

Category	Accumulated Value	Importance (%)	Success Rate
External Sub-Category		40	
Internal Sub-Category		60	
Predicted success rate of the start-up			X%

Statistical analysis of the proposed factors

Let's look at some statistics to further understand how the significance differs for internal factors compared to external factors when it comes to start-ups. This is done to justify the author's assumptions of assigning the different importance levels for the categories (internal vs external factors).

Table 14 Statistical data about proposed internal and external factors

Statistic	Value
Number of internal factors (sub-category)	13
Number of external factors(sub-category)	9
Number of questions in internal factors	80
Number of questions in external factors	41

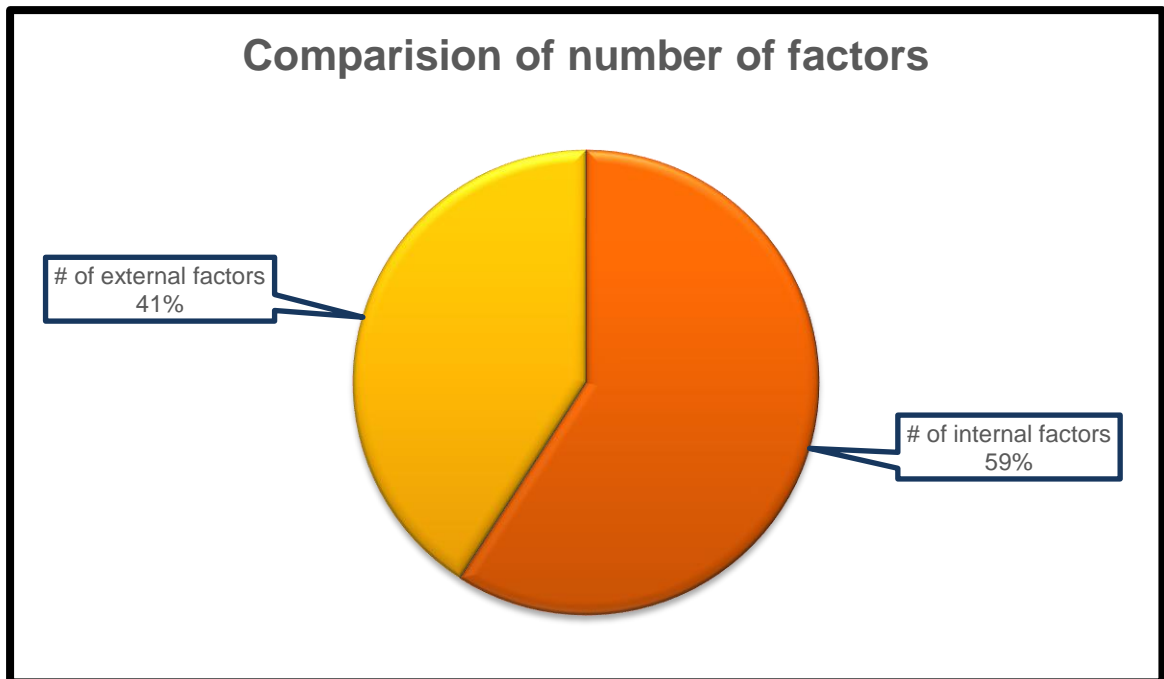


Figure 8 Bar chart representation of the comparison of number of factors between internal and external factors

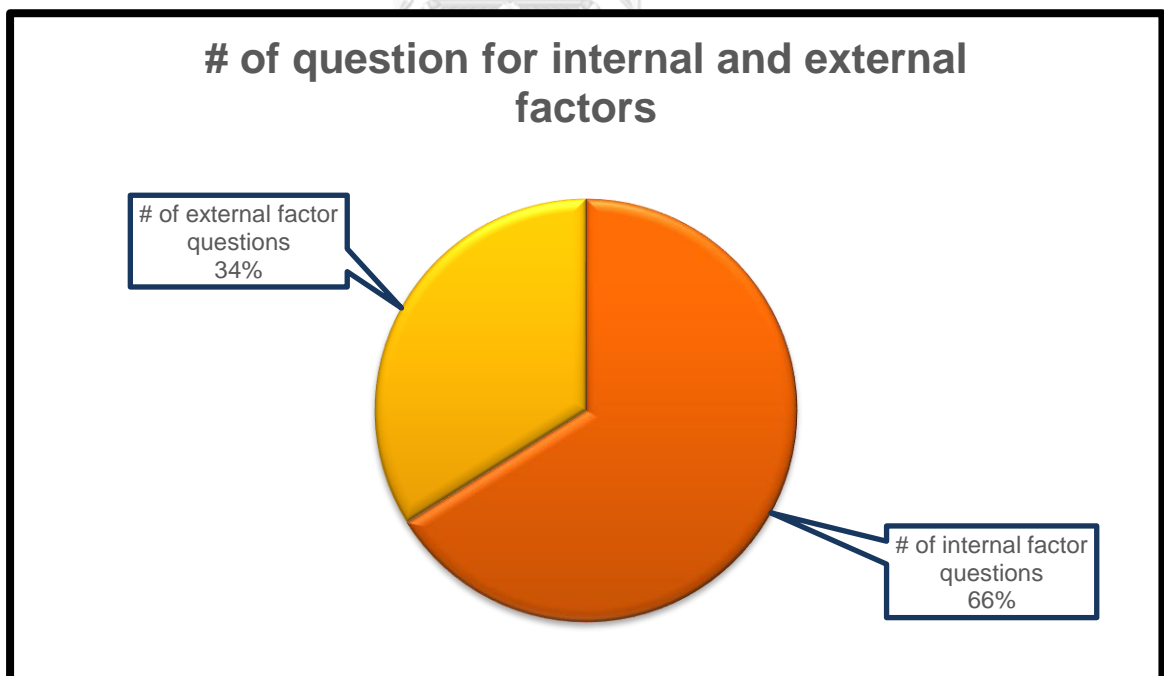


Figure 9 Bar chart representation of the comparison of number of questions between internal and external factors

We can observe that based on these statistics, the significance on internal factors to external factors are in the approximate ratio of 6:4 respectively. Since the statistical analysis of the literature review does not differ much with the author's appointed importance levels of the internal and external factors, it is safe to assume that the author's assumptions were quite accurate and precise.

Limitations and restrictions of the model

- The model's results are purely based on the users speculated idea and their own opinion of assigning the points. Thus, resulting in many different quantitative outputs for the same start-up if done by different individuals.
- The importance assigned is purely based on the authors perception of the different factors and parameters that would cause a success or failure of a start-up. Further or new research of the factors and parameters responsible for the success or failure rate of the start-ups will result in a newer version of the model with updated importance values.
- The categorisation of the questions under different types of portfolios and their categorization under external and internal factors is assumed by the author. A change of question or portfolio may possibly affect the quantitative analysis of the start-up through the application of this model.
- The model's value is maximized only when used at the right time. The ideal period for using the model is during the transition of the idea to a business. This is the period where everything is only in the 'planning' stage and the company is just about to officially start. The model can also be used when the start-up is still in the 'idea' stage; the qualitative analysis will have most value to the entrepreneur at this stage. The model can also be used after a short period of time after the company has started: the quantitative analysis will have the most value to the entrepreneur at this stage.

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- It is best that the individual applying the model not be aware of the importance of each question and/or category as the model is being filled out. This is due to the human capacity of being biased.
- The detailing of the model may be improved by going more specific into each of the question found in the model and respectively re-assigning the importance accordingly. This may not affect the quantitative analysis as much as it may affect the qualitative analysis because of the number of specific situations the entrepreneur or individual applying the model needs to think about.
- Certain questions have a dependency on other questions to a certain level. Some question may provide a constructive advantage within a sub-category but a negative disadvantage when combines with questions from other
- Questions from different sub-categories or categories cannot be directly compared with each other based on their importance value.

Chapter 4 Business analysis of Smart Parking; a case study

Smart Parking business analysis

This section covers and talks about a potential new start-up called Smart Parking. It is crucial to include this section into the thesis because it is needed in understanding and studying how the new prediction model applies and affects a start-up with the nature of Smart Parking. Multiple challenges must be faced by entrepreneurs if they are to successfully establish a start-up. This is to be done with limited resources at their hand while a fraction of the factor needed with differ depending on which level the organization is running at (Chorev, 2006).

The only factors and parameters that an entrepreneur can control as known as the internal factors. There internal factors that have the entrepreneurs say and voice in include business processes such as marketing, product functionality and features, financing and human resourcing. Whatever affects the business, but the entrepreneur has no control over is called the external factors. Khelil (2016) correctly identifies that these external factors that the entrepreneur has no control over yet has significant impact on his or her business come in the form of policies made by the local and foreign governments, quality of mentorship received by the entrepreneur.

Firstly, this section will analyse the external environment of Smart Parking, this will include but isn't limited to topics such as the industry, competitors, available technology, political and

socioeconomically situation of the country Smart Parking will be based in.

Secondly, the external environmental analysis will be followed by the internal environmental analysis. The internal analysis of Smart Parking will include the study of factors such as strategy, company structure and style, human resource, required skill and infrastructural support and systems. The entrepreneur themselves is also an important piece of study under the internal environmental analysis of Smart Parking because just as any start-up, the soft and hard qualities of the entrepreneur significantly contributes to the chances of success or failure of the new business.

Thirdly, following the internal environmental analysis of Smart Parking, the financials that are required to support and grow Smart Parking will be analysed and it is one of the most important factors that determines the success or failures of new organizations.

The final part of this section will outline and look at the different business strategies of Smart Parking. This part will be useful when studying and comparing the business strategies with other start-ups and how they have been successful. Alongside that, the business strategies may be changed according to the results of running Smart Parking through the new predictive survivability model which will be done on the next section.

Smart Parking Concept

Birth of the idea and its execution in the form of a project (Smart Parking Phase 1)

Have you ever been stuck in a mall parking lot? Spending an unnecessary, profuse amount of time roaming around aimlessly, hoping for a stroke of luck to magically anoint you with a chain-breaking, freedom-giving parking spot which eventually gets stolen by another motorist quicker than you? Of course, you have, and so have others. The problem is simple, motorists do not know where vacant parking spots are. These motorists then tend to roam around in vicinities familiar to them, i.e. in facilities closer to their destinations or facilities familiar to them. The problem escalates further during rush hour. On weekday evenings, weekends, and during festive sessions, motorists may spend more time circulating for available parking spaces or queuing outside of parking entrances.

A result of this is that traffic increases both inside the parking lot and on roads containing entrances to said parking lots. This traffic congestion has become a notable issue and requires corrective measures. We thought why we shouldn't help the motorist in parking. As a solution to this problem, our Smart Parking solution has been designed to contribute to the efficient use of current parking facilities. Smart Parking will provide motorists with a location to park, the motorist simply has to follow direction as to where the vacant spot is. Motorists, therefore, no longer need to spend time circling parking lots and are guided to a vacant parking spot. Hence, the amount of time searching for parking lot and the congestion inside parking lots and on outside roads will be decreased.

Being able to provide motorists with answers before they ask a question is going to be the solution for this particular problem, before we give the motorist the chance to ask him or herself where they should park we provide them with the answer; there! Smart Parking will assign you the perfect place to park using many different algorithmic calculations. When you know where you have to park, you won't be wasting time wandering around the parking lot floors looking for a vacant spot rather you can easily go to your spot via the guidance given by in-park overhead direction boards. When you don't have to be very attentive looking for spots the customer will be able to have a chill ride to his space. As the customer finds it easier to park in our Smart Parking's parking lot, they would find this as an advantage over other places and prefer visiting here than our competitors places. This is what make our solution more compelling than other solutions. The sensors and camera are already there in the market, the things that we need to make new patent or copyright would be the way we setup the system and the algorithm, but the algorithm is very vulnerable to being use by others. Ikea had tried to implement the system of detecting parking spot using light indicator but still there is a limit to the range and application of this system, so we still see an opportunity for our solution. Our key concept to solve this problem is to allocate parking spots to customers when they enter the parking lot. This will allow a one-to-one ratio of parking spots to customers. Customers will then be able to go directly to their parking spot instead of circling around parking lots which ultimately saves time, reduces congestion in parking lot, saves fuel, and provides a better parking experience.

An improved version of Smart Parking with newer and better technology (Smart Parking phase 2)

Motivation for phase 2

With the rise in city building infrastructures and the accompanied traffic congestions within the building’s parking lots an efficient solution must be thought of. The primary goal of this solution would be to save time spent parking as well as maintaining the flow of traffic within parking lots.

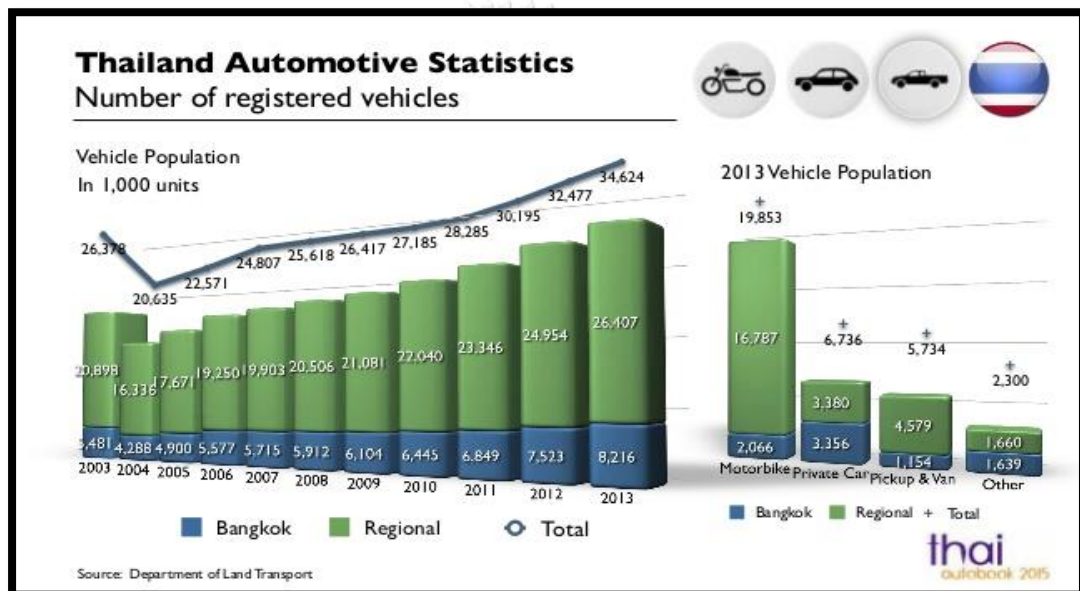


Figure 10A chart showing the trend in the number of vehicles in Thailand (Department of Land Transport, 2015)

New technology and improved solution

To achieve this goal, we would make use of cameras instead of proximity sensors. Each camera would be attached to a single-board computer such as the Raspberry Pi to take pictures and run analysis. The camera would take a picture of up to 6 parking spots and send that information to the board it is attached to. The board would then analyse each parking spot and determine whether or not each parking spot is empty. Once that is complete

this information is sent wirelessly to our server. The server will then run our Priority Algorithm to determine the best empty parking spot for each customer entering the parking lot.

Differentiation: The reason why we have decided to go with cameras attached to a single-board computer is due to 2 main reasons:

1. It is more cost efficient than having proximity sensors
2. It is more expandable than proximity sensors

The advancement of technology has resulted in its cost going down. Having a camera and a single-board computer handling 5-6 parking spots is much cheaper than having proximity sensors which are required for each parking spot. This provides possible users with incentive on choosing our system over the current one.

The use of cameras also allows us to collect much more information. Instead a proximity sensor which simply replies with a few bits of whether a parking spot is vacant, we can collect over 5 million pixels of data. We can then use this data to run multiple analysis, such as determining the license plates of each car being parked, the size of each car, the colour of each car, etc. Using cameras would also allow us to collect consecutive images of the parking lot, thereby replacing and eliminating the need to have a separate security system within the parking lot.

Additionally, being able to provide motorists with answers before they ask questions is going to be the solution for this particular problem Smart Parking will assign you the perfect place to park using many different algorithmic calculations. When you know where you must park, you won't be wasting time wandering around the parking lot floors looking for a vacant spot rather you

can easily go to your spot via the guidance given by in-park overhead direction boards. When you don't have to be very attentive looking for spots the customer will be able to have a chill ride to his space. As the customer finds it easier to park in our Smart Parking's parking lot, they would find this as an advantage over other places and prefer visiting here than our competitors places.



As mentioned above, our system can collect vast amounts of data. All this data can then be analysed to further understand consumer behaviour. For example, in our prototype testing within Chulalongkorn University's Faculty of Engineering, we have extracted the following information about professor's parking behaviours.

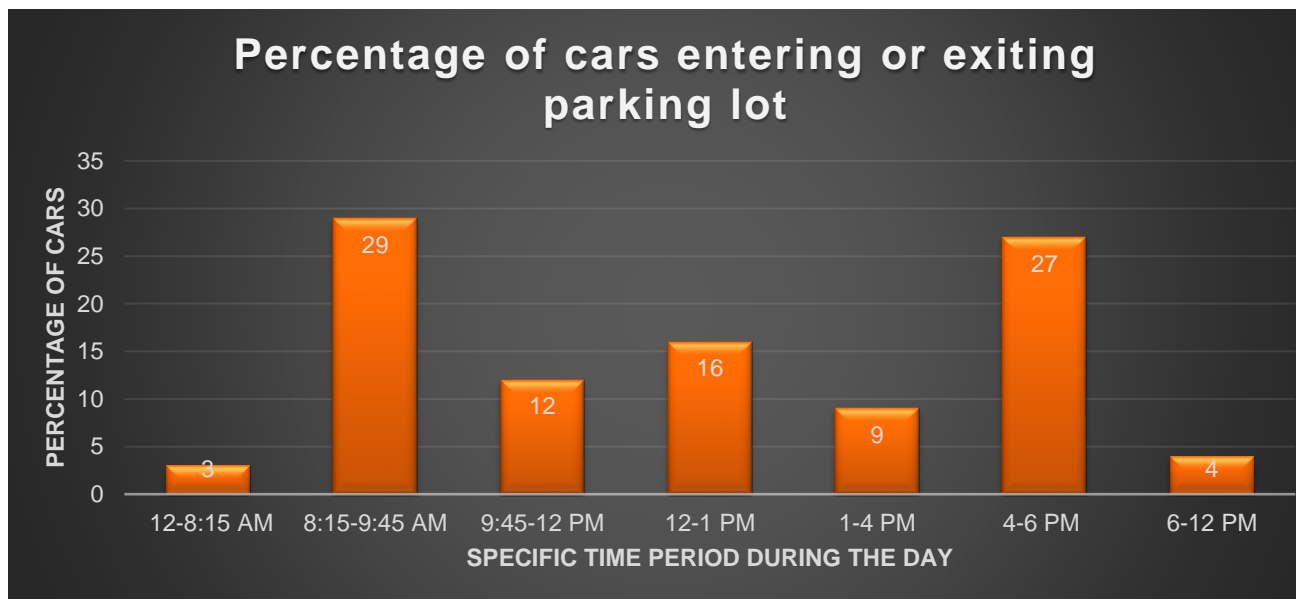


Figure 11 An example of information obtainable by Smart Parking solution

Business analysis

External factors

The innovation metric

The “Smart Parking” was thought to be a bit of both, “Low-end” (has a lower cost business model as it uses inexpensive computers instead of humans) as well as “New-market” (using this solution to satisfy other “jobs” like tracking of products in the warehouse, this option was not explored much) disruption as it showed characteristics of both just like Southwest Airlines (Kowalik, 2011) as cited in Singh (2018).

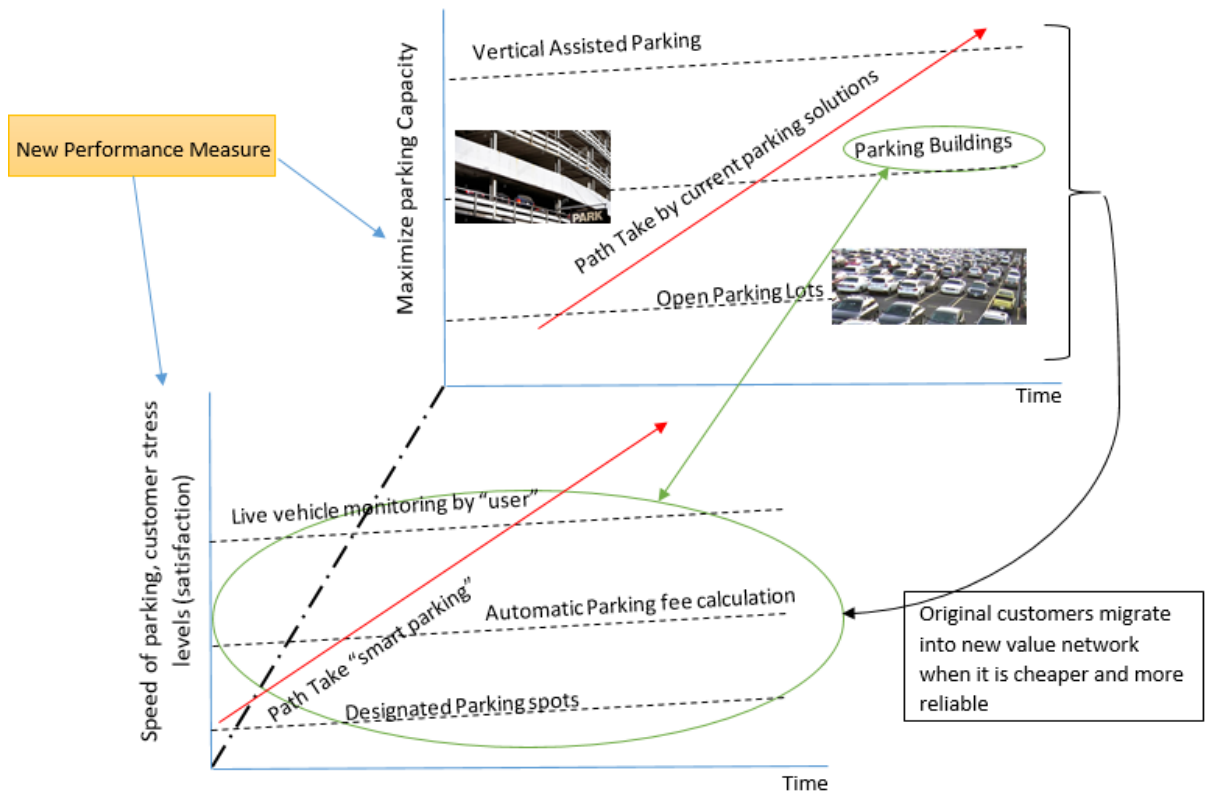


Figure 12 Low-end, New-market disruption market graph (Singh, 2017)

The aim of “Smart Parking” is to integrate Technology into existing market solutions in the Parking Buildings. The new market disruption is replacing open parking lots and vertical assisted parking. But it is very important to make sure there are strategies in place to compete separately with the Blue ocean market (Kim and Mauborgne, 2015) as cited in Singh (2017). These strategies must not conflict with or acknowledge the existence of the Red ocean market the solution can serve. The low-end disruption is to replace human work force with autonomous technology in existing Parking Buildings. Traditional parking system’s performance measure was purely based on the capacity of cars accommodated. The core measure of performance in the “new-market” perspective of “Smart Parking” is how much quicker and without stress can the motorist park. Another performance measure is the customer satisfaction level

that has to do with the user's ability to understand and use the "Smart Parking" system.

Opportunity Analysis

The increasing and rapid growth of technology is something that could not be ignored. This is the result of Moore's Law which governs the fundamental advancement of technology. Globalization is making the world into a miniscule place. People can be thousands of kilometres away from each other, yet they could talk to each other as if they are right next to each other. More complex structures and services that 50 years ago were considered to be Science fiction are become reality; e.g., Portable Audio Device that was described as "little seashell...thimble radio" in a classic novel called "Fahrenheit 451" turned into a reality known as "Earbuds". Disruptive technologies that could shake the foundation of a currently stable market are born at a rapid rate.

Furthermore, human's behaviour, needs, and point of view are being changed, as a result of new technology and services that solved their daily problem, and satisfied their demands. However, in a world full of problems, human will always have more demands one after the other. To illustrate, people in Bangkok used to have a problem with entering the city, because of the huge traffic, now with the BTS (sky train system) the problem has somewhat reduced as people have an alternative. However now the next problem is, how to make the BTS faster more efficient or reduce the queue. As a result, this produce an opportunity for an Entrepreneur to bring technologies to solve the issue. That is why it is fair to conclude that the changing of people's behaviours that generates new kind of demands, and

disruptive technology that enabled new kind of services and customer experience opens a new business opportunity.

One of the disruptive technologies that is gaining its momentum worldwide that could not be ignored is the “Internet of Things”. Internet of Things is a technology that allows user to collect and process data in real time. It works by installing multiple sensors at a designated spot. Internet of Things has open doors to many opportunities and new type of services, such as Microsoft Predictive Maintenance and Tesla’s auto-pilot. It is versatile and there is a lot of rooms for potential growth of the technology. Although it is not yet popular in Thailand, but as times goes by and the technology become much more effective, chances are Bangkok will be filled with all of these sensors due to its versatility in term of utilization. Internet of Things may as well open a business opportunity in Thailand as well.

In Thailand, especially in Bangkok the amount of automobile own per person is slowly increasing every year. This could be caused by the increased efficiency in production of automobile, which makes it cheaper to afford. Even though the government puts a high tax on the automobile product, people are still purchasing it. This phenomenon could be explained by the changing in society’s needs and value. Owning a car in this contemporary society is now considered as a need rather luxury. Furthermore, owning a popular car or many cars is also correlating with high social status. As a result, it is unavoidable that the traffic within Bangkok is terrible, as well as parking spaces in Mall and other public places are becoming less and less common as time goes by. Thus, the problems that is related to parking spaces in popular places such as Siam Paragon, and Central World arises, due to the effect of changing society’s behaviour and values.

Research methodology and reasoning

“Smart Parking” idea originated by my personal painful experience of having to park cars in Bangkok’s shopping malls. Surely, this was a problem faced by many other motorists. The only way to know for sure was to talk to other motorists and find out. Which is exactly what “Smart Parking” team did. However, before users were interviewed and surveyed it was crucial to realize the different demographics of users. This was the part where hi-end, mid, low-end and non-consumers were grouped. The hi-end users had drivers for their personal vehicle or had access to valet parking, the mid and low-end (target market) seemed to be the main users of the traditional parking system. The non-consumers would include people who had private transportation but choose to use public transportation to commute to certain destination purely out of the frustrating parking experience (Future target market). Questionnaires about how long “users” spent in finding a parking lot and how stressful on a scale of one to ten was the whole experience were handed out to our target market “users”.

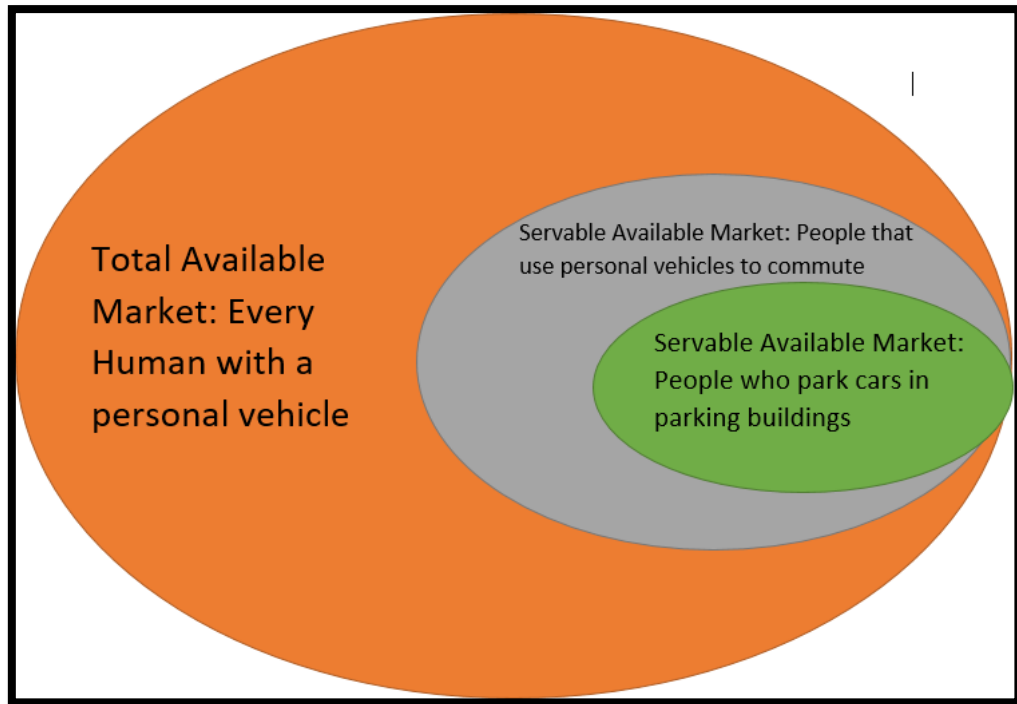


Figure 13 Total market segmentation (Singh, 2017)



Then after explaining our solution of “Smart Parking” and its trade-offs that include replacing humans with machines and being able to follow instructions, another questionnaire about how likely the users are to adopt the solution were given. The questionnaire also included a comment section where users could generate their own ideas that they think will make their parking experience more blissful. This was the first part of reaching out to customers. Fortunately, “Smart Parking” team recognized that our “users” are not the same as our “customers”. Hence, we also had to reach out to our customers, who were not as enthusiastic about discussing or providing information. When asked about detailed statistics of their parking lot (number of parking spaces, numbers of cars that enter per day etc.) they saw it as a security liability and denied any such information.

“Smart Parking” team decided to use “user” (our customer’s customer) data to convince our customers by building a prototype as a proof of concept and then revisiting the customer for another try. After building a prototype, testing occurred on a real parking lot to determine the accuracy and speed of detection of an empty parking spot. Using the results, a computer simulation was carried out using data of the average number of cars in a parking lot and the size of the parking lot. All of the data was obtained through research on the field. The simulations gave an expected time to park with the “Smart Parking” system. Then “users” faced another survey after learning about the simulated results. This time the questions were more about the numbers. How much more are the “users” willing to pay to save a particular percentage of time parking cars (Obtained from simulations). This second part of the research assisted in drawing up the first business model canvas for “Smart Parking”.

An ideal level of research for this project would have been making many MVPs and sticking them up in a real small parking lot in the real world to be able to test the usability and reliability of the technology used. This will also help in the discovery of any flaws of user's interaction with the system, as the computerized part is only half of the "system". The feedback loop of the lean innovation could prove useful again in this stage. This would let the team focus on improving the usability and emotional design rather than using computer simulations to improve upon only the technology.

Market pain point identification

This survey was conducted on 70 observations with diverse sets of samples ranging from teenagers in shopping malls, middle aged men and women in shopping malls, families in shopping malls, and college students. The only true similarity on this set of data is that all the samples drive a car and park inside shopping malls. We decided to choose a wide variety of samples because we wanted to eliminate the biases that could form when sampling from a single type of population and here is the outcome.

As stated earlier, the increasing in the amount of automobile usages in Bangkok and the limited available parking space, caused a set of problems for drivers and the company that owns the parking lot. Due to the limited amount of parking space, drivers will have to spend a surplus amount of time in order for them to find a parking spot. Additionally, they are also not guaranteed to find one either when they enter the parking lot of a given mall. This make it frustrating and time consuming for the driver, while possibly could ruined the relationship between the customer and the company who owned the parking lot e.g.: Siam Paragon or Central World. Furthermore, other problems such as

contention within the parking lot also arise, because there is a huge chance that the car that is driving in the parking lot is not evenly distributed. Sometimes drivers also steal each other precious parking spot, which could potentially end up in a physical fight. Currently there are some solution that is trying to address these problems, but they are not efficient or effective enough to be a viable fix. The solution includes, adding a sensor that indicates free parking space and valet parking. However, the sensor solution is not accurate, and sometimes they are blocked by pillars and other wired in the ceiling, while the valet parking solution raises several security issues. The research that is conducted by the team also support this claim as shown in the figure below

The bar graph (below) of how many people think that the current solution is helpful in solving the amount of time it takes to find a parking spot.

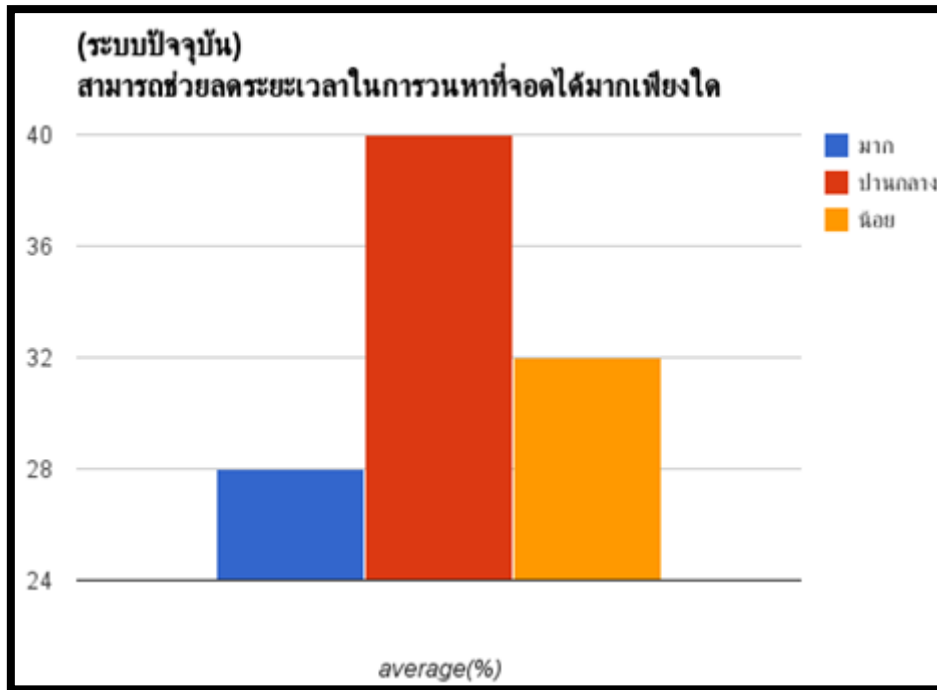


Figure 14 Customer survey result of existing parking solutions satisfaction

According to the graph, there are more people who thought that the current system is not helpful and a small percentage of the people who thought that it is helpful. It can be seen that the current system still has a lot of room for improvements. The bar chart above gives information about the percentage of people who think that the current parking system in parking malls (i.e. sensors) can help to reduce time to find a free parking space. It shows 40% of people think that the current system can help in moderate level, low and high level with 32% and 28% respectively. We can imply that most people are still not satisfied with the system, and one of the main reasons may be the high number of cars and poor managing system. Both of these result in more time consumption in looking for free parking spaces.

Customer research

The problem of limited parking space, and frustrating parking experience is something that should not be overlooked. According to recent studies conducted by BK Magazine in 2012, the problem of finding an available parking space ranked number 2, after the terrible traffic. According to many people in Bangkok, they are also agreed that they all have problems when it is about finding a viable parking space is troublesome and the experience of doing such is proved to be annoying. According to the research conducted by the team a significant number of drivers or 34.7% spent more than 10 minutes looking for their parking lot. The pie chart of the research is shown below.

The amount of time spent by driver looking for their parking space shown in Pie Chart below.

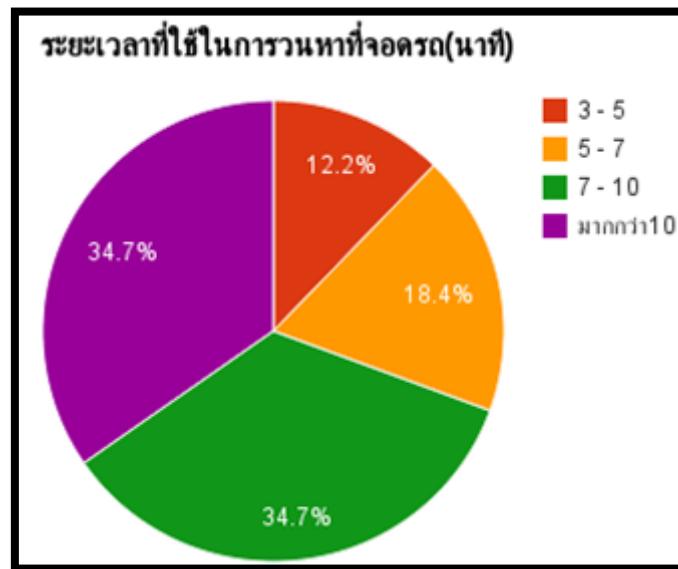


Figure 15 Customer survey result of how long on average it takes to find a parking spot in minutes

The pie chart below illustrates the average time used to find a parking space. We can see that 34.7% of the sample population spend more than 10 minutes when looking for a parking space, while the same percentage also uses 7-10 minutes. Only the minority uses 5 minutes or less.

Additionally, according to the Bangkok Post’s article written in 2015, it is stated that cars outnumbered people by almost 2 to 1 ratio. Furthermore, it is estimated that this number will increase by 3500 vehicle each day, and only 40% of the people who travels in Bangkok uses Public Transportation. As a result, the parking space problems will keep increasing and affect everyone. In other words, there is always a demand for the solution to solve the problem. The solution must be able to automatically find the parking spot. This can be achieved by knowing the real time data about which parking spot is available at the current time and

manage it. Apparently, this solution could be a reality today with support from the Internet of Things. Currently the processing power of an embedded system is considerably high enough to process real time streaming, and the means of connectivity Wi-Fi or Ethernet is fast enough to be transmit the data into the server. Given that there is enough capital to buy and install the sensors, ordinary parking lot could be a Smart Parking lot. In other words, it can be concluded that there is a demand pull, and a technology push. Another fact to back up this claim is the data that was gathered by the team. During the survey, we also described our project to the people being surveyed. We explained what our system is and how it would be implemented. We found all 100% of the people agree that using our system would improve the current parking system. The team ask several drivers about the demand of the technology and according to the data there is a huge demand for it. The research results are shown in the figure below.

Bar graph (below) of how helpful it would be to know the parking space before entering the parking lot.

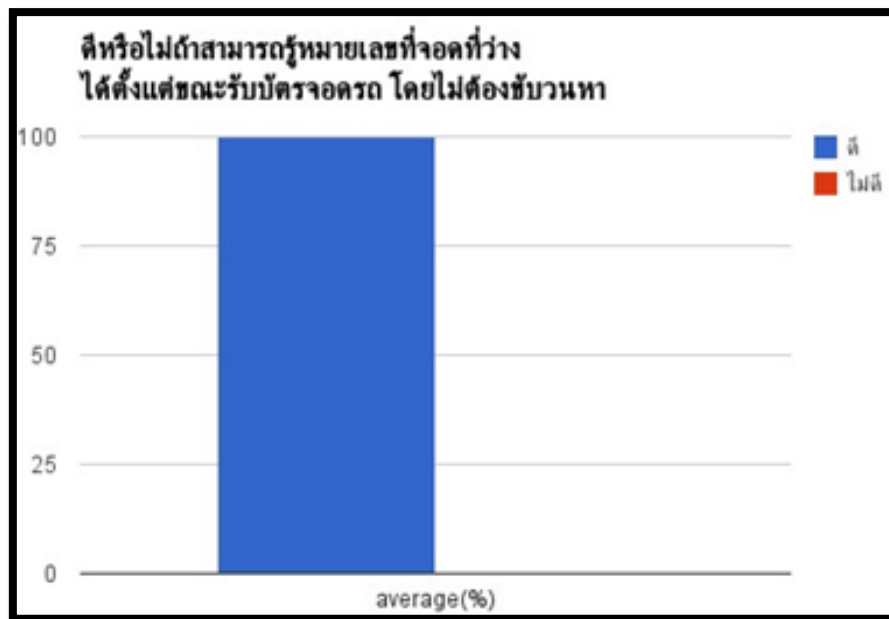


Figure 16 Customer survey result showing how many people would like to know where to park before entering the car park

According to the graph, 100% of the driver state that it would be really helpful if there is a system which give them the location of their parking space prior before entering the parking lot. However, it still could not be concluded that it will address the pain point of the driver, therefore more research is conducted.

Bar graph (below) indicating the % of people who think that the system would be useful in decreasing the time in finding parking space

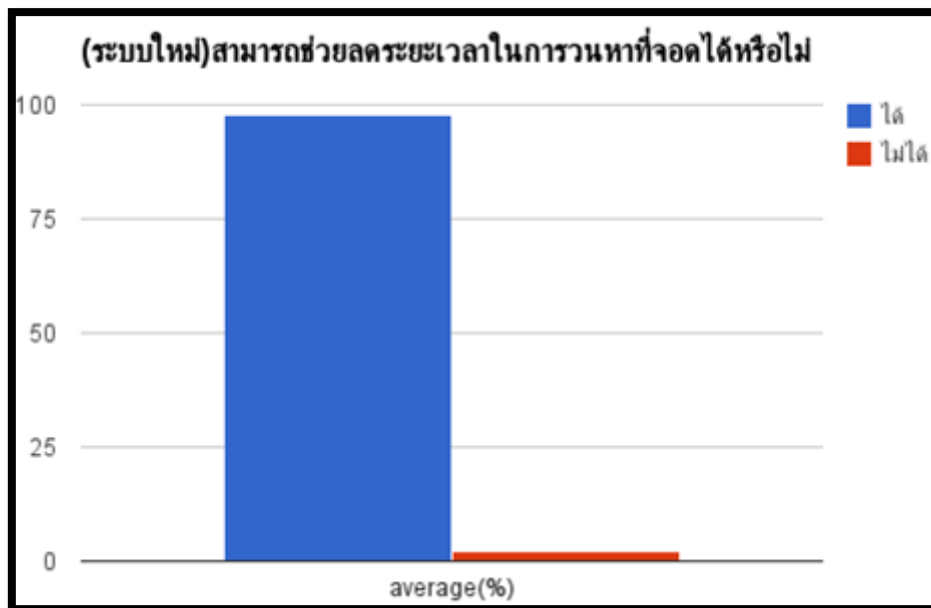


Figure 17 Customer survey result of how many people believe that the new solution will help them save time and money

Almost 100% of the driver agrees that it help, thus this can be concluded that the solution will address the pain point of the customer of spending so much time on finding a parking space. The bar chart above shows the number of people who think whether knowing where the exact free parking space would reduce time consumption. Almost all of people thought that is good. Only 2% of the people think that it would not help to reduce the time used to find a parking space.

However, it is still not enough to conclude that they will use it, thus the team conduct more research on the usability shown in the following figure.

Pie chart (below) on how many % people will follow the system.

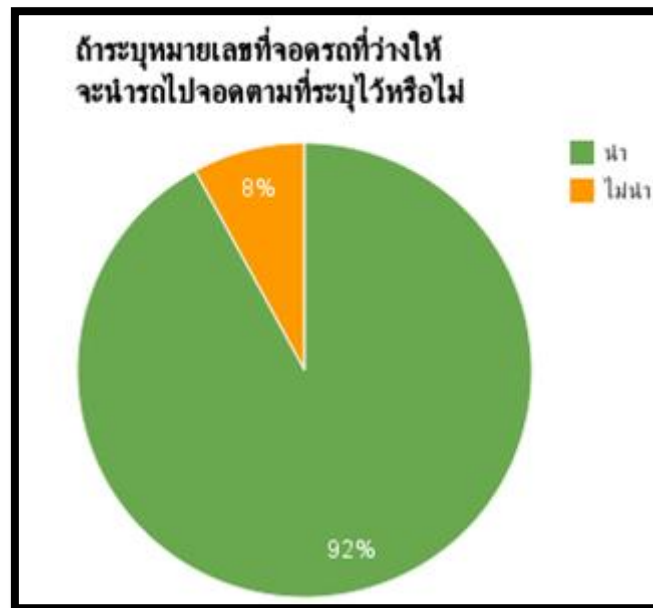


Figure 18 Customer survey result on how many people will follow the rules of the Smart Parking system

According to figure, 92% of the people will follow the system, which is a sufficient amount to introduce Smart Parking. Although, if the 8% does not follow the system, the system will still not be broken, because the system calculate the parking spot by using the real time data. Furthermore, there are no Internet of Things solution that claimed to solve this issue. Therefore, this is market is classified as a Blue Ocean, which will make the opportunity looks even more attractive.

From the statistics gathered from the survey, we can conclude that while the current parking system helps reduce time in a moderate amount, drivers are still not satisfied with the time they currently use to find a free parking space. All of them agree knowing where the free parking space is would improve on the current system. Almost all of them say they would use our system as they think it would reduce time and fuel consumption. Also, the minority that does not want to use our system could still prefer our system once they have witnessed the impact our system could make on parking.

It is evident from the data collected that a Smart Park system will provide a solution that benefits both the consumers and the owners of parking lots.

Industry trends analysis

The industry that we are targeting is the Parking Lot industry. This market doesn't sound like the most profitable industry but in fact it is. According to new analysis by Frost & Sullivan (Dalal, 2014) the parking industry has a net worth of 100 Billion Dollars and it is expected to bring in another 200-250 Million Dollars, this makes the parking industry a very obvious choice for us to innovate in. The segment that we will be focusing on is every single aspect of the parking experience (Go hard or go home right?). We believe targeting the whole industry rather than on smaller modules of a huge industry will grant us opportunities of becoming a monopolized world standard of parking experience.

The following market researches will prove the need for improvement; as already mentioned earlier the parking industry is a 100-Billion-dollar industry and there are many opportunities where we can use innovation and machine learning for

profitability. A 2011 Study by Cisco concluded that the total cost of personal transportation was a whopping 3 trillion dollars. Parking was responsible for an incredible 12.5 percent or 374 Billion Dollar. Cisco claims that these costs include actual cost to park and associated inefficiencies, such as the urban traffic created by people looking for parking. According to a 2011 IBM survey, drivers globally spend an average of nearly 20 minutes per trip in pursuit of a parking space (whereas we can guarantee less than 2 minutes no matter the place or time of parking).

The survey also adds that “Most people continue to drive around searching for a spot, either on-street or off-street, typically unaware of what parking inventory is available to them”. Using our technology, the days of having to “search” for a parking lot are long gone. Parking is an inherently transient activity in which the majority of drivers don’t think about parking until they’re in their vehicles about to reach destinations. This is why one of the aspects of our solution is an app that will have your subconscious mind make sure to book a parking spot before you reach the destination for the most convenient parking spot wherever it may be.

The approximate total revenue for the parking industry in the past few years account to about 30 billion dollars. As the world's population grows and as personal transportations are getting more of a necessity it is proof that the world need not only parking spaces but a quick and efficient way of parking. “Thai auto Book” backs up the facts by showing that the number of vehicles has only been increasing since 2004. In Thailand, the opportunity for designing and implementing a smarter parking experience is more important now than ever. We expect to be “Early market” penetration as mentioned before the parking

industry is gold under mud, entering the market would be relatively easy as our core competency is our never seen before innovative technology.

If we are successful in entering the market and people find our solutions, then we believe we may conquer more than 90 percent of Thailand's market before we plan on international growth. "Early adopters" such as ourselves will be able to stay in the market continuously as well as grow simultaneously as our vision is "A better innovation today for a better tomorrow".

Potential competition analysis in terms of technology

1). Smartpark (Smartpark.co.th, 2015) – A competitor that uses wireless technology to improve the parking experience.

Key points of the competitor:

- Makes use of wireless technologies to spot vacancies within the parking lot
- Uses WSA-N
- Has many research and technical challenges

Analysis of the competitor: มหาวิทยาลัย

The strategy of this company is to aim too high by using the most expensive technology and sensory devices to achieve the highest possible accuracy.

2). Smart Parking (Agarwal, 2016)– a project-based technology that uses Arduino to show proof of concept. A potential solution for other competitors.

Key points of the competitor:

- Uses Arduino board
- Simple and small scaled
- Inexpensive technology

Analysis of the competitor:

Very similar to the author's start-up wants to achieve but on a bigger scale.

3). **Smart Santander Project** (Bielsa, 2013) – A university-based research project/start-up potential. Collaborations by Telefonica I+D and University of Cantabria.

Key points of the competitor:

- Uses sensors, actuators, cameras and screens.
- Detection is based on magnetic field with Waspnotes
- Magnetic sensor placed under the road
- Information about free spaces are updated every 5 minutes

Analysis of the competitor:

Very complicated and too many sensory that are hard to implement and are also expensive. Their system is not real time whereas we plan ours should be.

4). **Parkifi** (Parkifi.com, 2018) – A parking solutions provider.

Key points of the competitor:

- Sensors are battery powered
- Uses magnetometer as the sensor
- Has an effective app to analyse various information

Analysis of the competitor:

This is an actual service provider that has interactive applications with harder to use sensors.

5). **Streetline** (Streetline, 2019) – Another parking solutions provide that provides custom tailored and personalized solutions.

Key points of the competitor:

- Uses in pavement sensors
- Uses camera for license plate detection

- Uses GPS from smartphones to also act as a sensor
- They have their own payment system

Analysis of the competitor:

Pretty big solution with many features.

6). **Libelium-Metiora Smart Parking Sigfox Kit** (Libelium.com, 2016) – A high technology implementation of custom parking.

Key points of the competitor:

- Magnetic sensors
- Easy installation
- Battery operated
- Cloud solution provided by Metiora
- Sensor connectivity provided by Sigfox

Analysis of the competitor:

Used like a kit rather than having an implementation solution. Operated by collaborations with many other companies

7). **Tinynode** (Paradox Engineering, 2017) – a well-established business with many partners and different types of sensory solutions to different parking lots.

Key points of the competitor:

- Above ground and below ground sensors
- Wireless sensors
- Have partner companies to handle Guidance app, system installation, panels and display, mobile payments, indoor detection, law enforcement, parking management and law enforcement.

Analysis of the competitor:

They provide different types of sensors for different types of areas and application.

8). **Telensa** (Telensa.com, 2019) – A parking lot solutions provider that allows end-user interaction.

Key points of the competitor:

- Uses magnetic sensor and long range UNB radio systems.
- Has a UI for customers.

Analysis of the competitor:

Like other solutions with wireless sensors and has analyses through UI.

9). **Kiunsys** (Kiunsys.com, 2016) – An extremely high-tech complete parking solutions provider.

Key points of the competitor:

- Uses ultrasonic sensors
- Above and below ground sensors
- Customers can choose their parking spot using apps
- Paying system using RFID
- Battery operated
- Cloud based solutions

Analysis of the competitor:

Interesting technology because they make use of ultrasonic sensors.

10). **Urbiotica** (Urbiotica, 2019)– Another example of a solutions provider for parking lot problems.

Key points of the competitor:

- Wireless magnetic sensor
- Battery operated
- Uses cloud technology to do the processing

Analysis of the competitor:

Like other magnetic sensor-based solutions

Competitor technology analysis summary

- No one has used the author's ideas of technology as a full-scale implementation
- Most use magnetic sensors
- Most use battery powered systems which would need replacement
- Having an UI like most of the above solution providers make it an effective marketing strategy for the customers
- No one uses an algorithm to find the best parking spot and force the customer to park there to save maximum amount of time and money and overall parking efficiency
- All solutions above are not limited to parking lots (they provide solutions for open streets, open parking spots and parking buildings as well.)

Regional competitor analysis

In Thailand, parking lots currently make use of proximity sensors which detect whether or not a parking spot is vacant. The parking spot is also equipped with an LED light which turns green or red depending on whether or not the spot is vacant. This information is then consolidated to determine how many parking spots are empty on each floor or zone of a parking lot.

The customer is then informed of the number of empty parking spots by LED boards which are placed at the entrance of a floor or zone. This system however is flawed. Customers still have to circle around parking lots to find the parking spot with a green LED. This coupled customer's indecisiveness on the threshold of empty parking spots to enter a zone and multiple customers heading towards the same empty parking spot brings great inefficiency. This inefficiency results in excessive time spent while parking, congestion within parking lots, excess fuel consumption, and an overall bad experience while parking.

The Competition initially only consists a company that calls itself “Infinite”. This company is responsible for over 60 percent of the market share of “Smart” parking. While they have the majority of the market and have already set up their systems in the main parts of the city center like Siam Paragon and Central World. This would make it harder for our solutions to replace theirs easily as reinvestment is going to be costly for the customers.

The advantage we have is that our system is “Smarter” as we use cameras and image processing to detect parking spots and we also help guide the customers to their own reserved parking spot all using a centralized intelligence system. Our competitors use technology that’s just ancient, infrared technology and light sensors used in every single parking spot is just not scalable. Why use a sensor for every parking spot when you can use a camera to sense multiple parking spots at the same time while the camera can also act as additional security. Second market entrants and also late market entrants can easily “C&D” and try to open up shop with cheap knock off technology and steal market shares. As innovation is what keeps the world moving there can always be another genius entrepreneur that comes up with better ideas to improve the parking experience for motorists. This will be considered as our competition.

The major competitors’ sales as only growing as their products have a constantly increasing customer base. But we believe we will be able to capture most of the new customer bases with our newer innovations. While we believe what we believe there will always be barriers to cross and potholes to fill. First, people had change and that will discourage our potential customers from embracing our newer technology. Secondly, we will have to prove ourselves within the first few months of launch or the project

would be considered a failure. One of the biggest barriers is to give what we promised which is a stress-free parking experience that saves them time and money. Additional competitors will also have to face similar barriers that we would have to but an additional barrier they would have to face is the fierce competition from our innovation as well as our up to date technology.

Market size and customer identification

Our customer base is not only for people who use parking lots. We have two basic groups of customers. The first group of customers are malls or hospitals or any infrastructure with a big enough parking lot, as most of these customers offer free parking to their customers so we will have to sell the solution directly to those malls or hospitals. The second group of customers are the ones who own personal vehicles and pay at the entrance of the parking lot. For these types of customers, we will either implement them on existing parking lots making the customers pay a few extra baht which our part of the profits will be, the other option would be to build our own parking lot on empty spaces and charge them at the gate for which the whole revenue would go to us.

As far as our research goes customers need to be able to find a convenient parking spot quickly. They complain that most of the time the parking spots are packed, and the flow is chaotic as everyone has to wait for one car to park which may take up to 1 minute. They say, "I come to the mall to relax and chill, but by the time I'm done with parking I'm just extra stressed". The customers responded very positively when we pitched our solution, they also added that our solution is exactly what they needed.

The customer needs to be able to park quickly, conveniently and save time and money on fuel, this allows the customer to have a pleasant experience and that means subconsciously they would prefer to come to a mall with our solution implemented rather than to a mall without our solution. This means more people will visit the mall more often and the mall can profit a lot from this. This is why the mall (who is our customer in this case) will hire us.

Today's parking lot technology is very dull, the best they can do (in Thailand) is having Proximity sensors on the ceiling of every single parking spot (which can be expensive) and this sensor senses if there is a vehicle under it and shows a red light if there is a car and a green light if the spot is empty. The problem with the existing system is countless.

The existing technology does not provide fairness as to whom saw the available spot first, for example you may have been driving around the parking spot for minutes and then you see a green light near the entrance and you make your way towards the empty spot but suddenly another car that just entered the parking lot immediately parks in that spot and while it wasn't wrong for that car to park in that spot it was certainly unfair to you, but no one knows that! You would always have to be close enough to the lights to be able to make out if there is an available parking spot in the vicinity (when in a huge parking lot).

This means if it's a multi floor parking lot then while there are boards that show how many parking spots are available at each floor, you will never know how many cars are already in that floor looking for those empty parking lot, so you will again find it hard

to decide on where to proceed in order to successfully find a parking spot.

Let's say for example the customer would waste 5-baht worth of fuel on average every single time they park. This means if we save the customer their 5-baht worth of fuel they would easily be willing to pay that five baht to us as we reduce their TTP (time to park) significantly as well, not to mention the amount of unnecessary stress involved. The channels we will use in order to reach our customers are mainly through our own website and personal approach.

We also have alternative ways to reach our customers using social media, though this method will not be as effective in procuring customers it will at least provide free advertisement. We believe that we will not have to reach the customers, but the customers will come to us after-market breach stage is complete.

As mentioned earlier our customers can be anyone who uses a personal vehicle for transportation and needs to park. Commuting from home to work and then maybe to malls before heading back home requires them to go through the painful and lengthy process of parking their car each time. A lot of people just waste most of time in parking their car and get stressed out. If only someone could provide a solution to them.

The motorists may get discouraged to go to a certain place just because the parking experience over there is just a nightmare. This may result in a decrease of productivity or missing out on recreational activities.

Internal factors

Smart Parking business model

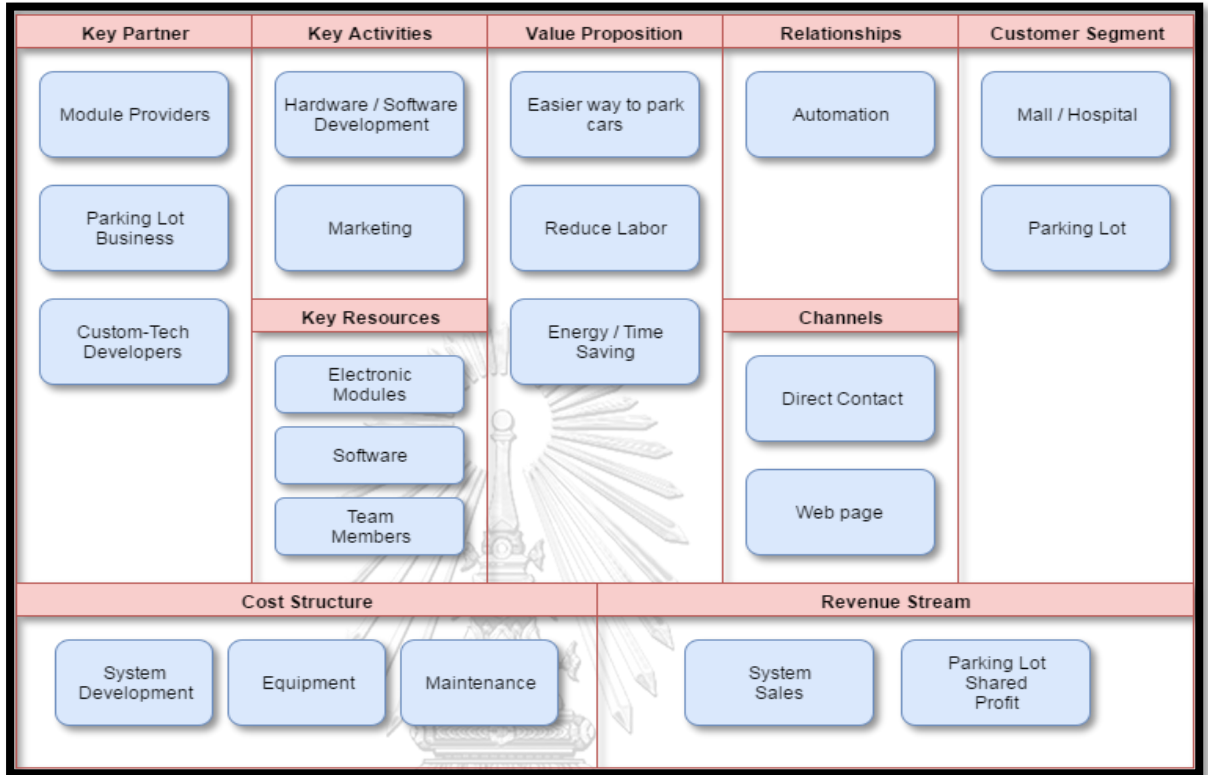


Figure 19 The business model canvas for Smart Parking

Smart Parking SWOT Analysis

STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
Saves time	People don't like change	New malls/buildings can contract us	Rival systems
Customer satisfaction	People might not park on the allocated space	Once an industry standard, our system can be everywhere	Customer's cooperation
Environmentally Friendly	Installation Time	Economic growth	
Improvement never seen before	System Malfunction	Increase in number of cars	

Figure 20 SWOT analysis for Smart Parking

Risk management

Technology

This is the aspect that we will tackle the problem first because it is how we are going to start. In order to convince the people that we will implement this system for we should have a working prototype that could demonstrate our product strength and differences it made. As we are working on camera and sensors there are many factors that could come into play, as these devices are susceptible to errors and delays. Image processing had an accuracy yield of 86% with average resolution photos so we should make the algorithm accurate and be sure to check each camera resolutions. As many people are working on image processing, we should be sure to secure our algorithm and implementation to prevent duplication of our solution elsewhere.

Financial and market

The initial cost of the system would be high as we have to implement it to a large scale of each of the parking lot deals that we have arranged. The cost for the initial research and prototype would have a moderate cost so we might have to consider relying on angels, Venture Capitalist, or loans to get started. The market risk is quite high as people are not likely willing to change right away so they might want to keep their old parking system, so we have to strike a deal with one of the mall/parking lot first and show a huge impact that could be seen throughout the industry.

Human capital

A team where there are no varieties in terms of different major and degree in college which would make the team less competitive. One of the most interesting recent findings around work-team performance, says Neale, the John G. McCoy-Banc One Professor of Organizations and Dispute Resolution, is that the mere presence of diversity you can see, such as a person's race or gender, actually cues a team in that there's likely to be differences of opinion (Stanford Graduate School of Business, 1999). That cuing turns out to enhance the team's ability to handle conflict, because members expect it and are not surprised when it surfaces."

A more homogeneous team, in contrast, won't handle conflict as well because the team doesn't expect it. "The assumption is that people who look like us think like us, but that's usually just not the case," Neale says. "Which means that our team might have problem regarding this aspect, however our internship experience at different firms could aid in this matter."

Future planning

Smart Parking future concept

“Smart Parking” was a solution developed by keeping in mind the increased exponential growth of the IT industry. From the “workers” and “users” in a parking lot being human, “Smart Parking” has replaced humans with computers in “workers”. The future solution to the current job that identified will take a similar approach by replacing humans in “users”, with computers.

The future solutions would still incorporate the Hi-Tech parking system of “Smart Parking” but rather than have humans drive their vehicle into the parking structures it will be done none other than AI. Jensen Huang and Elon musk both believe that completely self-driving cars will become mainstream within the next five years (Galeon,2017).

Having human “users” out of the picture generates contradictions. Wasn’t the whole “Smart Parking” performance measure based on the “users” experience and stress levels? Yes, but it is important to realize that “Smart Parking” provides much more than the primary goal of quickly parking vehicles stress free. It is still cheaper to have computer monitor the environment of a parking lot instead of human capital and their wages.

The technological infrastructure has a potential to passively calculate parking fee (by timestamps of cars entering and leaving by identification through license plate detection). There will have to be trade-offs between the user experience and the degree of hi-Tech used in “Smart Parking” based on how active “users” participate in the parking process. The further a “user” takes part

in the process; a higher presence of Hi-Tech equipment is required.

With the introduction of autonomous driving in the near future, the car will get smarter hence, the parking system does not have to compensate. Harvard Business Review on rebuilding your business model (2011) states that when there is an opportunity to serve a market segment that find existing solutions inefficient or when there is capitalization of new technology, there is a need to revise the business model. “Smart Parking” business model should be changed according to emerging future technologies.

The core part of the business model such as the customer relationships and channels will remain the same. Key activities will have a significant impact with some changes, such as creating partnerships with Autonomous driving (Key Partners) providers to have built in “apps” in their car that can communicate with “Smart Parking” while in the process of parking. However, the most important change must happen in the value proposition box in the business model canvas. Newer value proposition must be created based on revised performance measures against newly developed solutions that can disrupt part of the business model.

Technology

Smart card

Made from polyvinyl chloride with embedded integrated circuits.

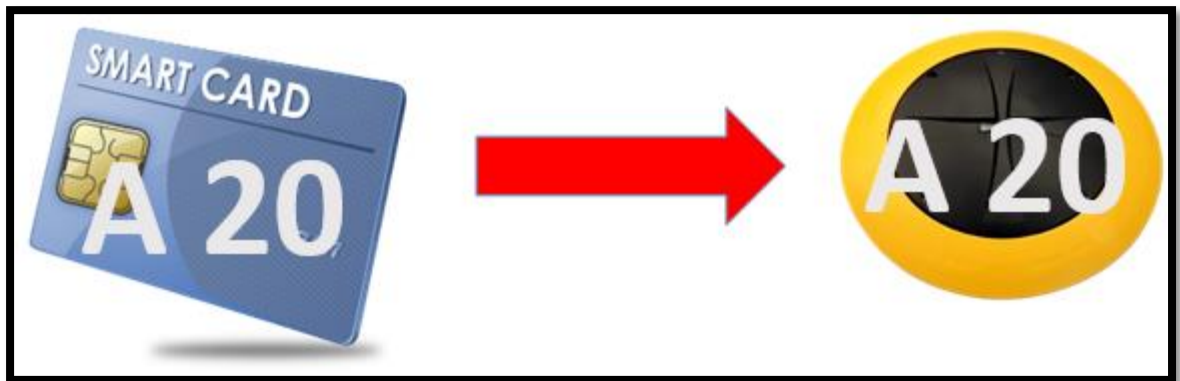


Figure 21 Feature of smart card connectivity to sensor

Every smart card relates to the sensor, when the car is parking in the wrong position it will transmit the signal to the card's collector, then we can ensure that the car is in the right position.

Solar cell

Amorphous silicon solar

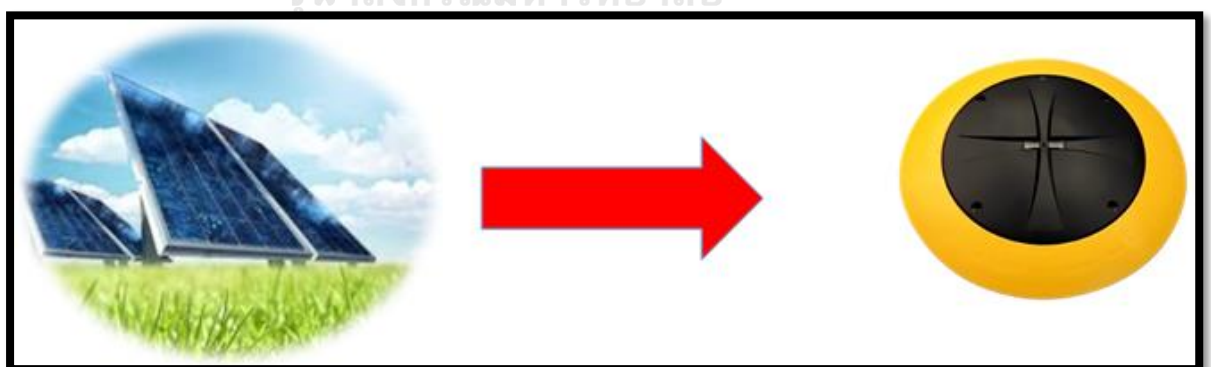


Figure 22 Potential implementation of solar powered sensors

Benefit of using solar cell

- Solar cells last a longer time and have low running costs.
- Solar energy does not cause pollution.
- Should be present in abundance in the future

Advantage of amorphous silicon solar cells is their lower manufacturing costs, which makes these cells very cost competitive.

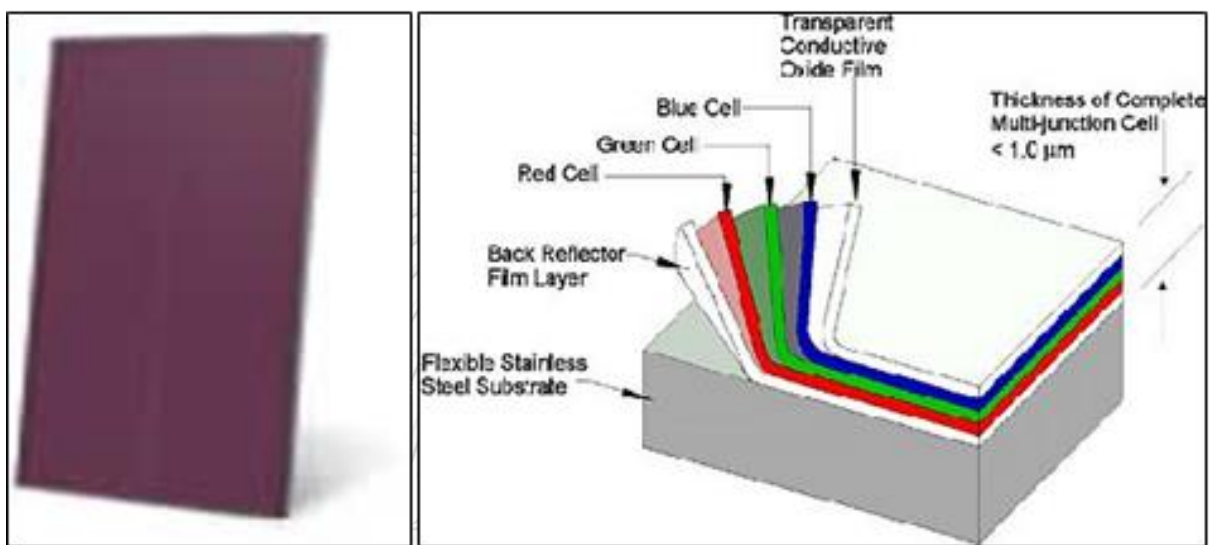


Figure 23 Amorphous silicon structure

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Financial Analysis

Cashflow

	Beginning	March	APRIL	May	June	July	August	September	October	November	December	January	February	Total
Cash on hand (beginning of month)	200,000	200,000	41,800	56,600	13,400	20,200	27,000	82,300	236,800	368,500	390,200	366,000	331,800	
CASH RECEIPTS														
Cash sales		0	0	0	0	0	50,000	150,000	0	200,000	150,000	250,000	200,000	1,000,000
Maintenance Assurance (MA)		0	0	0	0	0	2,500	2,500	2,500	2,500	17,500	17,500	42,500	87,500
Mobile App Advertisements		0	0	0	0	0	1,000	1,000	1,000	1,000	7,000	7,000	17,000	35,000
Franchise		0	0	0	0	0	0	0	40,000	40,000	40,000	40,000	40,000	160,000
Funds Raised (grants, angel etc)		0	0	0	0	0	0	200,000	300,000	0	0	0	0	500,000
Owner contributions		25,000	25,000	25,000	25,000	25,000	25,000	0	0	0	0	0	0	150,000
TOTAL CASH RECEIPTS		25,000	25,000	25,000	25,000	25,000	73,500	348,500	298,500	238,500	179,500	279,500	214,500	1,932,500
Total cash available	200,000	225,000	66,800	81,600	38,400	45,200	100,500	430,800	535,300	627,000	569,700	645,500	546,300	
CASH PAID OUT														
Registering Business		130,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	152,000
Advertising		0	2,000	10,000	10,000	10,000	10,000	10,000	2,000	2,000	2,000	2,000	2,000	62,000
Research		200	200	200	200	200	200	2,000	2,000	2,000	2,000	2,000	2,000	13,200
Contract labor/hardware installation		0	0	0	0	0	0	10,000	10,000	10,000	15,000	20,000	25,000	90,000
Employee salary		0	0	0	0	0	0	40,000	40,000	40,000	40,000	40,000	40,000	240,000
Social Security employees		0	0	0	0	0	0	2,000	2,000	2,000	2,000	2,000	2,000	12,000
Website Creation and maintenance		50,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	83,000
Rent or lease of office		0	0	0	0	0	0	10,000	10,000	10,000	10,000	10,000	10,000	60,000
Purchase of computers for office		0	0	0	0	0	0	30,000	300	300	300	300	300	31,500
Purchase of office supplies		0	0	0	0	0	0	10,000	500	500	500	500	500	12,500
Taxes and licenses		0	0	0	0	0	0	0	22,000	34,900	34,900	54,900	51,900	163,700
Travel		1,000	1,000	1,000	1,000	1,000	1,000	3,000	3,000	3,000	3,000	3,000	3,000	24,000
Utilities		0	0	0	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	24,000
Solution creation cost		0	0	50,000	0	0	0	51,000	51,000	119,000	68,000	153,000	85,000	577,000
Owners salary		0	0	0	0	0	0	15,000	15,000	15,000	15,000	15,000	15,000	90,000
Other expenses		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	24,000
TOTAL CASH PAID OUT		163,200	10,200	66,200	16,200	16,200	16,200	194,000	146,800	236,800	203,700	313,700	247,700	1,658,900
Cash on hand (end of month)	200,000	41,800	56,600	13,400	20,200	27,000	82,300	236,800	368,500	390,200	366,000	331,800	298,600	

OTHER OPERATING DATA (at the end of the month)	
Sales volume (dollars)	
Accounts receivable balance	
Accounts payable balance	
Solution cost	

Cash Flow Projection

Smart Parking

Starting Date : Mar-18-2018

All units are in Thai Baht

Figure 24 Detailed cash flow analysis of Smart Parking for one year in the future

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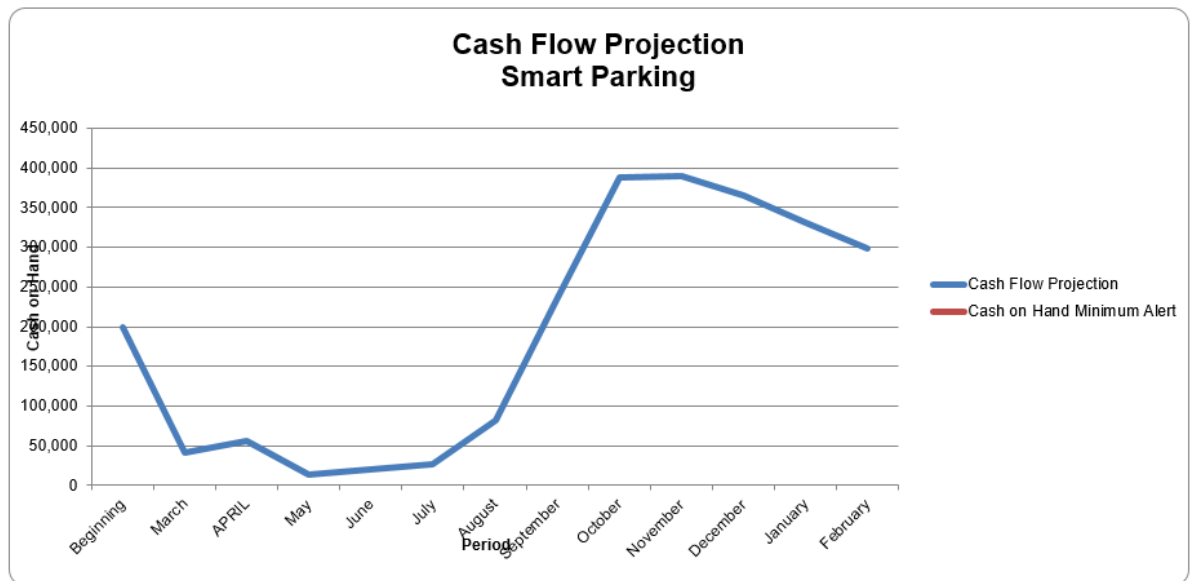


Figure 25 Cash flow project graph for Smart Parking

The above cashflow statement has been drafted based on the following assumptions made by the author:

- A solution is defined as an implementation of one “Smart Parking” for a customer. It can be thought of as selling one product. A customer can purchase multiple solutions for his parking lot (each floor has a different solution). A single parking lot usually will contain one solution. All monetary units are in Thai Baht.
- All expenses and income are Strictly Estimations (Berry,2011). They will be changed further as Smart Parking consults finance experts to estimate prices correctly.
- There will always be an extra 100,000 “money in the bank” (not to be confused with the 200,000 put into the business by the owner) put by the owner at the start of the business which is not shown in the cash flow as it is not used. The interest generated by that amount is also not to be included.
- Setting up the business will be outsourced to a law agency (MSNAGroup,2018).130000 to setup the business and a monthly fee of 2000. This includes all of the “legality” functions from the action list.
- All research while done in house for the first 6 months will have a cost of 200 per month. After which all research

(competitor, market and product) will be outsourced at 2000 per month

- All solutions (sales) will be sold at a 3x markup. Thus if “solution cost” is 10 then income from its sale is 30.
- Applying for grants according to the action plan is finished by April. Smart Parking estimates it will receive anywhere between 300000 to 500000 (Lee, 2017) within 6 months of applying for grants. The cash flow takes in the worst-case scenario.
- Money from angel investors amounting from 200000-400000 (based on owner’s relations) will be received by the 7th month of operating the business. The angel investors will be paid back their money with no interest once the business becomes sustainable and profitable.
- Smart Parking will make a franchising deal (where other companies can use Smart Parking’s IP) for 40000 per month starting on the 8th month.
- Multiple Solutions can be worked on at the same time. No concern for a total of three staff working in multiple solutions simultaneously because there are many aspects in these solutions that are the same. For example, the software and AI “database” is going to be almost the same.
- Payments for sale by customer will be 50% before delivery and 50% after delivery. Delivered within 3 months. Penalties for late delivery are at 10 percent of solution sale amount per month.
- Expenses of making the solution will have 17% of solution sale cost each of the 3 months taken to deliver. MVP cost will be upfront at 100% of sale cost.
- At the end of six months, Smart Parking will have a total of two employees (who start work on the 7th month) whose salaries are 20,000 each.
- Each month Smart Parking is guaranteed at least one “solution” contract.
- Maintenance assurance (MA) is a subscription that customers make from Smart Parking to maintain and fix any problems in their Smart Parking solution. MA costs five percent of solutions sale amount per month. MA is subscribed for all solutions and starts on month of delivery of solution.
- The sales of solutions are expected to be 300,000 400,000 and 500,000 on months 7,9 and 11 respectively. With a 3-

person capacity Smart Parking can only handle at max 2 solutions at a time.

- A mobile App that users of the parking system need to use inside the parking lot will have advertisements (not related to Smart Parking) shown so Smart Parking gets AD revenue. The AD revenue is estimated to be 2 percent of the solution's sale price (per sale). So 5x100,000 solution sales equals 5x2000 AD revenue per month. AD starts earning from solution delivery date.
- Owner puts 200000 of his own saving at the beginning and adds 25000 into the business every month for the first 6 months then withdraws 15000 for the next six months. Owner then continues to take a higher salary in the future depending on the cash flow requirements of Smart Parking at that time.
- Contract labour is outsourcing of installation of hardware in customers parking lots. Estimated at 10% of solution sale price. Paid up front.
- The MVP cost 50,000 to build and is sold for 50,000 at the sixth month. Also gets MA. No Contract labour required.
- "marketing execution" as per action plan finishes on April. Advertising starts the following month and is estimated to be at 10,000 per month for first 5 months then will shift to "word of mouth" and cheaper advertising at 2000 per month. Advertising cost on the second month of 2000 is for recruitment.
- Social Security for employees in Thailand is at 5% (tradegeconomics.com,2018).
- Website and mobile app (IOS & Android) Creation and domain costs 50,000 with a monthly maintenance cost of 3000.
- Work will be done in house(home-office) for 6 months then will move to a leased office (fit for 3 people) on the outskirts of Bangkok. Its utilities (water, electricity, phone and internet) is estimated to cost 4000 per month. The office rent will cost 10,000 per month
- 3 new computers will be bought on the 7th month for 30000. With its maintenance at 1% per month.
- Purchase of office supplies for 3 people will cost 10000 with stock maintenance and replenishment at 5% each month
- Taxation is at 20% for sales above 300000 and below 30000000. (taxsummaries.pwc.com,2018)

- Travel cost is going to be 1000 per month for the first 6 months and then 3000 per month for the rest of the time. Public transport will be used. Smart Parking will not be buying any transportation.
- Other miscellaneous expenses are accounted for at 2000 per month.

Smart Parking strategies

Establishing strategy and procedure

Activity	Importance	Difficulty	Estimated duration
Setup the company <ul style="list-style-type: none"> • Come up with business name and logo • Register the name and logo 	High	Moderate	<ul style="list-style-type: none"> • 2 weeks • 1 week
Digital company presence <ul style="list-style-type: none"> • Create a website • Buy a domain name 	Medium	Moderate	<ul style="list-style-type: none"> • 1 month • 1 week
Physical Company Presence <ul style="list-style-type: none"> • Decide on location to operate office from • Setup the office 	Low	Moderate	<ul style="list-style-type: none"> • 2 weeks • 2 weeks
Legality <ul style="list-style-type: none"> • Set up bank account • Terms and conditions • Payment system • Get relevant licenses to operate • Inform relevant authorities • Setup employee contracts 	High	Hard	<ul style="list-style-type: none"> • 1 week • 1 month • 1 week • 1 week • 1 week • 2 weeks
Marketing <ul style="list-style-type: none"> • Realise target segment 	High	Moderate	<ul style="list-style-type: none"> • 1 month • 1.5 month • 2 weeks

<ul style="list-style-type: none"> Decide on marketing/Advertising strategy Execute strategy 			
<p>Competitor research</p> <ul style="list-style-type: none"> Research competitors Research competitors' products Research competitors pricing 	Medium	Moderate	<ul style="list-style-type: none"> 1 month 2 weeks 2 weeks
<p>Recruitment</p> <ul style="list-style-type: none"> Decide on talent needed and "roles" to be filled Advertise for recruitment Interview and selection 	Medium	Easy	<ul style="list-style-type: none"> 1 month 1 month 1 month
<p>Finding relevant support</p> <ul style="list-style-type: none"> Searching for business partners Searching for a mentor 	High	Moderate	<ul style="list-style-type: none"> 2 moths 1 month
<p>Raising Capital</p> <ul style="list-style-type: none"> Research funding methods Apply for grants Angel investors 	Moderate	Hard	<ul style="list-style-type: none"> 1 month 1 month 1 month
<p>Prototype</p> <ul style="list-style-type: none"> Decide on basic functionality of product Build an MVP Test the MVP Think of improvements that can be made from testing MVP 	High	Moderate	<ul style="list-style-type: none"> 1 month 2 months 1 month 1 month

Outlined below are the assumptions that author has made while considering and planning the above activities and timelines:

- One week equals seven days therefore one month will equal twenty-eight days
- Smart Parking owner will be working through the weekend as well just like many entrepreneurs (Oppong, 2015). Interactions with other business that take place on the weekends are ignored and assumed successful.
- It only takes about a week to register a company in Thailand (Panwagroup.com,2018)
- Market Research, Competitor Research and funding research will all be done in house by using desk research as it's a lot cheaper (Matthews,2015).
- The time plan chosen to start Smart Parking has been the first Monday of March 2020
- Due to the amount of work needed in the beginning months of the business, the owner is assumed have to have left his work and studies to concentrate full time on his business
- Some activities such as deciding on a company name have already been done but the owner has still accounted 1 week for that task to come up with a better name.
- While the activities suggest there will be searching for an office and setting up office, in reality it will be a work from home situation in a 5x5 meter office (Williams and Murray,2008) until after the development of an MVP is finished.
- The prototyping activity will define Smart Parking's USP and thus by the end of 6 months a revision of the business model canvas is required but is not mentioned in the action plan.
- The business partners will include hardware suppliers and B2B marketing agencies (Fallon, 2015). Such partnerships will only be formed after Smart Parking is ready to begin trading.
- A supply chain is not being concentrated on for Smart Parking as each product is actually more of a project with customer's unique requirements and custom-tailored solutions.
- The mentor will be benefitting just as much from Smart Parking as vice versa. The mentor will be a close friend or family (Ries,2017).

- The life cycle of a “product solution” can differ significantly from the time scale of the “prototyping” activity because of the difference in requirements of each customer.
- The Website and mobile app will be developed by the owner and will reflect mainly on the products and services offered. An IT person will be hired to maintain the website once the business is established.
- The timings of raising capital are hugely dependent on how much capital and when Smart Parking needs it. The money will be raised as early as possible and certainly before it is going to be needed (Rifai, 2016).
- The owner and author are also an information and communications engineering bachelor degree holder who can save costs initially in IT recruitment by coding open source code and researching hardware by Himself.
- The owner and author being a Chulalongkorn university graduate and student provides lots of easy and guaranteed grants for the startup (Cu Innovation Hub, 2018).
- Owner’s personal savings of 500,000 will be used before reaching out to angel investors
- A loan is not mentioned under “Raising capital” as the owner believes it is not necessary to setup the business.
- Crowd Funding even though the fastest growing route for finance (Miller,2016) will not be used as an option to raise funds because Smart Parking is not a B2C business and the owner does not believe crowdfunding is an opportune idea when compared to other methods of raising funds for Smart Parking.
- Terms and conditions can be drafted before setting up the bank account or getting licenses and informing the relevant authorities.
- Payment system, getting relevant licenses, informing authorities and setting up employee contracts can all be done simultaneously.
- The “recruitment (decide on talent part)” activity can be done with no pre-requisites (like setting up the business).
- Basic Functionality of MVP will be based off of the target market (Hiringupwork,2018)
- MVP will be built on comparison of competitor products
- MVP testing is actually a “sale” of the product to the customer, so it could generate some income (Periu,2011).
- Angel investors was not known until I learnt about it through step 1 of Raising capital (Researching Funding Methods)

- At the end of these 6 months, Smart Parking is still in an “Existence” phase and needs to know if it can acquire enough demand to become sustainable (Churchill and Lewis, 1983).



Sales Strategy

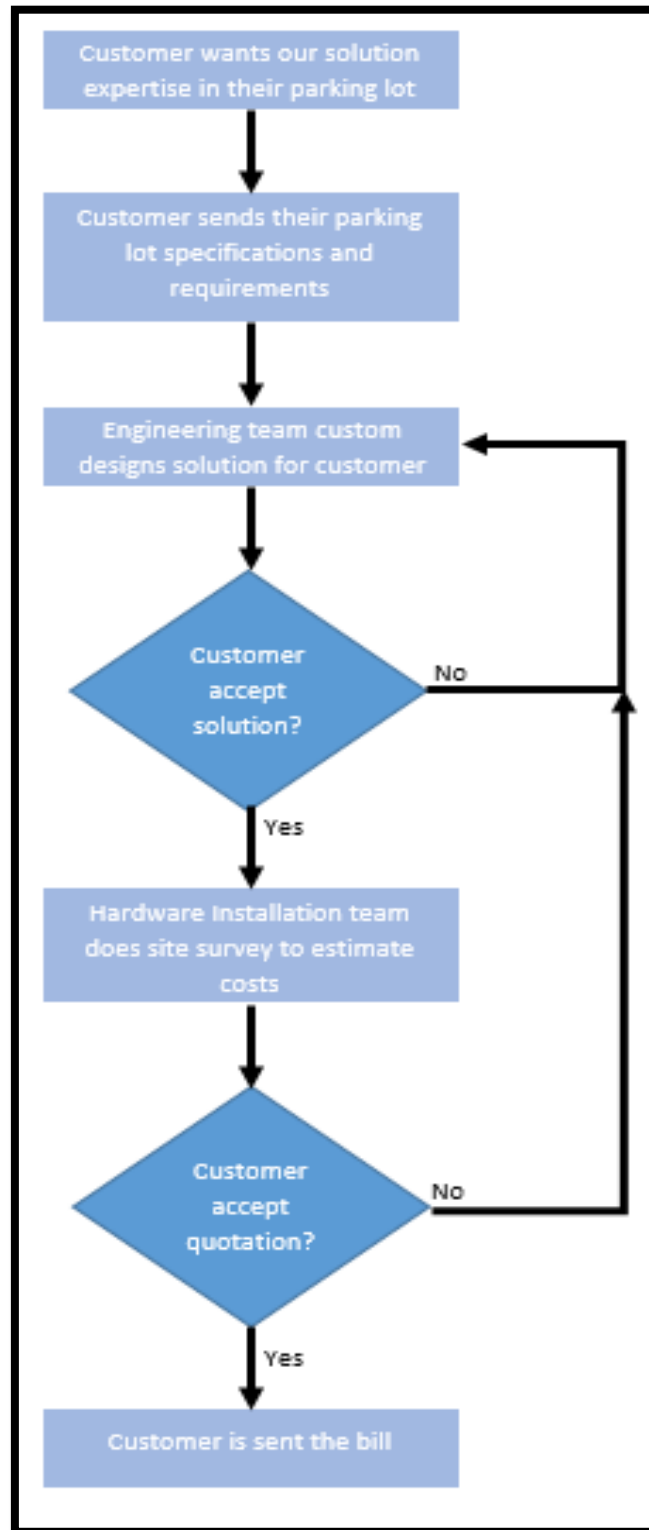


Figure 26 Typical process flow of ordering a Smart Parking solution

Strategic partnership

This project may involve developing and customizing existed electronic modules then assemble them into a system to provide our services. However, some of the modules out there can be considered hard to obtain without any prior contact. That's why the first to be considered us making alliance with are the electronic modules providers such as "Thai-electricwork" or "Arduitrronics", so that we can have a smooth flow of operation, reduction on the equipment's cost, and having lasting suppliers for materials by making ourselves a constant customer to them.

The next candidate we can partner with is the parking lot business itself. As stated in the customer section, it's possible for us to join hand with an individual parking lot of service providers to gain a fair-share of profit altogether from the customers who use the parking lot. For this candidate, we can appeal the partnership by providing the installation of our product and a regular service, just like what we provide to our direct customers.

Another that need to be considered partnering with is a business that deal with custom equipment, depends on the situation of our team. the reason is that, overall, our team and place may not be big enough to handle big scale production, may it be modules with considerable size or modules that need to be made in big numbers. It's not plausible if we need to make a single separated order for every time we have to provide our services. That's why it's recommended that we make a connection to such business as well if we need to.

Application of new predictive survivability model to Smart Parking

This section will be looking at the results of running the previous sections results into the new predictive survivability model developed the section before that. The first part of this section will be the application of the model and analysis of the results obtained from the application. This section will also critically explore the results in order to create the next part of this section which talks about how the business strategies of Smart Parking affect the results of its survivability rate according to the new predictive survivability model. Moreover, the results may also help and provide insight on how to reshape the business strategies so that Smart Parking as a start-up has a higher success rate according to the new predictive survivability model.

Model Application*Table 15 Part one of the proposed predictive survivability model being applied on Smart Parking*

External Factors			
Question	Points given	Importance (%)	Value
Economic Status			
How well is the economy in the region of the start-up doing compared to the past five years (GDP, Inflation etc)?	69	13	8.97
How well is the economy predicted to do in the next five years?	74	16	11.84
Is the average customer's buying power high?	79	7	5.53
Buying power of the currency of the	33	6	1.98

region the start-up is based in?			
Are the availability and cost of resources needed by the start-up are high and low respectively?	46	43	19.78
Is the economy in a situation that is a start-up friendly one?	68	15	10.20
Technological			
Does the local region have a rapid development of technology?	37	12	4.44
Is there a high supply of related technology that can be utilized by the start-up (instead of having to build everything from scratch and in house)?	63	22	13.86
Does the government policies affect technology in a positive rather than negative way (use of technology, laws, licenses etc.)?	62	16	9.92
Is the level of technology utilization in the local region high?	68	8	5.44
Is the cost of technology (in every regard) cheaper locally and in the region when compared to other places?	26	16	4.16
Can the existing technology be improved or outcompeted by the start-up?	89	26	23.14
Mentorship			
Does the entrepreneur have a mentor or mentorship that is experienced and in the same field	16	26	4.16

as the start-up?			
Is the entrepreneur going to listen to most of the mentors teaching?	5	17	0.85
Does the mentor have networks and channels that could benefit the start-up?	64	38	24.32
Is the mentor going to focus a majority of his time on the entrepreneur and start-up?	35	19	6.65
Competitor analysis			
Is the entrepreneur going to carry out competitor analysis?	78	17	13.26
Are there going to be a diverse range of methods used to conduct the research?	38	9	3.42
Is the start-up going to spend a relatively higher amount of money on competitor analysis?	28	13	3.64
According the current knowledge, are there little to no competitors in the market?	39	21	8.19
Is the potential for new entrants low?	19	13	2.47
Does the start-up have a competitive edge over the competitor?	81	27	21.87
Political and government			
Does the local government provide positive support or subsidies to start-ups (as a result of law, policies, regulations etc.)?	74	39	28.86

The start-up will not be facing any negativity politically or through government policy because of its idea and operations, right (the start-up is not going to be of much interest to political parties and government heads in a negative way)?	84	27	22.68
Does the entrepreneur or the start-up or the products or services have a positive reputation in the society?	69	34	23.46
Valuation			
Is the entrepreneur going to try and get a valuation for his company?	38	16	6.08
Is the valuation of the company high?	79	38	30.02
Are business operations and activities going to be focused on improving the valuation?	60	46	27.60
Market analysis (customer)			
Is the target market going to be identified and researched?	79	22	17.38
Is there going to be a lot of survey method (interviews, questionnaires, feedback etc)?	37	13	4.81
Is the customer the same as the consumer?	12	4	0.48
Is there a niche market or pain point in the market that the start-ups products will solve (a potential demand for the products and/or	74	28	20.72

services offered by the start-up)?			
Will the customer research will be conducted quarterly?	71	16	11.36
Will the start-up spend a relatively higher amount of cash in customer research?	36	17	6.12
Social and cultural			
Is the average customer or consumer educated enough to use the start-ups products and services with ease?	34	32	10.88
Is most of the population (and their culture, trend and fashion) prospective to the use of the products and services offered by the start-up?	86	31	26.66
Are the start-ups products for a population group that is the majority?	74	25	18.50
Is the start-up in any way going to do minimal damage to the environment through its products and services or business operation causing environmental concern (is the start-up going to help more than damage the environment)?	90	12	10.80
Legal			
Are the laws in the local region going to friendly to setup shop (legally setting up a business)?	83	37	30.71
Are the laws in the region going to	38	29	11.02

make it relatively easy to conduct business (operations)?			
Is it going to financially cheap to fight the law in the local region?	61	34	20.74



Table 16 Part two of the proposed predictive survivability model being applied on Smart Parking

Internal Factors			
Question	Points given	Importance (%)	Value
Entrepreneurial characteristics			
Is the entrepreneur going to be spending most of his time working on the start-up?	58	16	9.28
Does the entrepreneur have a lot of experience with the start-up culture?	74	11	8.14
Is the entrepreneur young enough to work hard and old enough to have relevant experience?	86	8	6.88
Does the entrepreneur prevent unnecessary risk taking?	28	6	1.68
Is the entrepreneur's motivation primarily monetary compared to emotional?	61	7	4.27
Does the entrepreneur have a bachelors, masters or a doctoral degree?	90	8	7.20
Does the entrepreneur's educational background relate to the core competency of the start-up?	77	4	3.08
Does the entrepreneur have a diverse range of skills and talents that will help the start-up?	61	7	4.27
Does the entrepreneur persevere or give up easily due to lack of focus or passion?	36	14	5.04
Is the entrepreneur ethical to	88	5	4.40

prevent scandals from affecting the business?			
Is the entrepreneur opportunistic and resourceful?	79	10	7.90
Is the entrepreneur reasonably optimistic or pessimistic?	93	4	3.72
Product and services			
Is the product and/or service going to be made up of a non-renewable resource?	98	5	4.90
Is the product and/or service going to be easy to understand and use?	67	10	6.70
Does the product and/or service take a small time to research, design and develop?	24	13	3.12
Does the product and or service cost logistics and inventory the minimal by having a high turnover rate or little to no need for inventory space?	87	9	7.83
Can the product and/or service easily integrate with other related technology?	72	10	7.20
Are the range of products and/or services provided by the start-up narrow?	84	5	4.20
Does the product or service solve specific problems more than a variety or problems?	66	4	2.64
Is the market situation the correct time for the launch of the start-up's products and/or service?	69	7	4.83

Is the product and/or service better than that offered by the competitors?	93	10	9.30
Is the product and/or service going to offer personalization?	13	4	0.52
Is the improvement process of the products and services going to be done only if required based on customer feedback and analysis rather than improvement being compulsory based on the entrepreneur's opinion?	61	7	4.27
Is the product and/or service going to be individually tailored for each of the start-up's customer and/or consumer?	97	5	4.85
Can the products and/or services be priced in such a way that customers will be willing to pay for it and it generates enough revenue to keep the company running?	84	11	9.24
Start-up leadership			
Is the entrepreneur going to invest in an experienced senior management team?	14	31	4.34
Is there going to be a low barrier between the leadership and other team members (in terms of visibility, communication, voicing concerns, sharing ideas etc.)	27	33	8.91
Will the senior management team be given little to no power on dictating	40	36	14.40

the direction of the start-up?			
Human capital			
Is the start-up going to hire employees as needed in a slow and steady way?	70	21	14.70
Is the average cost of a suitable team member (for the core competency) going to be cheap?	37	29	10.73
Does the average team member require a high education, skill, knowledge or talent?	74	34	25.16
Is the average team member easy to hire and keep for the long term?	39	16	6.24
Financial			
Does the company have a low burn rate?	65	18	11.70
Does the entrepreneur and executives take little to no salaries?	79	11	8.69
Does the start-up spend the minimum amount of cash on business expenditure that are not core to the business?	73	11	8.03
Does the start-up pay its employees the bare minimum salary compared to industry standards?	84	8	6.72
Will the start-up have enough financial capital to start the business with enough money left to run the company for another 6 months?	88	11	9.68
Does the start-up have backup plans and reliable channels of financial	91	12	10.92

aid?			
Is the entrepreneur going to try and secure free funds through competitions and grants?	60	8	4.80
Is the entrepreneur going to use a cash flow statement to monitor the financial status of the start-up?	65	8	5.20
Is the start-up going to be run on a minimum amount of debt?	66	13	8.58
Business planning			
Does the business have a vision and mission?	86	17	14.62
Are the vision and mission clear, concise and easy to implement and follow?	73	16	11.68
Does the entrepreneur have clearly set operations and activities for the company?	70	21	14.70
Is the entrepreneur willing to give up a lot of equity in exchange for capital in the long run?	16	9	1.44
Is the entrepreneur going to create and follow specific strategies for business (market, product, financial strategies etc.)?	68	19	12.92
Are these strategies in line with the organizations vision and mission?	37	10	3.70
Is there a rush for scaling or growing the business?	80	8	6.40
Future planning			
Does the entrepreneur have a short-	72	14	10.08

term and long-term goals clearly identified for their start-up?			
Are the goals SMART (Specific, Measurable, Attainable, Relevant, Timely)?	61	19	11.59
Is this plan going to be documented and visualized using the correct methodologies (milestones, road mapping etc)?	38	24	9.12
Does the entrepreneur have an exit plan in case the start-up is not doing well?	7	9	0.63
Does the start-up have a pivot plan?	25	34	8.50
Business model			
Does the business have a business model?	87	37	32.19
Is the business model treated as a living document?	61	19	11.59
Is the business model a feasible one?	67	25	16.75
Has this or a similar business model been tested or proven to work?	13	19	2.47
Prototyping			
Is the entrepreneur going to build a prototype?	84	30	25.20
Is it easy to build a prototype?	38	15	5.70
Is the prototype going to cost a lot of time to build?	26	11	2.86
Is the prototype going to cost a lot of money to build?	19	11	2.09
Will the prototype shown to the	84	18	15.12

customer/consumer and their feedback taken to improve the prototype?			
Can the company save money by building a specific prototype that covers the entire range of its products and services?	94	15	14.10
Marketing			
Is there going to be an online presence through digital marketing?	66	13	8.58
Is branding cheap or relatively not a priority?	80	8	6.40
Is there going to be direct B2B marketing?	94	36	33.84
How much of the marketing is going to be professionally outsourced?	83	21	17.43
How much capital is going to be spent on marketing?	38	22	8.36
Company positioning			
Is the company a first mover into the industry?	73	41	29.93
Does the start-up have any intellectual property?	84	36	30.24
Does the company have a good name with a suitable slogan?	61	23	14.03
Support systems			
Does the entrepreneur have relatives that could support the entrepreneur emotionally?	70	19	13.30
Does the entrepreneur have relatives that could support the entrepreneur	57	21	11.97

financially?			
Does the entrepreneur have friends that could support the entrepreneur emotionally?	77	19	14.63
Does the entrepreneur have friends that could support the entrepreneur financially?	35	21	7.35
Is the entrepreneur going to limit the support system's unnecessary input into the business (is the entrepreneur going keep emotions and business separate)?	25	20	5.00
Business operations			
Is the business going to be located at a suitable place?	67	13	8.71
Is there going to be outsourcing of basic operations when time comes (HR, accounting, IT support, Legal etc)?	75	27	20.25
Can the start-up make do without an elaborate and complex supply chain?	86	23	19.78
Is the company going to operate in an agile fashion compared to a traditional working methodology?	94	37	34.78

Table 17 Part three of the proposed predictive survivability model being applied on Smart Parking

External Sub-Category	Accumulated Value	Importance (%)	Success Rate
Economic Status	58.30	11	6.4130
Technological	60.96	13	7.9248
Mentorship	35.98	13	4.6774
Competitor analysis	52.85	21	11.0985
Political	75.00	3	2.2500
Valuation	63.70	4	2.5480
Market analysis (customer)	60.87	23	14.0001
Social and cultural	66.84	6	4.0104
Legal	62.47	6	3.7482

Table 18 Part four of the proposed predictive survivability model being applied on Smart Parking

Internal Sub-Category	Accumulated Value	Importance (%)	Success Rate
Entrepreneurial characteristics	65.86	15	9.8790
Product and services	69.60	14	9.7440
Start-up leadership	27.65	4	1.1060
Human capital	56.83	4	2.2732
Financial	74.32	21	15.6072
Business planning	65.46	7	1.9638
Future planning	39.92	3	2.7944
Business model	63.00	9	5.6700
Prototyping	65.07	9	5.8563
Marketing	74.61	5	3.7305
Company positioning	74.20	3	2.2260
Support systems	52.25	2	1.0450
Business operations	83.52	4	3.3408

Table 19 Part five of the proposed predictive survivability model being applied on Smart Parking

Category	Accumulated Value	Importance (%)	Success Rate
External Sub-Category	56.6704	40	14.16760
Internal Sub-Category	65.2362	60	48.92715
Predicted success rate of the start-up			<u>61.8%</u>

Discussion

Chances to increase Smart Parking survivability rate

The model gave the author (who applied his own predictive survivability model to his own idea of a start-up) a big picture understanding of the different business operations and activities that have an impact on the success of his start-up. Through the authors personal application of the model using his perception (and facts and speculations from the start-up research), the writer encountered several opportunities that presented the entrepreneur with ideas on how to improve the success rate of his start-up. The author will now attempt to describe the thought process that allowed for potential improvement to the chances of success of the start-up. This will be divided into qualitative analysis and quantitative analysis.

Qualitative analysis

During the application of the model, the author had the chance to ask himself the questions in the model. While doing so, the author got an idea as to the different aspects (subject of the question) that are of concern under different internal as well as external factors (sub-categories). This gave the entrepreneur the chance to see if his own start-up is ready to answer this question in the first place. If it is, then to what degree of certainty the entrepreneur can be sure of his answer based on how well he has an overall knowledge of his start-up. That is why business planning is crucial; documenting them as well.

This gave the author the chance to realise how important it is to first properly document the ideas and operations and plans of his start-up business. Additionally, while the author was reading and answering the questions, it allowed the entrepreneur to learn

more about how each question (corresponding to an activity related to business) relates and belongs to a certain internal or external factor. Furthermore, the nature of the questions and their diversity allowed the entrepreneur a chance to further challenge themselves by think of similar questions that may be significant and relative to the authors start-up. The entrepreneur could then note down those thought to be checked against the plan of his start-up to make sure that during the research of his start-up, no detail was missed.

Quantitative analysis

The model outputted a quantitative result that the start-up has a 61.8 percent chance at survival. The quantitative analysis was mainly through the numbers. As the entrepreneur applied the model to his start-up, he had the opportunity to read a particular question and assign a numeric value between zero and a hundred. This allows the entrepreneur to not only look back at his start-up and make sure such an activity or factor in the subject of the question is present, but also forces the entrepreneur to give a quantitative result as to how well the start-up corelates positively with the question.

This shows how strong the factors within the start-up are based on the 'points' the entrepreneur gave that particular question. Just at this step here the entrepreneur simply asks himself a question and answers it himself, gives the author an idea of how the particular factor (subject of the question) should and could be improved; without any output from the model. Next, when the entrepreneur takes a look at the 'importance' value assigned to the questions by the author, the entrepreneur gets an immediate knowledge about how important that particular factor (subject of the question) is to the success of the start-up. Of course, the

significance is only comparative within the category and sub category but nevertheless, based on how strong the start-up is in that factor (subject of the question) and combining in with how important the author stresses the factors significance, the entrepreneur can instantly decide to improve that factor within his start-up. Subsequently at the next step of the model's application, the entrepreneur has to get the product of the entrepreneurs thought on the 'points' allocated to the question with the 'importance' assigned by the author. This 'value' now gives an instant understanding of how much that factor within the start-up is contributing to increasing the chances of success of the start-up.

After the entrepreneur is done with filling the first two tables of the model, the entrepreneur gets to the third and fourth tables of the model. These models give a quantitative analysis of the sub-catalogues of the internal and external factors that drive a business and its operations. At this stage, the entrepreneur has a chance to see a bigger picture performance of his start-up. The total accumulated points from the first two models are summed for the sub-categories in the third and fourth model. Thus, the accumulated points for each subcategory stand for how well the start-up is doing in that particular category and how much it contributes to the success of the start-up. This provides the entrepreneur a holistic view on which sub-categorical functions the start-up is doing well on and which functions need improvement.

The quantitative analysis also provides the opportunity for the entrepreneur to judge and prioritize based on the numbers which factors could be improved within the start-up for maximum effect (with least time and cost, maximizing value) on the success of the

start-up. Subsequently, similarly to the first two tables in the model, the accumulated points will then be multiplied with its respective 'importance' which has been previously assigned by the author. Its result is the depiction of how many percent that particular sub-category is helping the start-up build up success. This allows to see which sub-categorical function has the minimum and maximum effect on the success of the survivability.

Finally, the fifth table combines the internal and external factors and their total accumulated points. This combined with the 'importance' gives a final quantitative analysis on the predicted success rate of the start-up based on the factors taken into consideration during the design and construction of the model. However, it is important for the entrepreneur to understand that the model's purpose is not to tell the entrepreneur about the predictive survivability chance.

Rather, its true purpose is for the entrepreneur to understand how the current status of the start-up is resulting in a particular predicted state. This important question the entrepreneur must now ask himself is whether it would be easy to make improvements and bring up the predicted value to a reasonable level where the entrepreneur is willing to take his chances. The model provides the entrepreneur a conversion formula that takes the start-up's current position and/or planning and outputs how well it is expected to do. The entrepreneur always has the chance to improve and modify many factors within the start-up; hopefully resulting in a higher predicted survivability rate.

Change in strategies to improve the chance of Smart Parking success

External strategy changes

- Focus on the mentorship aspect of running a start-up. Find a mentor, preferably one in the same field as the start-up and has enough time to allocate to the start-up. Follow the mentor's advice often.
- The economic status of the local region isn't too supportive of starting the business, perhaps explore ways in which the start-up can be adjusted to allow the start-up to thrive in the economy.
- Try spending more money in competitor research. Also widened the variety of techniques used in conducting the competitor analysis.

Internal strategy changes

- Start-up leadership needs to be significantly increased. There have been too many cases of start-up failure due to poor leadership as studied in previous sections. Invest some money in experienced hires that will help in leadership. Also allow the leadership to actively contribute to the start-ups vision, mission and strategies.
- The predicted success rate of Smart Parking can be significantly improved by simply having the entrepreneur habituated to documenting all ideas, plans, strategies etc of Smart Parking. The entrepreneur must have to become acclimated to planning for unfortunate situations where the company must be shut down or the organization needs to attempt a pivot to survive.
- The entrepreneur also needs to find better support systems. This is simply achievable by finding richer friends and/or contacts and yet not allowing their voice and concerns to drive the business.

Maximizing the value of strategy change

It is recommended that Smart Parking's entrepreneur focus his efforts more towards internal factors compared to external factors. This conclusion is a result of two key observations. Firstly, the cumulative value of the internal sub-category is much lower than that of the external sub-category. Secondly, the internal sub-category's influence is worth three times more than that of the external sub-category; 25 percent compared to 75 percent. This means the entrepreneur has to work three times as hard on external factors to bring about the same effect to the predictive survival rate of the start-up when compared to working one time on any internal factor.

Assumptions, disclaimers, restrictions and limitations to this study

The customer and end-consumer of the start-up are different and clearly differentiated in certain sections of this study. In other sections, the words consumer, customer and end-user are used interchangeably.

Based on the authors research of the characteristics of a typical start-up, the following assumptions have been made in the study regarding start-ups and their characteristics:

Usually found by a single person or a group of people with not more the three to face people.

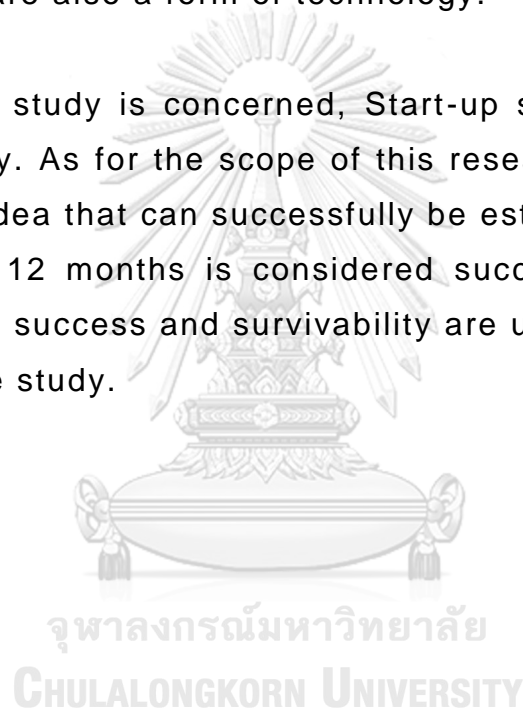
Start-ups are usually established using a loan. The loan can be from a bank or friends or relatives.

The entrepreneur or entrepreneurs may invest a little bit of their own money into the business but is usually significantly lesser when compared to other sources of funding.

When talking about start-ups, most of the times the study would be referring to technological start-ups.

Technological start-ups are assumed to be one that uses technology as its core competency to provide products or services that are also a form of technology.

As far as this study is concerned, Start-up success is the same as survivability. As for the scope of this research, a Start-up with a successful idea that can successfully be established and run for the first 8 to 12 months is considered successful. Thereby the words start-up success and survivability are used interchangeably throughout the study.



Chapter 5 Conclusion

Summary

The objective of this thesis was to propose a new predictive survivability model for technological start-ups. The aim was not to draft a model with high accuracy but to build one that gives the applicator a qualitative as well as quantitative analysis of the chosen start-up.

The thesis can be divided into two major parts. Creation of a new predictive survivability model. It's application on the author's 'idea' of a start-up. For the creation of a new predictive survivability model, literature review of other existing survivability model had to be done. Furthermore, the author had to do research as to why start-ups fail or succeed. The reason being to identify the the internal and external factors that have significant influence over the performance of start-ups. These identified factors were then studied. Based on certain analytically decision making models being informatively backed by the research information, the author was able to conclude the significant factors affecting start-up success rates and their degree of influence on start-up behavior. For the second part of the thesis, before applying the author's 'idea' of a start-up to the newly drafted model, the author must first analysis the internal and external factors of his start-up. Only then can the entrepreneur act as an informed applicator of the model.

The thesis covers research of existing predictive models and factors of start-up success and failure. This was used to build a new predictive survivability model that can be used on technological start-ups. The thesis studied the internal and

external factors of the author's 'idea' of a start-up and used its findings on the new model. The author was able to reach a conclusive quantitative result of his 'idea' being 61.8 percent successful. While the author learnt that ninety percent of start-ups fail, a 61.8 percent chance of success for his own start-up was not too bad.

Moreover, the most important value provided by the application of the model was the qualitative analysis. The entrepreneur (author) was able to gain a deeper insight into how different factors within his start-up relate to one other and how important each and every factor is. This allowed the entrepreneur to identify which are the low performing factors within the start-up and the high performing ones. The factors were also assigned respective importance levels. Using this the entrepreneur is able to decide which of the factors within the start-up should be changed to have the greatest value to the success of the start-up. Finally, the author discussed the results of the model being applied to his start-ups and his qualitative and quantitative insights to come up with new strategies or modify existing strategies that would help the start-up achieve a higher probability of success in the future. The take away from the application model for the entrepreneur was the changes (or lack thereof) that needed to be done to the current business plan of his start-up for the betterment of the start-up.

The author hopes his proposed model of predictive survivability of start-ups will help other potential entrepreneurs analyse their start-ups and get a better understanding as to the current position of their start-up and more importantly on how to improve the position.

Future work

The author believes there is a lot of potential gaps for improvement within this study. The deliverable of the thesis, which is the predictive model can be exponentially improved by increasing the scope of research when it comes to existing predictive survivability models and also on factors and parameters that cause a start-up to succeed or fail. Through further extensive literature review, the accuracy and precision of the model can be significantly enhanced.

Additionally, the model's specificity can also be exponentially increased by being more detailed and specific about the questions within the model. The future work done on this needs to decide between the accuracy and precision of the model against its convince and simplicity of use.

An example of having a more complex model than the one proposed in this study to introduce a new point combo system where when two different question from any category or sub category have a certain rating that combines and multiplies to end with a 'bonus' value that could either help in the failure or success of the start-up. For example, if the question of having mentorship and the question of entrepreneur characteristic to be open minded both score relatively high in 'points given' then there could be an additional 'bonus' that would contribute to the quantitative end result of the model.

Furthermore, a more refined multistage predictive questionnaire model based on this study could be created that would address the different factors and their unique level of significance in the different stages of the start-up life cycle.

The accuracy of this model could be tested by applying it to many more technological start-up cases like Smart Parking. Additionally, the model could also be tested on non-technology-based start-ups to see if its applicable. It would be interesting to study the defences in accuracy of the model for the two distinct cases.



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Appendix A

Additional information and supporting evidence for Smart Parking phase 1

Smart Parking phase 1 experimentation and proof of concept

The experiment

We conducted an experiment as a proof of concept of Smart Parking. The following is just information that was required for carrying out the experiment. The experiment was done in a small section of a real parking lot.

Choosing the Microcontroller

The first question that arose was which microcontroller should be used for such a project. After considerable research, we arrived with 3 candidates: The Microchip PIC16LF1938, the Freescale MC9S08QB8, and the Atmel ATMEGA328P. Given below are the specification of each microcontroller.

Table 20 Comparing technical information about microcontrollers

Options Factors	Microchip PIC16LF1938	Freescale MC9S08QB8	Atmel ATMEGA328P
Cost (THB)	55	47	58
Pin Count(I/O)	25	24	24
Frequency (MHz)	32	20	12
Frequency (MIPS)	8	20	12
Flash (Kb)	28	8	8

EEPROM (bytes)	256	N/A	64
Ram (bytes)	1024	512	512
ADC Channels	11 10-bit	8 12-bit	6 10-bit
Timers	5	3	2
PWM	Yes	Yes	Yes
Communication	SPI/IC	SPI	SPI/IC
Supply Voltage	1.8-3.6	1.8-3.6	1.8-5.5
Standby Current (nA)	60	250	100
Operating Current (μ A)	150	750	243

For our current position, Atmel ATMEGA328P provided significant advantages over the other 2 microcontrollers. First, although it is the most expensive microcontroller, it turns out to provide the most efficient solution at this point. This is because the Atmel ATMEGA328P is widely available and significantly easier to purchase over the other 2. The other 2 microcontrollers have to be imported in bulk (5,000 pieces and above) while the Atmel can be purchased either in bulk, or in individual pieces. Choosing the Atmel allowed us to begin working on our first prototype, reduce investment costs, and turn our so-forth dream into a reality.

Sensors

The next step was to choose how we would want the sensors to detect parked cars. Generally, in high-end parking lots in

Bangkok, an infrared device is placed on top of the car. This infrared device sends out a signal which is then received by a detector. If a car is parked in the parking spot, the car interrupts this signal and a parked car is detected. Our system, however, will be different. Instead of support devices above the car, which only work in indoor parking lots, we will support devices both above and below the car. This will allow the system to be supported by both indoor and outdoor parking lots.

Components required at the entrance and exits of Smart Parking solutions

Table 21 Required components to be used at the entrance and exits of the parking structure

Main component	Quantity needed
Control center	1
-ticket printer	1
-workstation computer	1
Monitoring camera	2
Indicating light	2
Automatic barrier	2
Photoelectric beam sensor	2
Electronic cashier	1

Photoelectric beam sensor is used to restrict the barrier to close when there is a car in the range of barrier. The barrier will close automatically when the car passes the range of barrier.

The automatic barrier will open automatically when the ticket is printed.

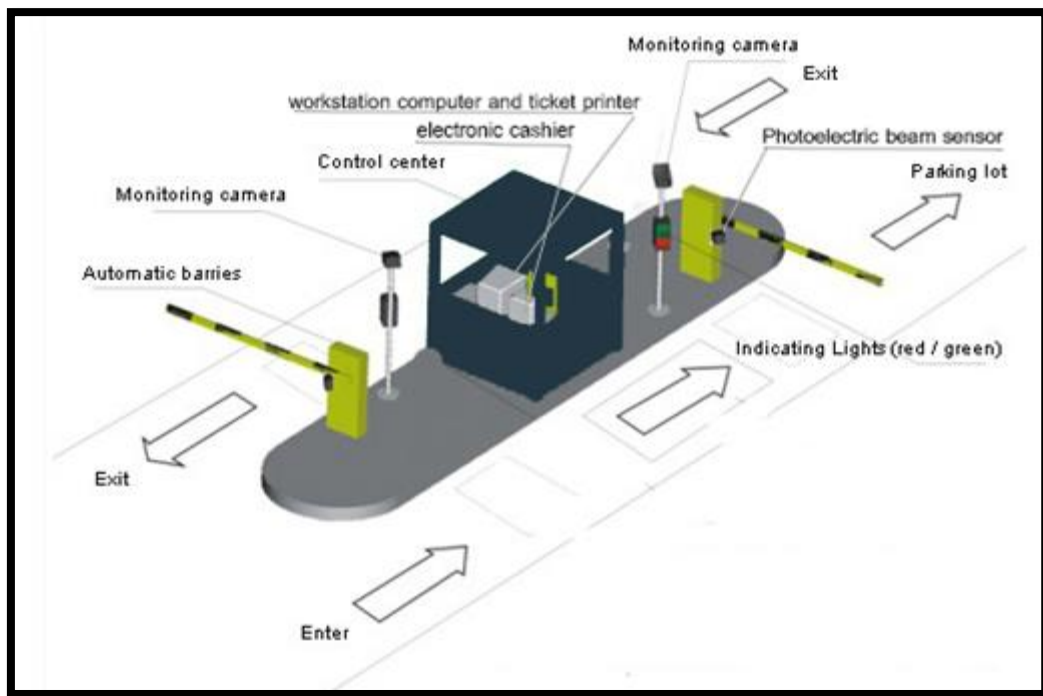


Figure 27A Visual Representation of The Entrance and Exit Security Mechanism for Smart Parking



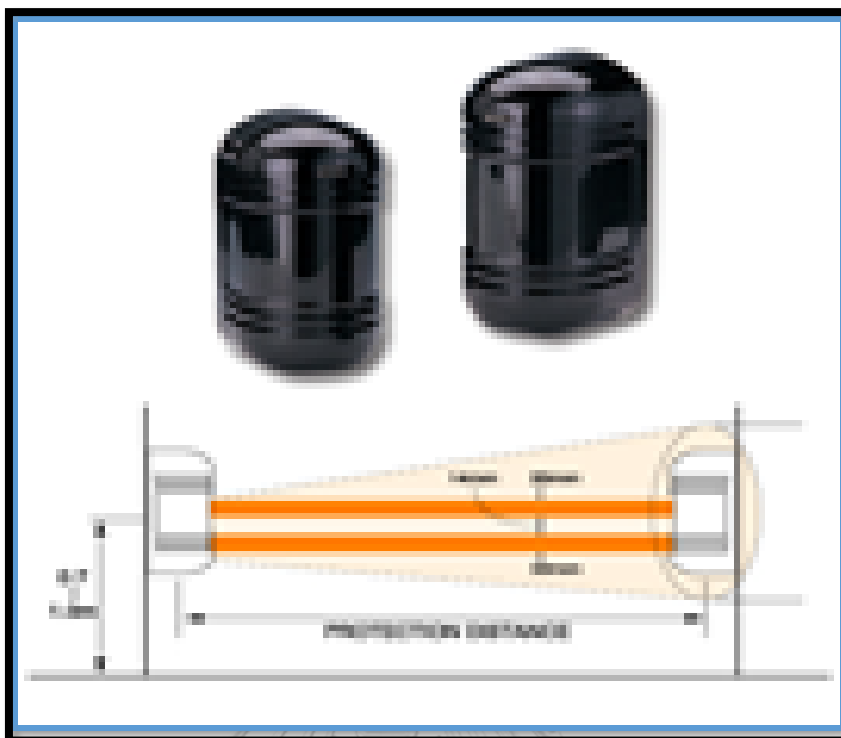


Figure 28 Photoelectric Beam





Figure 29 Receipt Printer





Figure 30IP Camera





Figure 31 Light Indicators





Figure 32 Cash register





Figure 33 Automated Barrier

Table 22 Required components for each floor of the parking structure

Main Component
Direction Sign
Direction Display Screen
Ultrasonic sensor
Ultrasonic Detector controller (programmable logic controller + Arduino)
- contain wireless adapter
- connected to and co-operate with the main computer server via Wireless LAN
- translate the result of the Ultrasonic sensor to the logic and provide them to the server
- support 60 ultrasonic sensor devices per 1 Ultrasonic detector

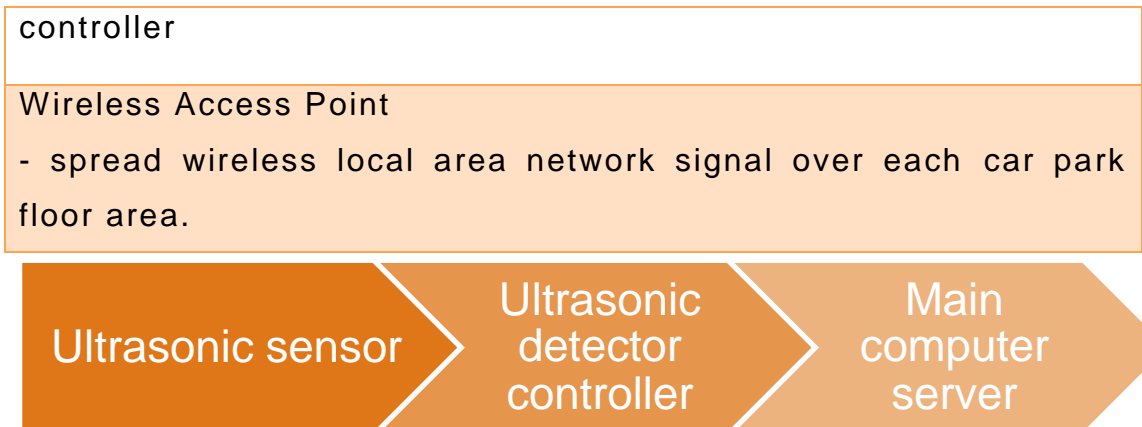


Figure 34 Information Flow of Data

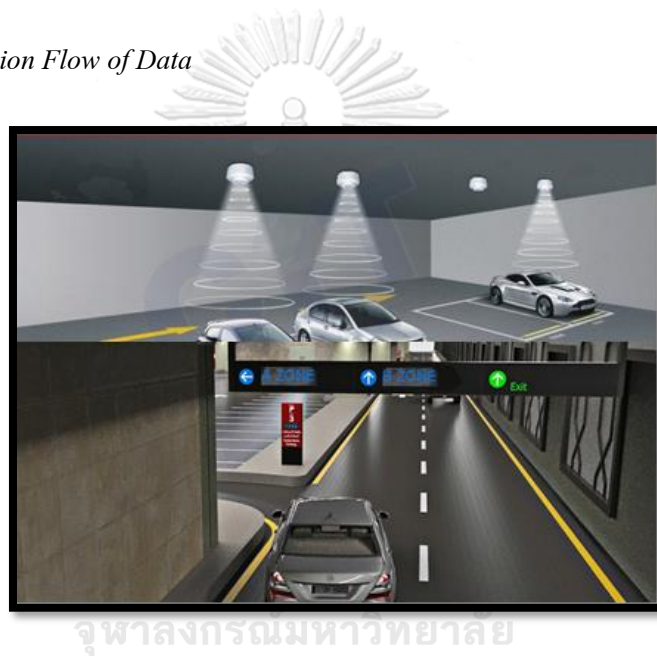


Figure 35 Visual Depiction of Technological Components to Be Installed in Smart Parking's Parking Lot

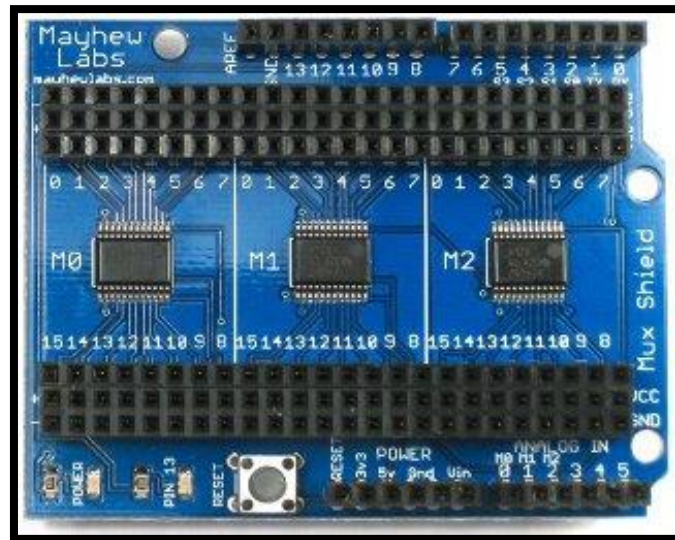


Figure 36A Microcontroller (Mini Computer)

Table 23 Required components per solution of Smart Parking

Main Components

Main computer server

- be the 'Location Data Processing Center' and 'Data Collection Terminal'.
- Inspect and collect the status of sensors and control the display screen.
- collect all data of status in car park, compute and manage the data and connect with client (workstation computers at exit and entrance gates).

Main types of server

- Database server
- used to run the system that is the database DBMS (database management system).
- SQL, Informix.
- Application server.
- Used to run the application software by co- operating with the client (workstation computers).

<p><u>Router</u></p> <p>- connect the wireless LAN network in each floor together.</p>
<p><u>ADSL modem</u></p> <p>- used to connect to the internet system.</p>
<p><u>Firewall hardware device</u></p> <p>- prevent the unexpected intrusion from the internet system.</p>
<p><u>HUB or Switch</u></p> <p>–extra port connects the main computer server with the clients.</p>

Main components of the Smart Parking solutions



		
ADSL modem	Firewall hardware device	HUB
		
Router	Main computer server	Gate computer

Table 24 Typical Networking Devices Required for Smart Parking’s IT Infrastructure Support

High level design of technology workings

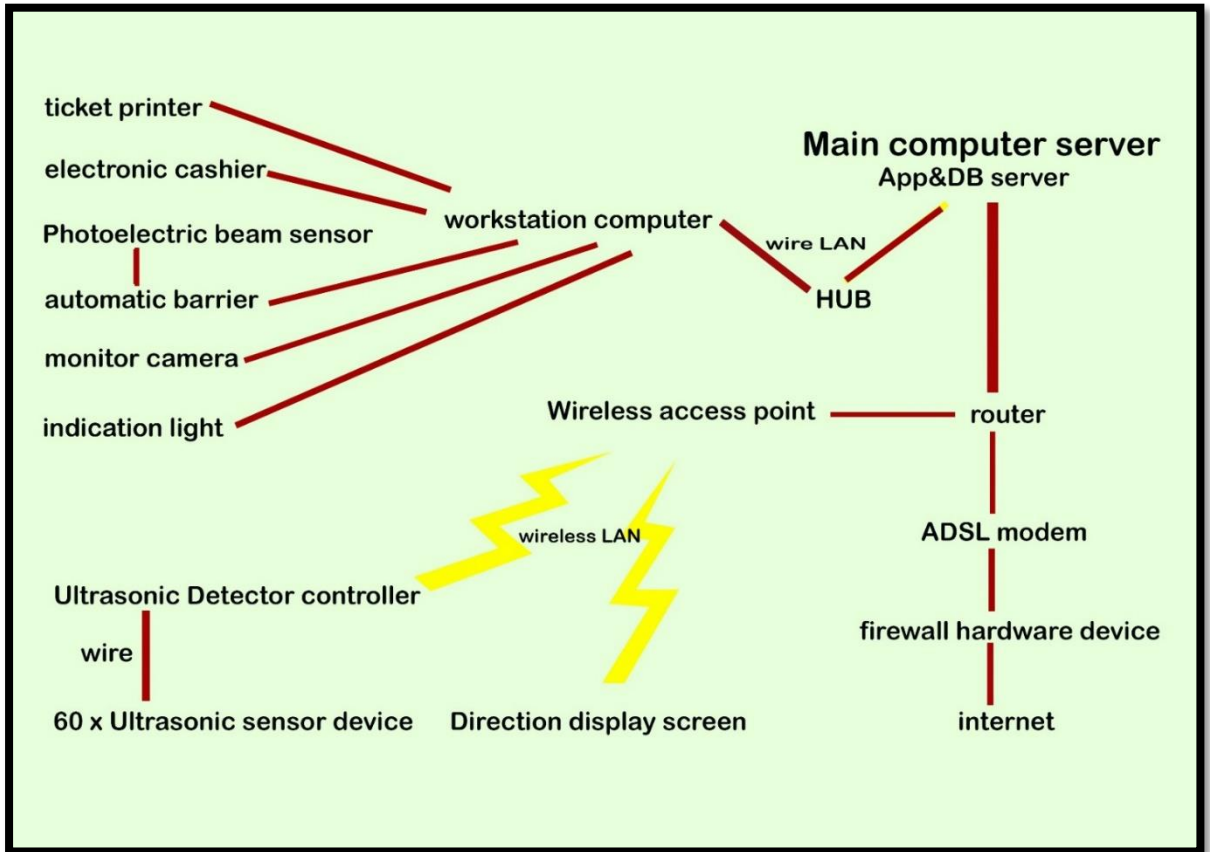


Table 25 Visual Representation of the Interoperability of Different Components and Data Flow

Proprietary algorithm logic

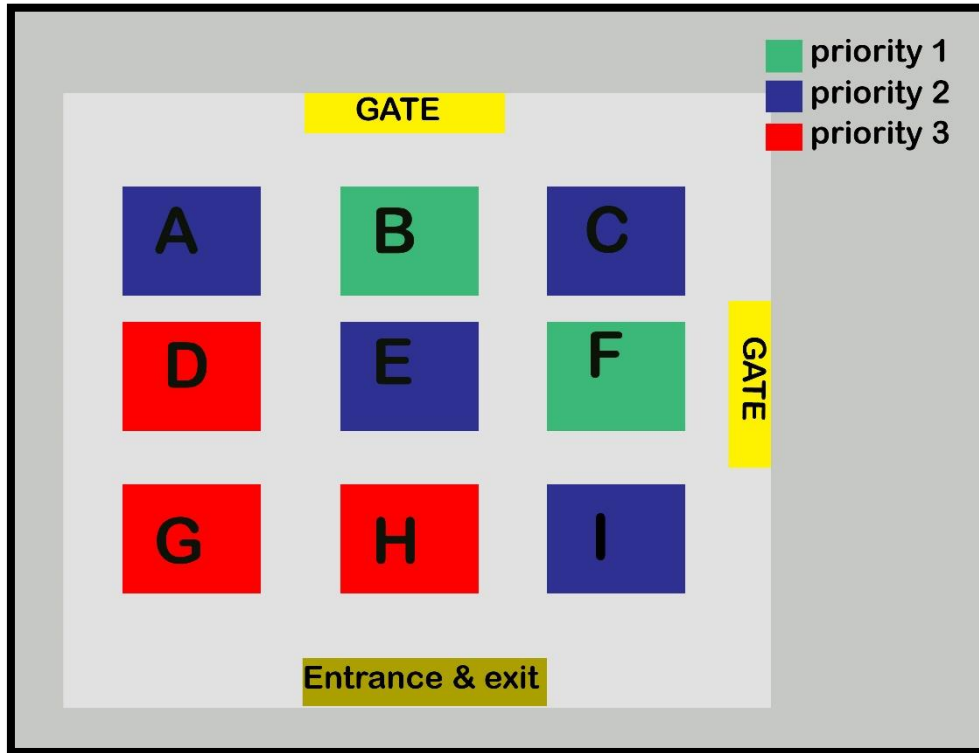


Figure 37 Sample Visual Representation of a Typical Parking Floor

Table 26 Preference of parking space within the same floor

Priority	Sequence of selecting
Priority1	B – F – B – F – B – F - ...
Priority2	C-E-I-A-C-E-I-A-C-E-I-A-...
Priority3	D-H-G-D-H-G-D-H-G-...

Table 27 Preference of parking space amongst multiple floors

Floor Priority	Floor		
	1	2	3
1	1	2*	3*
2	2	4	6*
3	3	6	9

Table 28 Floor selection sequence to be implemented into Smart Parking proprietary algorithm

Sequence of selecting
1 – 2 – 2* - 3 – 3* - 4 – 6 – 6* - 9

Experiment findings and result

From our tests, we have found out that an allocated parking system reduces the time spent while parking. Our prototypes have provided acceptable levels of accuracy which proves that our concept would work. We have also conducted numerous surveys on customers and clients and our feedback have mostly been positive that they are willing to accept a new system which would improve their parking experience while reducing costs.

Photographic and pictorial information and evidence

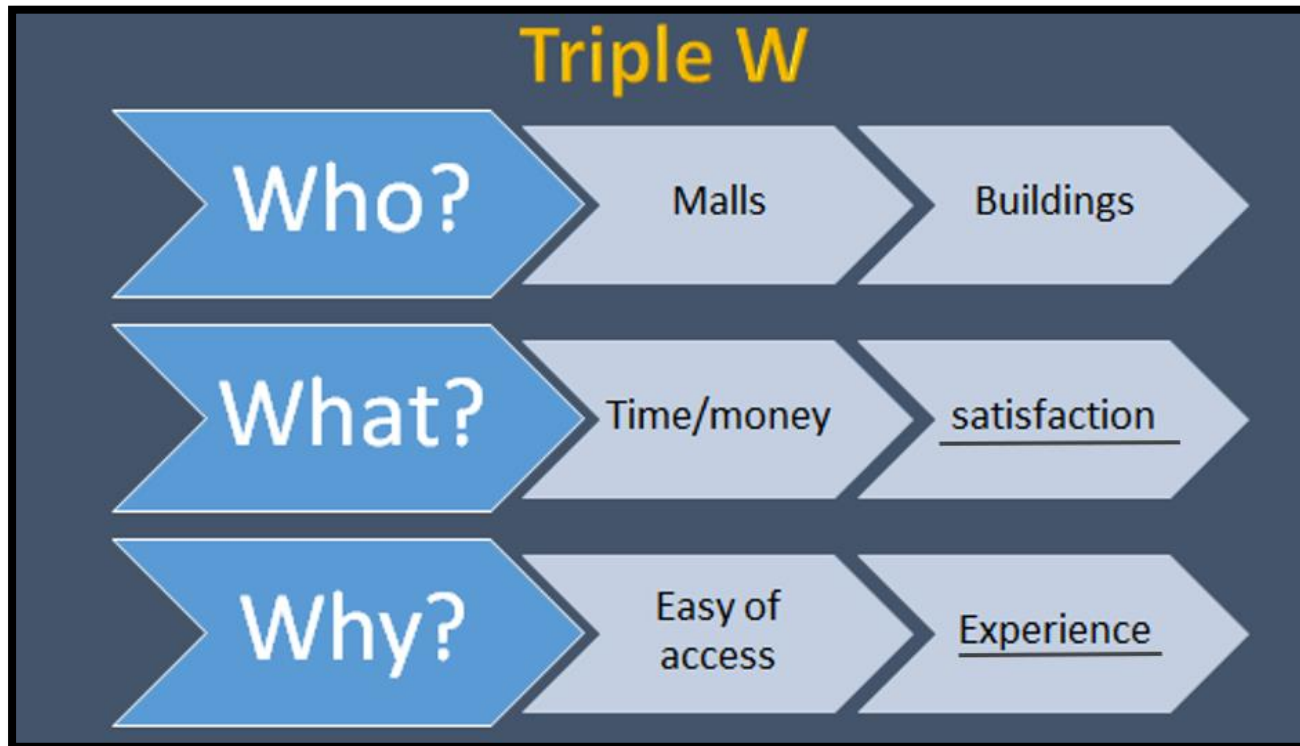
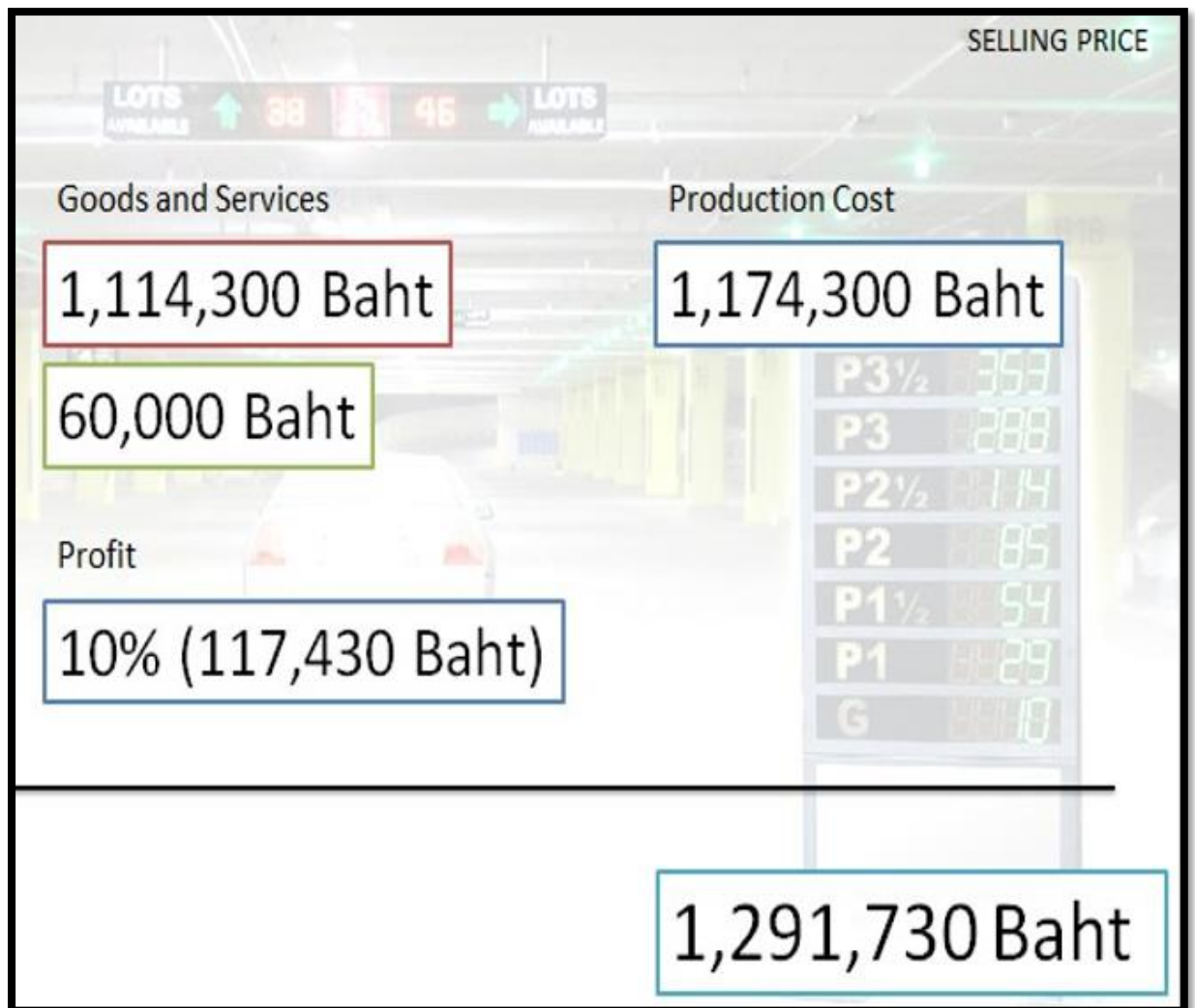


Figure 38 Triple W analysis of Smart Parking phase I



Parking Area		DIRECT MATERIAL COST	
Component B			
- Wire/Wireless item	40	Baht/sqm.	
- Camera Devices	240	Baht/Unit (for 3 unit)	
	280	Baht/3 Car Parking Space	
Surrounding Area			
Component C			
- Guide Post	300	Baht/Unit (1 for 30 cars)	
- PLC(Raspberry Pi) + MUX(HUB I/O Ports)	80	Baht/Unit (1 for 30 cars)	
- Server Computer + Modem + HUB	16,000	Baht	
- Wire	40	Baht/10m. (1 car)	
	300	Baht/75m .(30 cars)	
	1,050	Baht/30 Cars Area	
	16,000	Baht	

Figure 39 Material cost estimation example for Smart Parking phase 1



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Figure 40 Pricing and costing analysis for Smart Parking phase 1

Additional information and supporting evidence for Smart Parking phase 2

Value proposition

An intelligent Parking system that allows motorists to quickly park their vehicle by having the parking system assign a designated parking spot for the motorist.

Obstacles and resistance to innovation implementation during Smart Parking phase 2

External factors

Customer and user research were an obstacle in terms of being able to push our idea. Since “Smart Parking” was a system with many modular components to it, explaining how and what “Smart Parking” does took time and patience none of which neither the “users” nor “customers” had.

Building the MVP was one of the biggest challenges. With the limited financial budget, an MVP had to have all the functionalities but at the same time reflect across all parts of the MVP triangle.

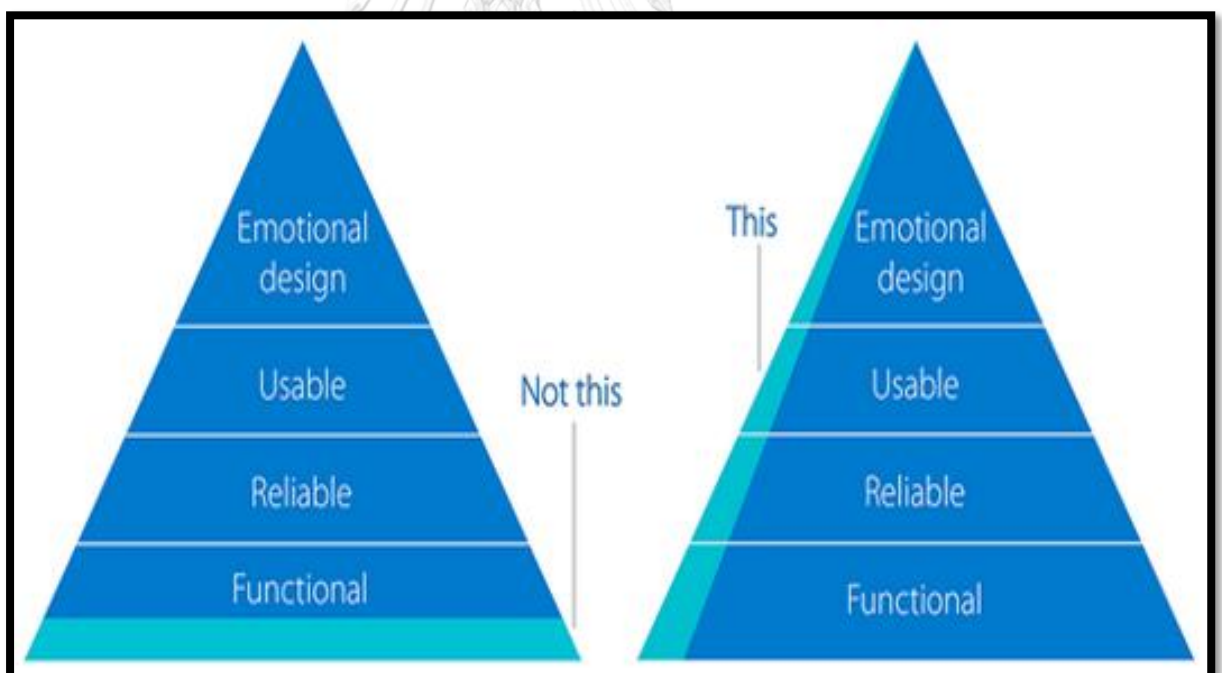


Figure 41 Innovation MVP Triangle (Singh, 2017)

This was hard to decide upon since the MVPs intended use was not by the “users” or the “customers”. So, the question we faced

was should we stick to the principle of the innovation triangle or fit in as many functionalities as possible with the given budget.

Internal factors

The technology required to develop the intelligent system was divided into three categories software, hardware and networking. A lot of discussion took place on the right software to use, should we build our own libraries or use existing libraries and open source materials. Even the programming language was a barrier to certain functionalities required. Python was the new and upcoming programming language of that time and hence did not have many open source materials. Java on the other hand was much more complex but already had many pre-defined libraries that made our job easier. We had to change from java to python after the second prototype. The limited financial budget also put a constraint on the computer network infrastructure that could have been setup. The Hi-Tech solutions of “Smart Parking” was Wi-Fi dependent, which required powerful outdoor Wireless Access points and repeaters. The network had to make sure that the Raspberry Pi was able to communicate to “Smart Parking” central server. This meant having to get permission to install our prototypes in parking lots. This took a long time because having a camera sensor on the MVP raised privacy issues. The hardware of the raspberry Pi had to be re-designed each time with continuously changing requirements and outdoor conditions (rainy, sunny and humid weather).

The internal and external factors faced during the innovation journey allowed us to comprehend the fact that just designing a new product and launching it is not innovation, rather it is the loop of processes with extended improvement based on changing conditions. We later learnt that innovation includes not only the

product but also realizing the right customer segment and providing for its value proposition. Innovation is not an action, but a process of the combination of several interdependent activities that associate to one another in some way (Trott, 2015).

Critical stakeholder support to implement the innovation

“Smart Parking” had a lot of support backed up by professors in Chulalongkorn University. The innovation allowed us to approach professors in the IT department to help us with the development process. Professors in the design thinking and innovation department helped us correctly identify gaps in the innovation journey and the methodologies to follow to ensure a higher rate of success. Professors in the business department helped us to commercialize our idea. It is not that there are not many creative ideas; there must be a way to commercialize the creative idea to conclude it as innovation (Schaufeld, 2015).

Our alumni from Chulalongkorn University included our project in the universities innovation hub and financing it. They had connections to owners of many shopping malls across Bangkok. “Smart Parking” team should have used such connections to sell our solution as a prototyping phase in a small part/floor of the shopping malls. This would have helped us raise more capital through sales to improve upon our product and further the process of innovation. The opportunity to test it in a real parking lot with active users would have also helped get real feedback and data to put into the design-feedback loop to better the innovation.

The suitability of the organizational process and framework used

“Smart Parking” was an incremental and sustaining innovation. “Smart Parking” was not a re-invention of the wheel but was an improvement of a system that already exists. Innovation is not necessarily new ideas; it can as simple as looking at something and figuring out how to make it better (McKeown, 2014). Before coming up with the idea of “Smart Parking” and what its functions are, the team went out to many parking lots for many different shopping malls and office building. Through this, we learnt about the flow of process from the time a car entered a parking lot to the time it was parked. This allowed us to reflect upon not only the users “pain points” but also realize opportunities for gains. Di Biase (2015) states that customers voice is of the utmost importance when developing a product for them. He continues to argue that the procedure of listening to customer is very industry dependent, sometimes its questionnaires other times it is focus groups. “Smart Parking” team did a simple survey by interviewing customers at the entrance of the mall. The survey was mainly about the users experience and how they liked the idea of “Smart Parking” helping them save time and fuel. It was important to know that “Smart Parking’ was something that customers wanted. Even if a project is finished on time, on budget, with attractive designs and exceptional quality, if nobody wants it then it is a failure (Ries, 2011). Perhaps the fact that the team was trying to sell the idea of “Smart Parking” being right and not listening to what the customer had to say was wrong with the idea could have led to the market not accepting the product. According to Plattner, Meinel and Leifer (2010) the design thinking process that helps design products for innovation include 4 distinct stages (Need finding, brainstorming, prototyping and testing). “Smart Parking” was put through these four stages; this is why customer

research came before development and launch. Maybe for such a project with big scopes and many parts, the ten rules for strategic innovators by Ulwick (2005) would prove useful as it showed more detailed steps in getting from idea to execution.

The method used for the process above was lean. Design thinking process, just like lean methodology has similar distinctive stages. The lean innovation process involves defining a value and growth hypothesis, developing an MVP, getting feedback on the MVP and learning from the feedback (Ries, 2012). “Smart Parking” was put through the Rapid feedback loop of the lean innovation. Many prototypes/MVPs were deployed (raspberry pi with sensors) in many different parking lots. Measurements of performance metrics on technology taken periodically allowed learning and helped to further improve the tech to meet the required performance for live deployment. The prototype of “Smart Parking” also followed the rules of MVP having not only functionality but also bits of emotional design, usability and reliability. The very first MVP could only detect the presence of a car, other functions, as license/car colour detection was not present.

Photographic and pictorial information and evidence



Figure 42 Smart Parking Logo

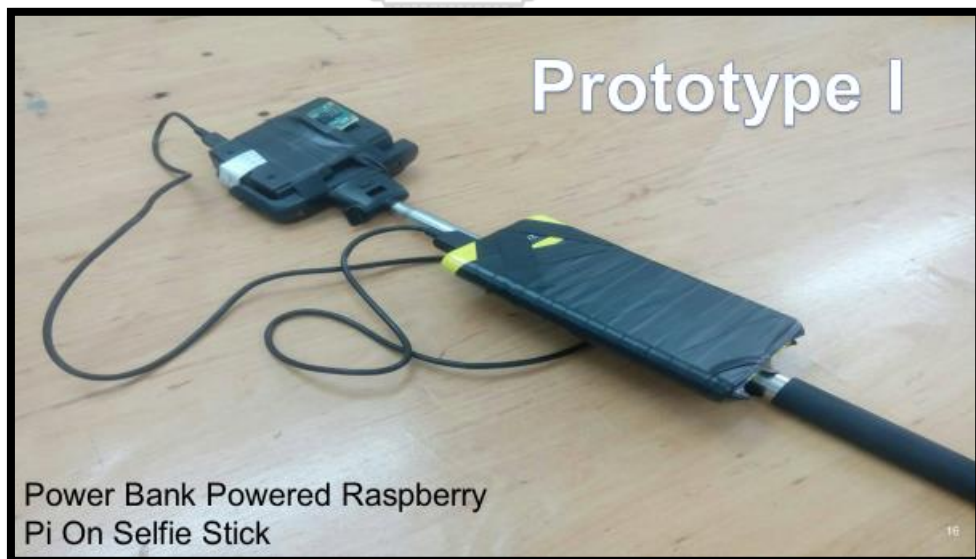


Figure 43 Prototype 1 of Smart Parking phase 2

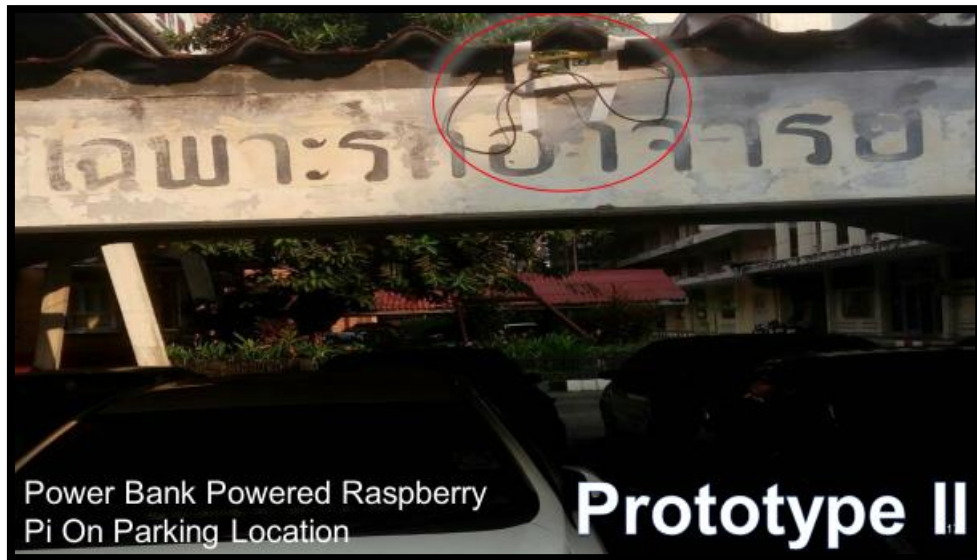


Figure 44 Prototype 2 of Smart Parking phase 2

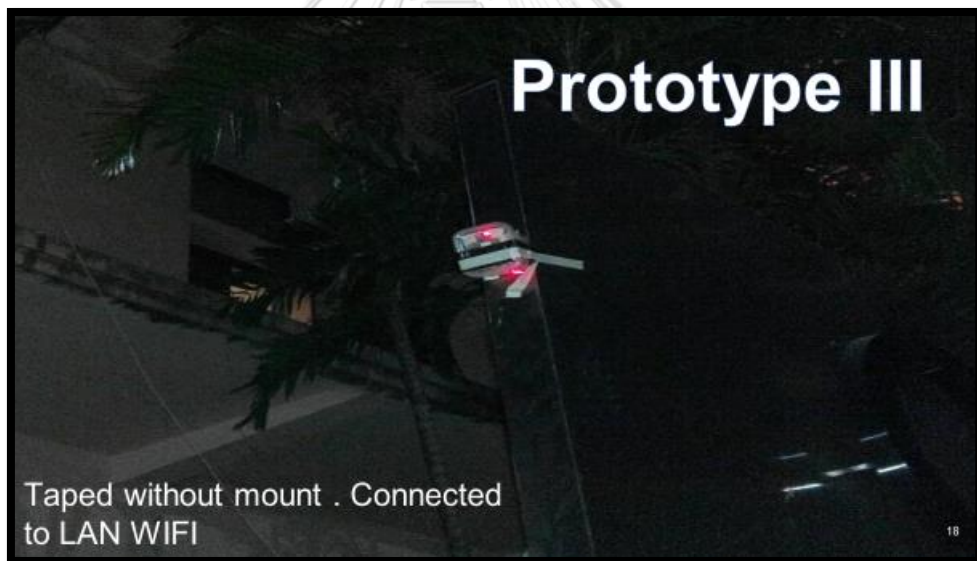


Figure 45 Prototype 3 of Smart Parking phase 2

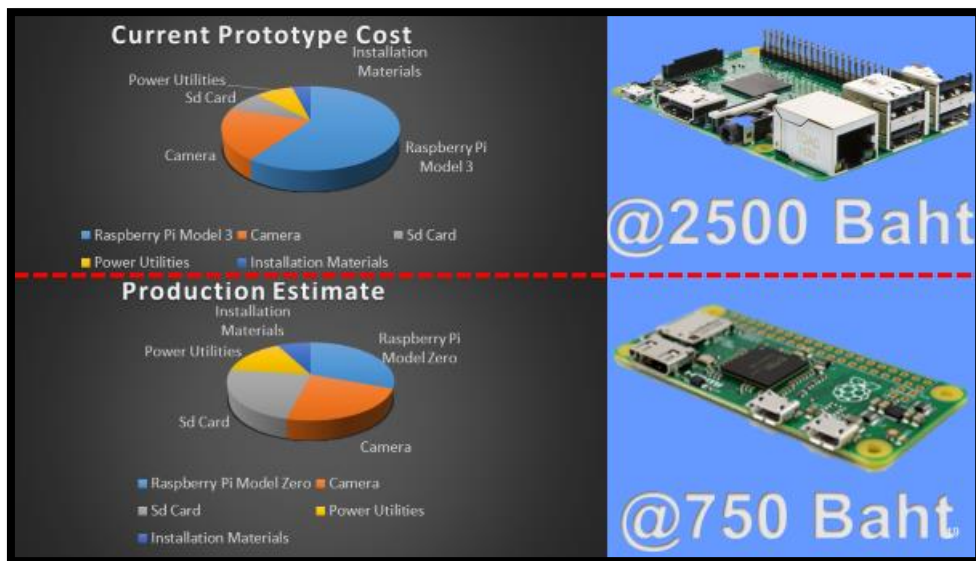


Figure 46 Cost calculation of sensor technology of Smart Parking phase 2

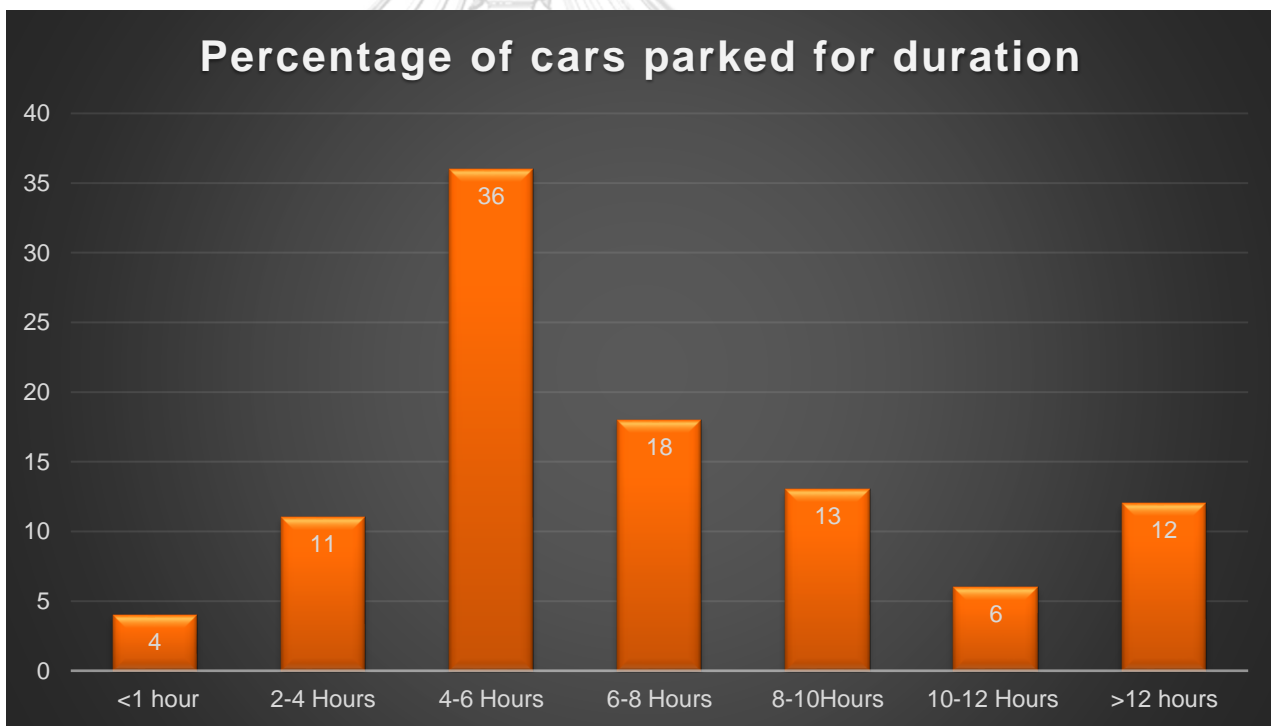


Figure 47 Example 1 of information gathered by Smart Parking solution phase 2

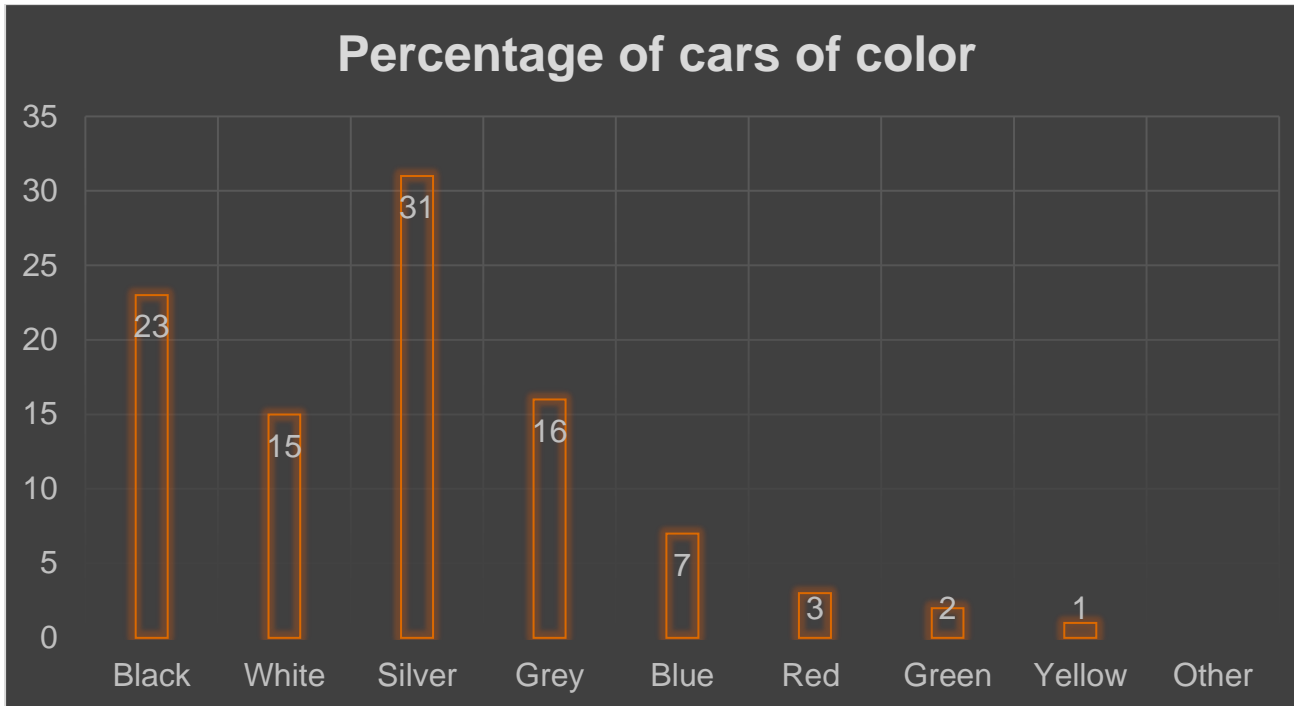


Figure 48 Example 2 of information gathered by Smart Parking solution phase 2

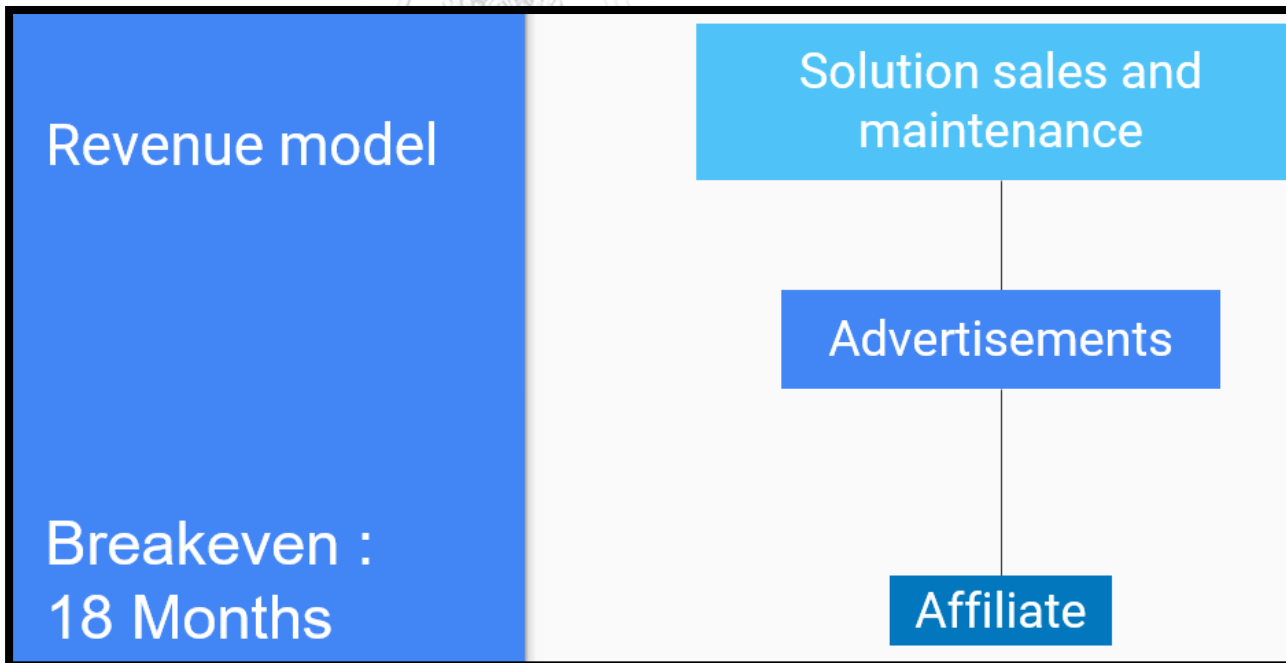


Figure 49 Smart Parking initial revenue model phase 2

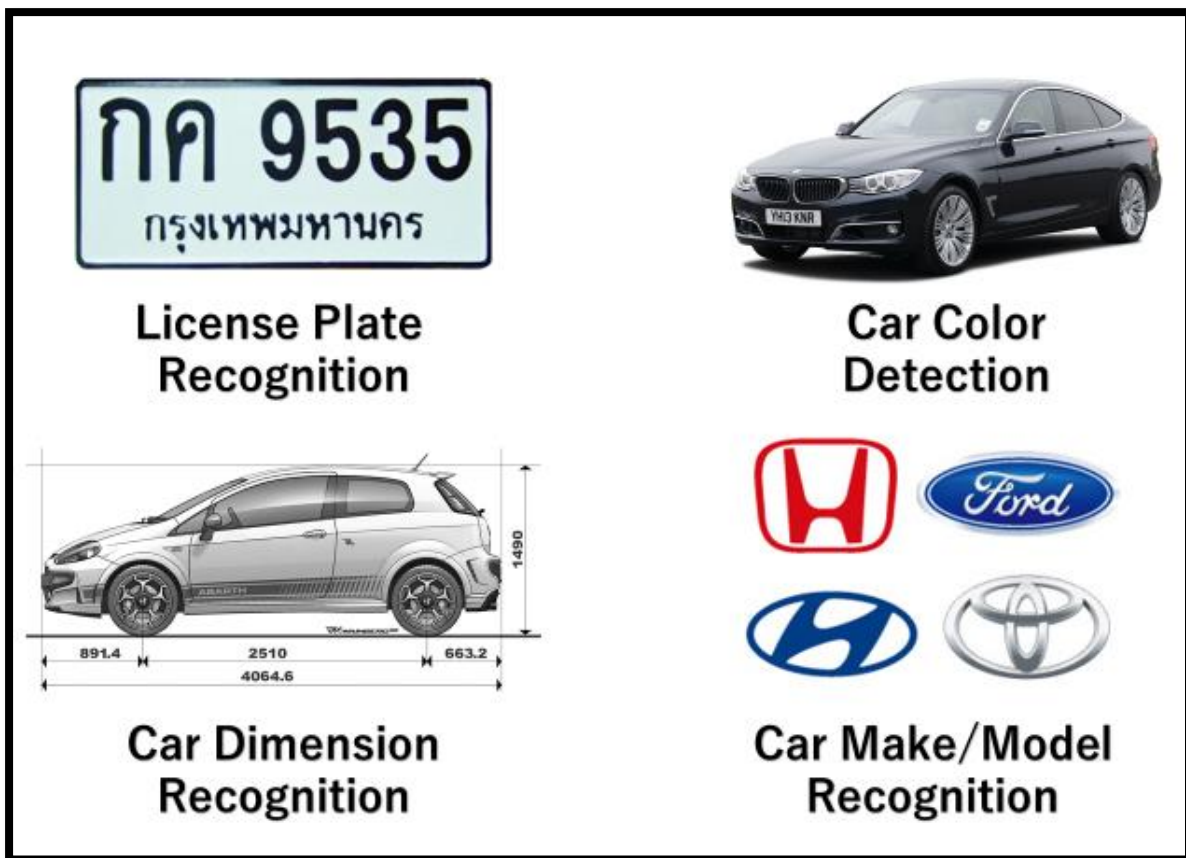


Figure 50 Technological capability of Smart Parking solutions phase 2





Figure 51 Example of primary methodology used in customer survey for Smart Parking phase 2

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

บัตรจอดรถยนต์			No 0330012		
			วันที่ 12/12/2555 เวลา 13.34 น.		
A20			ที่ประทับตรา		
ระเบียบการใช้ที่จอดรถ					
1. อนุญาตให้จอดรถ เวลา 10.00 - 23.30 น. เกินเวลาปรับ 1000 บาท พร้อมค่าจอดรถตามจริง					
2. จอดรถได้ในชั้น/ช่องจอดที่อนุญาตเท่านั้น ฝ่าฝืนปรับ 300 บาท					
3. บัตรชำระเสียหายปรับ 200 บาท พร้อมค่าจอดตามจริง					
4. อัตราค่าจอด - ฟรี 2 ช.ม. แรก / มีตราประทับจอดฟรี 3 ช.ม. แรก ช.ม. ต่อไปค่าจอด ช.ม. ละ 30 บาท					
			- เศษของ ช.ม. คิดเป็น 1 ช.ม.		
5. ให้ใช้สถานที่จอดรถเท่านั้น ไม่รับผิดชอบในความเสียหายและสูญหายของทรัพย์สินในรถทุกกรณี					
6. สงวนสิทธิ์การเปลี่ยนแปลงเงื่อนไขการจอดรถโดยไม่ต้องแจ้งล่วงหน้า					
หน่วยจัดการอาคาร โทร. 02 666 5555					

Figure 52 Sample ticket issued to customer at the parking entrance of Smart Parking solution phase 2

REFERENCES



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