The BlackBox Foundation

- **Alessio Bettarello <bettaz.developer@gmail.com>**
- **Yasaman Pazhoolideh <yasaman1997.yp@gmail.com>**
- **Taylor Evan Lucero <telucero@gmail.com >**
- **Zeyneb M'Hamedi <devazey@gmail.com >**

Business Development Lab

Bee-box report

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BLACKBOX FONDATION

CAR MAINTENANCE MADE EASY

Introduction

Bee-box is a device meant to increase road safety and preserve car components from unexpected failures, it is a BlackBox that not only monitors your vehicle's health state but also predicts future failures to avoid dangerous situations while driving. Through Bee-box, you can schedule regular maintenance and predict the emergency interventions that your car or fleet would probably need. Preventive action may reduce the impact of a failure that can damage other components and undermine road safety. This box, coupled with fleet management software Bee-man, is the perfect solution for companies possessing vehicle fleets.

Problem identification

During the last two centuries, thanks to technology and globalisation, the automotive market became enormous and involves multiple players of two main kinds: On one hand, we can see customers, usually owners, that are using mostly cars to reach their workplace, to complete everyday family-related tasks, and to move around during their free time; On the other, we find professionals using cars and vans as an asset for their daily work time, companies that own multiple cars and trucks for commercial purposes or to mobilise products and workforce (usually with a homogeneous fleet), and, last but not least, logistic companies that have vans and trucks as the main asset to keep their business moving.

All the elements from these two categories are systematically having expectations of a vehicle that is likely subject to unexpected failures and faults. In fact, based on their economical means and business or domestic exigencies, they decide to buy, rent, or lease a specific vehicle model from a specific company. One of the parameters that guide the choice (at least for the business side) is the maintenance schedule and cost: a reliable, cheap vehicle is every business owner's dream. Private owners instead are less strict with this preference because they often look more at their wallets and the design of the cars. Nevertheless, they have a common will of trust in their vehicles. This reliability is insured, under certain aspects, from brand reputation, and from the scheduled maintenance. This last is suggested by the manufacturer to minimise

failures. Through simulations and gathering data during tests, they evaluated when to plan, in terms of mileage, the servicing.

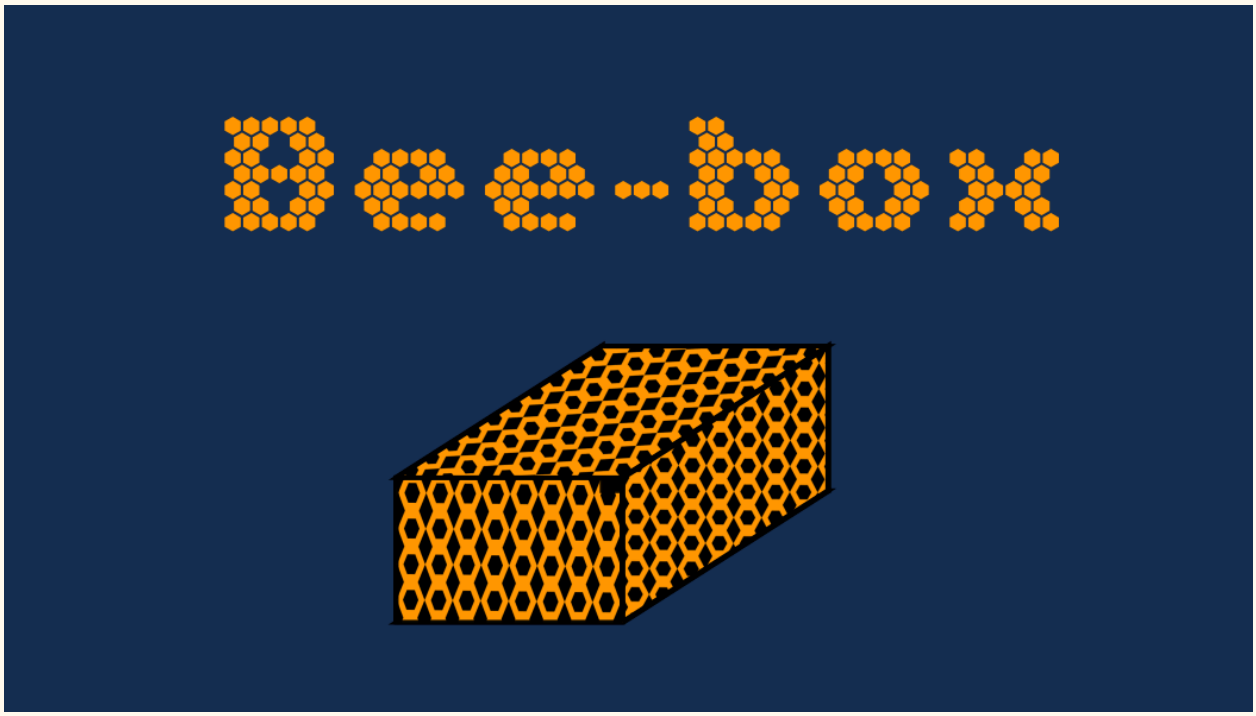
Those parameters are not certitude of safety; instead, they are subject to variation. Simply put, we can identify two main kinds of influence that can undermine that schedule: passive stimuli (asphalt and driving environment conditions, weather, and road bumps) and active stimuli (such as driving style, load level, crashes, and usage). Most of the essential components are preserved if the owner follows the scheduled maintenance.

Unfortunately, vehicles are also composed of a group of secondary parts whose failure could threaten driving safety, expose users to risks, or at least delay their schedule, regardless of whether it is a holiday trip, a delivery, or a plumber's intervention. In all of those cases, damage of some kind will affect the user or the owner: For private users, it could cause problems in the form of car unavailability, ruining a holiday or making them late to work and causing huge, avoidable costs. For companies, this would not only call for avoidable costs and other damages that come with the unavailability of essential vehicles, but also could cause an accident; which would obligate these businesses to pay for the medical bills, insurance, or legal settlements.

Bee-box is a device that aims to reduce the incidence of those types of failure while monitoring vehicles' health: a smart EDR (Event Data Recorder) uses different sensors located throughout the vehicle to acquire a holistic measurement and view of the vehicle. Gathered data is processed from a Machine Learning server which will label behaviours and stresses that are leading to certain mechanical damages. Crossing that information with the technical specs of the car (such as model, volume, engine type, tires, etc), Bee-box will know the overall usage level of the vehicle, suggesting who is in charge of the maintenance to selectively check mechanical and electronic parts and eventually change them before failure. This can be done during scheduled maintenance through a software tool that is provided to garages, or after the reception of a notification from the online fleet management tool Bee-man that advises fleet managers about the possible component failures/ issues they might experience. Through Bee-man, the business customer can check not only the health status of their fleet but can also track and schedule the daily activities to optimise their company tasks. This tool can also be interfaced with all the major Open Source Process Mining

frameworks to perfectly integrate with the other management tools the businesses are using to monitor productivity. Where the prediction is not sufficient or in case of serious crashes, an automatic emergency procedure will keep in contact with the driver (where possible), the owner, and all the necessary emergency services from medical to a network of mechanical services.

The aim of Bee-box is to avoid road trip failures while decreasing the probability of accidents due to bad or partial maintenance that is actually causing health and economic damages, traffic disturbance or eventually disruptions, and, depending on the situation, even psychological problems caused by those events. Nevertheless, defining a new standard for vehicle diagnostic will speed up the intervention process and will raise the interest of the car manufacturers in developing newer interfaces and enhancing the already existing ones exploiting V2I (vehicle to infrastructure) communication not only for traffic purposes but eventually also for pre-alarming emergency intervention to face up every kind of needs that the road user may have. In a further stage, the project will also fit the private customer's needs making cars connected and monitorable in a more proficuous way more likely through collaboration with manufacturers.



Validation

The initial project was intended to provide a tool for domestic use to save money on emergency car repairs caused by sudden failures. The idea is that through a Kickstarter project we were able to gather as much data as we can to make our machine learning servers perform better with the promise that in the future this device will predict and help prevent the failures that are not prevented by the regular maintenance. A car owner wants to have a reliable car and wants it to be prepared for any brief or long trip. To be sure that our product would fit the market need, we have analysed which assumptions on the product were supporting the customer and problem hypotheses through the validation board.

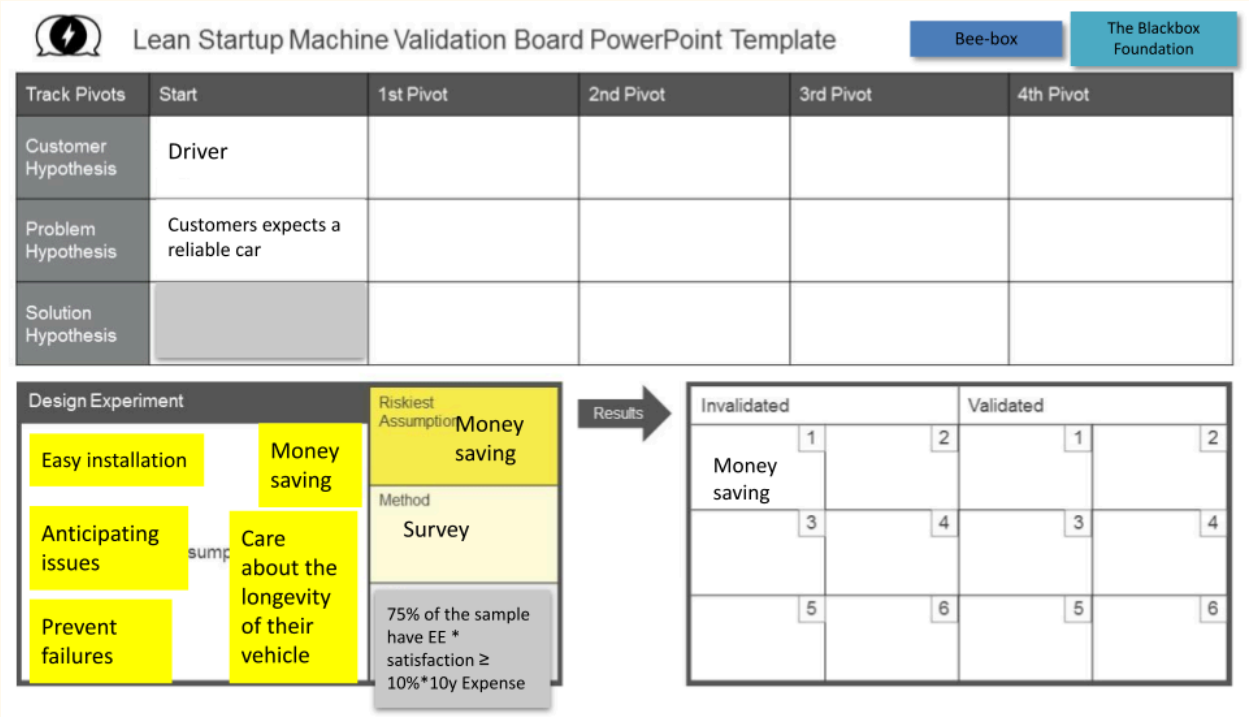
In this initial product status, our assumptions were the following:

- The customer wants an easy-to-use and easy-to-install product for this purpose without disrupting their vehicle's actual setup.
- The customer likes the fact that this device can avoid future issues that would threaten the driver and passengers' safety.
- The customer likes the fact that Bee-box can prevent failures that would require unexpected needs for repairing their vehicle.
- The customer wants to save the money that a road failure will cost in terms of emergency service expenses and last-minute or vacation time fixes that are costly.
- The customer cares about his car's health status and wants to keep it as high as possible.
- The customer cares about the longevity of the car, and would like for it to work for a long time.

The question we asked ourselves was: are we sure that the owner will perceive a sense of money-saving by preventively changing pieces in comparison to what he normally senses as an emergency expense when a failure happens during a trip?

To test this assumption, we have decided to produce and spread a survey about the expenses that every owner gets through during a decade that you can find in the appendix.

Those questions were aimed to get an idea of the perceived impact of their car expense with respect to what was the real expense in terms of emergency service. The survey was also questioning the feelings to get some kind of suggestion on how much we can exploit the struggle caused by a road failure as leverage on them. After defining the format, we decided on our minimum success criteria in terms of perception through the formula: (10-year maintenance * the bad feeling (on the scale of 1-5) / (4 * 10-year emergency expense) > 0.1 on 75% of the sample.



Through the gathered data, we realised that less than 50% of private owners had a feeling that using this box could actually help reduce their maintenance costs, as a result, we knew that a change of either customer and/or problem hypothesis was needed.

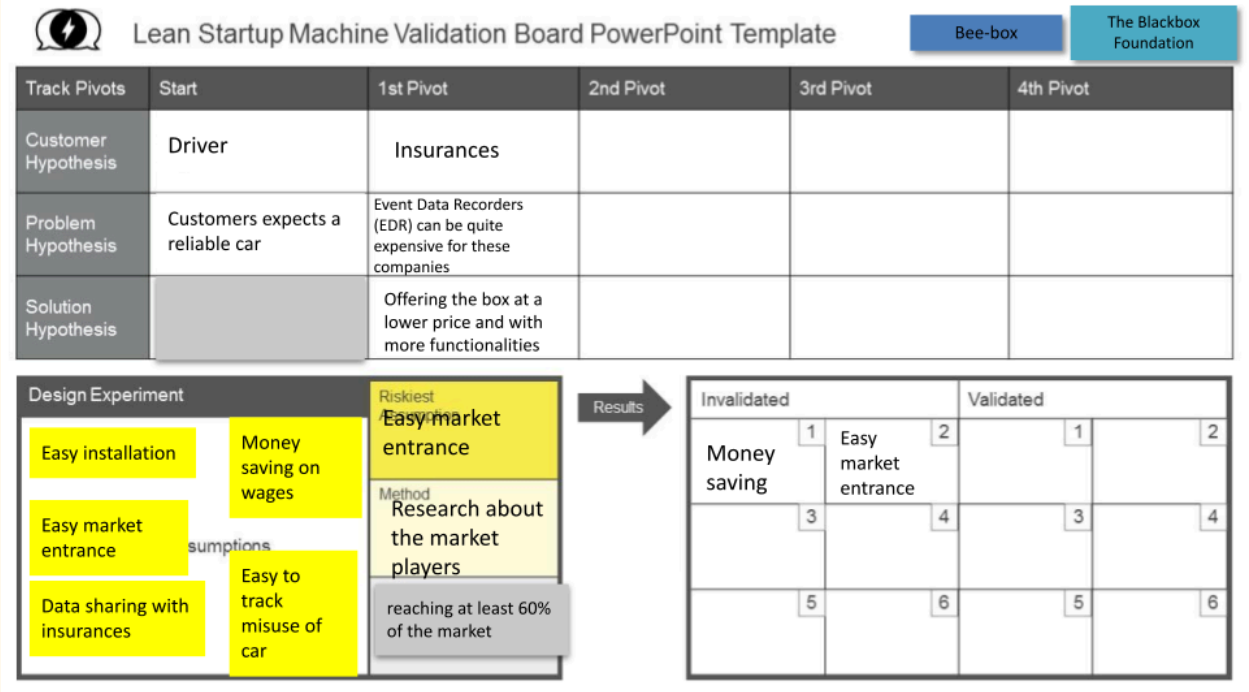
As such, we pivoted the customer hypothesis to insurance companies.

In fact, during the last years, many insurance companies have started collaborations with EDR producers to provide them with standalone devices that are useful to track the driver's behaviour during an accident and, depending on the model, to create a telephonic link to an emergency corp and/or to an emergency car service. To incentivize

the usage of those boxes, most insurance companies have decided to discount their policies. In addition to this, some particular agreements included a growing discount on the policy fee based on the driving style of the owner tracked by those black boxes. The average cost for insurance to buy one EDR is close to €70 and when we discovered this, we were surprised about how high it was and we thought we could provide a cheaper solution. That's why we decided to pivot our customer hypothesis to insurance businesses with our problem hypothesis that the EDRs are expensive for insurance companies. Our goal became to provide them with a cheaper solution to solve this. This was possible because we can actually afford to reduce or null our income from the Bee-box physical product while gaining precious data from their usage. It is a long-term strategy that pays with delays. We have done many assumptions that were close to the preceding ones but coherent with the new customer:

- It is still easy to install a Bee-box in comparison to the competitor's offer (a harder-to-install box can stop the customer in the decision process to preserve their own customers).
- It is easy to define an agreement with the customer on the portion of data we're going to share with the insurance companies to complete their own job.
- It is easy to track the misuse of the car by the drivers to provide good forensics to the insurance.
- Reducing the price of the product with respect to the competitors, will allow us to enter the market easily and quickly.

Trying to analyse all of these assumptions, we found out that probably the riskiest assumption was this last one and so, we decided to test it with a data researching process. We fixed the region of interest and we decided to look for data that we are able to quantify the market size and inflation. As minimum success criteria, we wanted to have a minimum probability to access a country's market in more than 60% of the EU countries. The gathered data shows that this market is already abused with a huge coverage, often close to 70%, in most countries. In fact, this discount on safe drivers is quite widespread in most of them. This has invalidated our problem, making us pivot to a new customer hypothesis, being the ones we were analysing, already inflated.



Lean Startup Machine Validation Board PowerPoint Template

Bee-box

The Blackbox Foundation

Track Pivots	Start	1st Pivot	2nd Pivot	3rd Pivot	4th Pivot
Customer Hypothesis	Driver	Insurances			
Problem Hypothesis	Customers expects a reliable car	Event Data Recorders (EDR) can be quite expensive for these companies			
Solution Hypothesis		Offering the box at a lower price and with more functionalities			

Design Experiment

Easy installation

Money saving on wages

Easy market entrance

sumptions

Easy to track misuse of car

Data sharing with insurances

Riskiest

Easy market entrance

Method

Research about the market players

reaching at least 60% of the market

Results

Invalidated		Validated	
1 Money saving	2 Easy market entrance	1	2
3	4	3	4
5	6	5	6

Solution

While questioning ourselves about which were the other customers we weren't considering, it was easy to decide to pivot the customer to any business with cars that would need a more efficient way of maintaining their fleet and ensuring their higher safety and better performance. We thought that the solution will need a review to fit the new market but still in the form of the black box that is easily installed and connected to a server that would detect and predict any possible failures as well as send notifications for regular car checks.

Our assumptions for this hypothesis were as follows:

- The customers would want a device that would be easily installed.
- Fleet managers need a powerful connected online tool to control, schedule checkups, and monitor their fleet.
- The customers would want to prevent unnecessary, sudden costs on car maintenance, caused by car part failures that were overlooked.
- The customers would want to know if the company car that is being used by their employees is being misused, or looked after properly.
- The customers would want to extend the life span of their fleet.
- The customers would want to prevent the costs that would be caused by any delayed schedule and car accidents.

In this case, analysing all of them, we've decided that the riskiest assumption is the cost prevention for a company because we actually didn't know how to quantify those types of costs.

As for the previous validation, we decided to check statistics and data through research into road forensics websites, specialised newspapers, and public companies' data, to have an idea of how much logistic companies spend on fleet maintenance, employee injuries, and insurance.

Workers' insurance refers to coverage for employees to ensure companies comply with government-mandated laws in providing appropriate pay. These laws, for the sake of calculating the premium, are supported by audits on the collection and protection of

appropriate employee information, workplace standards and conditions, and similar factors that can impede an employee's ability to work. Insurance is normally determined by a factor multiplied by the employee's annual salary and such holistic attributes as claim history and claim frequency. Specific Rates set for workers' compensation vary from country to country. Some businesses may attempt to reduce workers' compensation by instituting a safety program or by increasing the deductible for each Claim. Corporate insurance and the rules of regulation are a very complex domain, to establish an appropriate policy time and effort needs to be devoted to understanding the relationship between a company and its workers.

In France for example, the financial implications vary depending on the size of the business: if the company has at least 150 employees, any car accident impacts the gross occupational accident contribution rate calculated according to the real risk. If the company has less than 20 employees, the gross rate of the car accident contribution is pooled at a flat rate; however, companies that have numerous accidents above a threshold are subject to an increase in insurance cost.

Information on costs due to vehicle accidents at work was not readily available from sources or regular surveys on health and safety at work. We found an article from the Working Papers and Studies: Statistical analysis of the socio-economic cost of accidents at work in the European Union. This article produced a preliminary model estimating these costs in the EU by a number of variables. The model was based on cost data from a questionnaire survey and administrative statistical data on numbers and characteristics of accidents at work and labour. Overall, this article presents a quantitative overview of the total costs of accidents at work and documents the potential benefits of their efficient prevention.

The results show that accidents at work are estimated to have caused costs of 55 billion euros in the EU in 2000. Most of these costs (88%) were due to loss of working time (labour cost). However, one must bear in mind that for accidents that permanently incapacitate a worker's ability to work or fatal accidents, the information did not allow estimate costs other than those resulting from lost working hours. Of all economic activities, most fell into the category of manufacturing and construction, which also accounted for the largest number of accidents at work.

The number of accidents and the costs for the about 7.5 million accidents with temporary incapacity to work (and the first year of accidents with permanent incapacity to work). Costs other than those directly related to lost working time (labour cost) accounted for 70% of the total costs of 22 billion euros of these accidents. According to the information, from 18% (accidents with less than 4 days lost) to 65% (accidents with 14 to 30 days lost) of accidents caused costs other than labour costs. Among accidents with such other costs, these costs were 6 times higher than the labour costs among accidents with less than 4 days lost, while they correspond only to about 40% of the labour costs among accidents with more than 6 months lost. The loss of working time (labour cost) due to fatal accidents at work was estimated assuming a retirement age of 65 years. The 5237 fatal accidents at work were estimated to result in a cost of 3.8 billion euros. The number of fatal accidents at work increases importantly with age, but the total number of working years lost and therefore also the highest costs were due to fatal accidents at work among those aged 25-34 years and those aged 35-44 years.

As we can see, the cost of work accidents is considerable and companies have to spend a lot on protecting their workers. In addition to employees' insurance, companies also have to pay for vehicle insurance that would cover damages to the vehicle and third-party injuries.

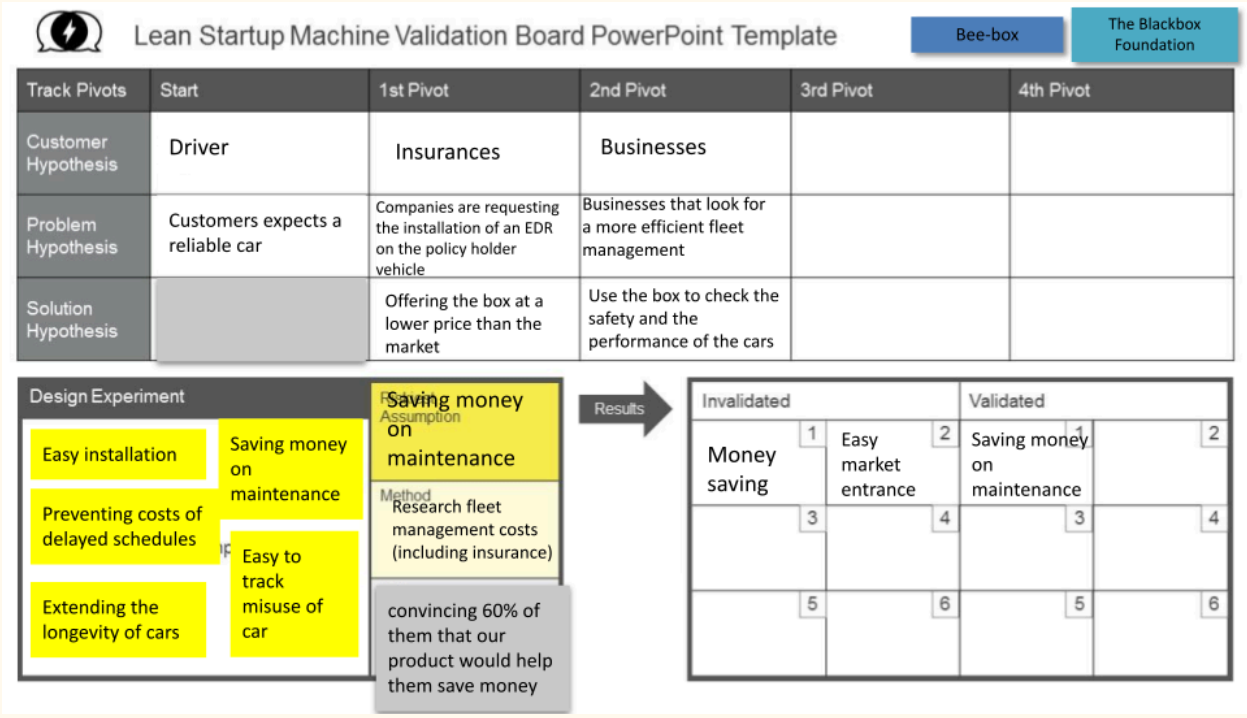
Insurance costs account for an average of 30% of transport companies' expenses. These costs can be volatile and often depend on the nature of the fleet. For example, haulage vehicles are more likely to incur higher insurance fees if they carry dangerous goods as opposed to food delivery driver vans. Rising insurance costs are causing transport companies to reduce their risk profile.

Two key ways they are addressing this are:

- Addressing driver history; Screening driver history has become a crucial element of the hiring process, as personal driving records also contribute to the rising costs of fleet insurance. If a driver has several past violations, their premium tends to be much higher than their colleagues. Some fleet operators require applicants to provide a clean motor vehicle report spanning more than 3 years. This allows them to confidently vet responsible drivers and avoid issues down the line.

- Installing vehicle safety technology; While installing safety technology may reduce the risk of incidents, insurance companies now have to take into account the repair and replacement costs of modern vehicles. High tech equipment substantially increases the value of fleet vehicles, driving insurance costs even higher. Additionally, larger fleets have an increased risk of accident and personal injury claims due to the sheer number of employees they manage, which further heightens insurance costs.

Evidently, transport companies need to implement more effective risk management strategies in order to reduce insurance quotes and avoid unnecessarily throwing away funds.



To sum up, our new product format will be the combination of Bee-box, a smart EDR that tracks all the mechanical and electrical stimuli that vehicles are receiving, their position, and all the diagnostics data coming through the CAN bus of the ECU (engine control unit) that can be helpful for our purpose of predicting car's failure. All the data is sent to a database that binds it to the vehicle's specific characteristics for internal tracking purposes.

An online fleet management tool will be provided to:

- Monitor the positioning of the vehicles
- Monitor the fuel consumption of the fleet
- Monitor the drive-style
- Provide a customisable dashboard for managers with alerts for scheduled and unplanned maintenance
- Provides a full set of APIs specifically studied to interface with all the Open Source process mining tools and easily interact with most of the management tools that medium-big size companies are using
- Provides a module for that permits the remote control of the vehicles

The solution will mainly fit the companies that are owning an internal fleet:

- Logistics, professionals, and consultancy companies that are using vehicles to move things or employees;
- Cab businesses as Uber that are stating in their corporate responsibility that they are caring for drivers and passengers health and safety;
- Car-sharing companies that need this kind of tools to run their business as assets.

Our solution will answer perfectly some exigencies that the companies are facing.

It can be used as a highlight tool for safety, security, and healthcare for companies that are moving people first but also for the ones that are moving precious materials. Indeed, through drive-style detection, GPS monitoring, and vehicle integrity assurance, also their customers may have a feeling of security.

For logistic companies, the Process mining integration will provide progressive monitoring of tasks: E.G. Instead of discrete tracking a delivery step from loading in the truck/van to delivered, we can provide continuous and better delivery time estimation. In a similar way, this tool can be used by professional companies to advise their customers about their arrival time for intervention so as to add value to their professionalism by providing side services to every intervention.

Usually, out of the vehicle acquisition process, the software part has considerable weight on the initial phase of a car-sharing business and most of the companies that are borning, are facing the same issue; Providing them an almost ready-to-use management tool software that is already offering APIs to control vehicles, will facilitate their development process a lot leaning the task to create a GUI for their purposes.

This said, our actual business model it's a mixed type: On one side, we have a long term value from the network effects coming from data gathering; On the other, we offer with a service subscription the fleet management software to cover the development costs for Bee-box and Bee-man.

Our main key partners are suppliers: we need to start a collaboration with electronic producers specialised in mid-range sensors and boards: STMicroelectronics is the perfect partner that provides an AI-oriented central unit to develop our firmware for Bee-box. As a side partner, we need a network of affiliate installers to get our box working on the customer fleet.

The key activities to support our value are basically software development and maintenance of the bundle of products and commercial activities to start acquiring customers (which we will detail more in-depth later). From the software point of view, we will need development activities in the first phase and maintenance, R&D (to improve the effectiveness of the prediction), and maintenance in the second phase.

The key resources are mostly human and intellectual: there is a high request for design, software development, and commercial skills.

The customer segment is diversified, spreading through many kinds of companies that are requiring a fleet to run their business.

The relationship we are going to build with them is based on the automation of some of their internal processes and on the help we can give them during the startup phase. To keep them, we need smooth transitions, easy collaboration agreements, and competitive prices without drawbacks from the service side.

To reach our already running customer, we will use a network of B2B representatives while, for the new-born startups, we will need instead to combine advertisements on founding looking targeted public and to promote ourselves publicly during events for startups enhancing our lean process to create local car-sharing fleets. The physical channel used by our customers will be a selected installer that will provide them with a professional service.

From the cost point of view, we have mostly wages because they are our main expense; the hardware costs will be covered by the customer. The R&D department is the one that will require more expense being the technology still to be perfected to make it perform as soon as possible opening new markets.

On the revenue side, we provide a board at almost realisation cost: our main value comes from the service we provide so the stream is a subscription fee model. The company can decide the payment schedule on a prepaid basis to be more flexible while running their business.

Talking about regulation, in Europe, the data gathering is regulated by a privacy policy but, through encryption, we will separate profiled data that we will use for running Bee-man (accessible only for the interested customer) and to communicate between Bee-box and the server. An anonymous copy of that data will be moved from the customer service to the machine learning one, conserving only information about the vehicle that will be profiled while deleting company-specific data. After a 6 months period of time, those data that will be already used for training will be deleted effectively if not needed by the customer.

Another important aspect of regulations is the homologation of the device in respect of different electronic and automotive standards for product design and development. In fact, companies such as TÜV Rheinland are providing this kind of service and, like all the German ones, are usually the more accepted in the standard market. This will come with the need for more specific resources to get a homologated product. Furthermore, this procedure requires an investment because it has a considerable cost that we have to take into account.

From the point of view of the funding, we want to develop the core software base by ourselves but we will need an external funding strategy. The idea is to try to reach investors by showing the potential of the technology itself as a long-term revenue model. The initial income, for the fleet management tool, will sacrifice great margins to gain customers from the competitors. To get a good start, we will also need to grant to our commercial force a decent margin on the customers' fees they are bringing in. That's why our target investor is the one that looks for low risks and future expansion, to create a long-term relationship. Cash-outers are not good partners in our strategy and we must avoid them. The ideal situation is three medium investors of this kind. If we will be at a dead-end in our research, we will rely on other kinds of investors that are looking for more risky investments but using as leverage, the possible exploitation of our technology. Another evaluation that must be done is whether to create a long-term collaboration with a pilot targeted customer: in this way, we will have the possibility to improve our product while gathering data without effort at a share price. This is the reason why we will need to carefully evaluate the entity of this external company because we may look for someone that has enough vehicles to help us but not enough resources to invest in our project more than needed (e.g. acquiring us in an early stage of development more likely deviating prematurely from our strategy). Another advantage of this possible collaboration is that most of those companies have side businesses that are already connected with other market segments and may potentially help us to reach a larger audience.

As previously anticipated, one of the biggest skills required for our market entrance is the commercial one: based on the customer segment, we defined two main different strategies to enter the market.

The first one is a commercial network of B2B representatives supported by a monthly income from the customers they bring. This channel has fundamental importance because it is the carrier of our major income flow. Their job is to evaluate the current status of the potential customer with them while showing the advantages and opportunities that our product offers. As a side task, the network must also do an affiliation process with installers: in fact, this is a key partner that we need to develop in a parallel way with respect to our commercial activities. Affiliation may also become an opportunity to enlarge our view: industrial body shops, for example, are collaborating

with our ideal customer every day so they can also provide more insights on vehicle crash incidence while creating acquaintances that, in turn, can provide us suggestions on market movements.

The second commercialisation strategy is more passive and consists in acquiring visibility on startups for sharing-mobility and similar. Those companies in fact are already facing giant challenges and costs from the logistic and design point of view so a partner that can provide outsourcing a part of hardware and software, would be very interesting for them. Through this strategy, we will try to reach them either through targeted advertisement or through participation in specific events that are attracting them like fundraising, incubator events, etc.

A lighter version of this strategy can be applied also to the consolidated B2B market but, in our opinion, physical commercial action is more effective in that case.

Timeline and Functionality

Bee-box is a smart event data recorder and control unit that aims to model all the mechanical and electronic stimuli received by a vehicle to monitor its health status and predict failures before their arrival. To achieve this goal, the product is designed with the following components:

1. A flat case to fit all the under hoods of our customers;
2. A central unit with a 5G-ready module used for communication;
3. A set of on-board sensors that are used to track stresses, shocks, and crashes;
4. A predisposition for external sensors to monitor non-mechanical events and every measurable thing;
5. A CAN interface to communicate with the vehicle's central unit and eventually controls it (for car-sharing applications or under customer requests);
6. An OBD interface to track internal diagnostic signals;

Every gathered data is sent encrypted on a central server that sorts and elaborates it.

Our core innovative product is a ML server: this evaluates every information received from every Bee-box that is running. Analysing time series data, environmental conditions, and entity of what it receives, evaluates for every customer and every vehicle, the damage of every single action. The more stressed a vehicle's component is, the higher is the output of it. This value represents a cumulative life loss for a specific component or for a group of them. Obviously, the ML models are multiple and a parallel elaboration will provide a good estimation for this value.

Last but not least, Bee-man, is our fleet management online tool. It's a multi-platform front-end application for fleet managers. Through dashboards, managers can monitor their fleet without effort scheduling maintenance and component verification in time before every failure will happen. From Bee-man, they can also control the status of every fleet's components, the driver schedule, position, and progress state. The back-end of Bee-man consists in a vehicle database that records all the customer data. Furthermore, it pushes notification when something happens on one of their vehicles (crashes, critical failures, etc.) and when a fundamental component needs a check-up after its life-score, gets closer to zero. This back-end also interfaces following the

highest process mining standards, with all the other management systems and productivity monitors the customer already uses.

To ensure the prediction quality, we will need to start gathering data through Bee-box. That is the reason why we will need, as soon as possible, some working prototypes of Bee-box. The information gathered with them will let us tune and test our machine learning server, perfecting it while also improving the final version of the box, giving feedback from the hardware perspective to the design team about the quality of the sensing action. This is a key proof of concept for our product that requires more time and resources than economical ones. This is because we don't need a final stage of Bee-man to perform this action but a working prototype of the box.

This said, it naturally derives that the real first action is to get a working prototype. With a lean designing process, we prospect to get a working proof of concept in two months. Once this has been done, the first version of Bee-man would be developed. It will contain all the necessary tools for fleet management. To speed up the project realisation, we will rely on skilled developers that are able to work under Agile procedures without diverging from the goal and respecting our schedule. A stable working version from a full-stack point of view will be ready in four months. Once the shape of Bee-man will be defined (close to month 3), we can already start to release the hounds to bite the market: in fact, our commercial force will have the possibility to show, and make our potential customers see the benefits of our product, so that, eventually, customers will compare and contrast ours to our competitor's product. This will give us precious suggestions on what we will need to change and where we will need to improve. Meanwhile, the gathering process must continue restless and it will be enforced by our test field collaborator, if existent. Basically, we will need a set of happy customers after six months that will also help to verify and correct, at that time, our orientation.

The bigger goal and expectations from our first year are a good and progressive market entrance with a stabilisation of the product. After that, we want to empower Bee-box with the remote control unit. This will open the market to the car-sharing businesses that are an emergent segment and in continuous development.

Looking at the future, we see Bee-box entering the consumer market: in fact, this was our first hypothesis that we pivoted but it is still a goal that we want to achieve. In fact, once consolidated, the offer of an EDR device that also predicts failures for all the vehicles on the road can win the race with competitors. We forecast that new road safety regulations will be rolled out so there will be a general upgrade of EDR devices and we will need to be ready and take that chance to be the most performant competitor. This is also the reason why the technology must be mature and consolidated and, without investing too many resources, create connections also with vehicle manufacturers and insurance companies.

Competitors and USP

The competitors' range are wide and mixed: in fact, we consider competitors both insurances' EDRs manufacturing companies and connected GPS boxes producers for fleet management systems. This choice is the consequence of the fact that they both have the knowledge and power to develop a solution similar to our one so we will need to be on the go as well as them but with a smaller investment power. Fortunately, on our side, there is a more dynamic environment, a breeding ground for innovative ideas not being conditioned by the knowledge about what actually holds up our business. In fact, if something works very well in a company, it will more likely be kept as a core business and the change rate to new innovations will be smaller.

Starting from the EDRs producers, we can state that the internal activity is quite reduced in this field. In fact, most of them are offering those devices as a side business. We also need to say that their external activity, is booming instead: they are usually players in the automotive provision market (central units, electronic components, processors, sensors, etc) so they can sense the market faster than us through their collaborators network. This is a big strength that we need to consider and fight to create our collaborative network as soon as possible.

For the fleet management competitors, the reality is quite different: in this category, we can find multiple strategies being the business wider: we have blackboxes, mobile applications, integrated software, etc. So, this market is more mixed as a physical product while from the software point of view, we can find more homologation: every

competitor provides a tool to track vehicle position and some external data and provides a dashboard system to the fleet manager to help them conduct their job properly. Some of those companies are exploiting the data gathering to create multi-dimensional maps for autonomous driving cars (that business is quite popular nowadays and in our opinion, it's a high-value currency-to-be), some others are betting all of their cards on the mobile application functionalities so all of them have massive internal and external activities to compete for each other.

That said, we see in EDRs producers also an opportunity for collaboration, relieving us from the hardware design pain and innovation and not being competitive from the software functionalities, UX, and UI points of view. Furthermore, the product stabilisation process could be sped up by their knowledge and resources in patenting and safety certification.

Our other competitors instead are more skilled in software and all of their products are mostly in a high maturity stage. That's why we need to take a lot of care of them: we will need to anticipate the market needs maybe through collaboration with the pilot project that is our direct connection with the logistic (and consequently automotive) world. Of course, by our side, we can count on a product that is designed for risk prevention but, at the same time, open to every application we will need. In fact, our strength on the hardware side is the board power that can run onboard machine learning inference and this opens the wideness of its purposes because we can manage to change and adapt it based on our needs.

We have to mention also another two minor competitors just to clarify:

- Dashcam producers; This product can easily fall in the EDR category but it actually doesn't: dashcams' images, in fact, are fully eligible as forensics proof in case of crashes but are not considered as EDR from the legal point of view. Strategically, it can be another good source of information because of graphical data that can be used to interpret asphalt conditions and broader oscillations.
- Insurance emergency box producers; As the previous one, this device is also doing some kind of data collection but is not as effective as a real EDR. In any case, they offer the emergency call service and their data still has legal value in the evaluation of a car crash.

Analysing their offer, we found the necessity to differentiate our product from all of those competitors: the risks that this model is bringing with him are getting distracted by too many things and doing them worse than the competitors from both sides. That's why we decided to concentrate our resources more on the software part, a field in which we're more competent in respect of the hardware one where we rely more on our providers for a better architecture. In particular, we formulated our unique sales proposition as follows:

- Failure prediction; Through inference, we try to anticipate vehicle failures before their arrival. Many systems are simply reading the error messages that the vehicle's central unit shares through CAN bus and this is where the innovation comes from; in fact, those messages are reporting mostly electronic failures where a control unit is predisposed to do it. Our flagship functionality is monitoring mechanical parts that are not (or only partly) electronically monitored as suspensions, tires, brakes, etc. Those parts are the key ones for road safety and this is the bigger value we're offering to our customers.
- All in one solution; Instead of installing multiple devices, we will provide our customers with a product useful for both fleet management and emergency management with the classic functionalities offered by those systems: forensics analysis for insurance companies and autonomous and partially automatic emergency call service with operative central notification.
- Direct vehicle control; The product gets in direct contact with the vehicle's central unit and it can fully control it for every specific purposes (theft, rent, localisation, safety, etc).
- Startup pack; We will include, in a second stage, a software pack oriented to the startups of the smart mobility segment. In fact, our management system already has all the right stuff to fit this market and it only needs some customisation to meet the desires of the customer.

These 4 points (or parts of them) will be the central argument that we provide to our sales team to get on the market and be competitive combined with a brand new proposal from the technological point of view.

Channels

To build long-term relationships with our customers, we will need to design solid channels.

To manage them, we will need to set up a CRM connected with Bee-man that will be used also by the sales force. Furthermore, it will be used by affiliated garages to accept and schedule installations where needed.

A mixed type assistance channel will be provided via telephone and via email to cater to our customers' desires. It will be available during the daytime and adjusted based on the market location, exigencies, etc. This will also provide post-sale servicing for simple issues solving. Our salesforce will be the main company facade: we will prefer commercially skilled technicians with experience in logistic servicing. The commercial team will bring awareness of our product to the correct market sector and manage the communication and evaluation. They will also conduct the process that brings to a profitable commercial agreement with a small degree of freedom on the price list because of our tight margins on the service. A delegation of the salesforce and the management will be present at periodical expo events. The organisation of these kinds of events will be prosecuted by both the salesforce and the commercial management. For B2B customers, the sale process will be conducted by the representative that manages to get the customer awareness. In the case of start-ups, the agreement will be reached directly by the management to get those customers feeling a stronger sense of support, motivating them to choose us as partners for their hardware and software parts.

An IT support team will be slowly developed based on the market exigencies. It will be in charge of visiting or receiving remotely the customer in case of critical problems as a communication link with our development department. The components of the team will be general-purpose technicians that are often in touch with all the hardware and software components. This helps have a faster and leaner issue recognition and action.

In the end, an administrative department will manage all the requests from the fiscal and invoicing point of view.

Marketing Mix

The communication will be targeted based on the project stage.

If we are going to follow the cooperation strategy, during the first phase, we will need to find our beginning partners that will be probably interested in participating in our company. In this case, we will need a catchy one-pager to explain our business idea and get their interest.

In any other case, a prospect one-pager will be needed by the commercial team to get our B2B customers aware of the enhancements they can get through Bee-box.

A great job will be done by the website that will provide all the information, answers, and contacts our potential customers will need.

Looking at the marketing mix we identified key elements involved in promoting a product or service that significantly interact with each other. Considering all of these elements is an easy way to approach an overall holistic marketing strategy. Specifically, the 5 P's of the marketing that are of notable importance are

- Product - Event Data Recording Device
- Price range - Average cost of 20 Euros per Device
- Place - Europe
- People - Businesses (B2B)

As our Marketing mix is geared towards a more European customer base, it is appropriate to take a more hybrid approach in our marketing strategy.

Digital Marketing

For digital marketing we are aiming to post digital ads on popular social media platforms as well as appropriate news platforms that have a large digital customer base. These social media platforms would include Instagram, Tiktok, Twitter, Facebook, and Linkedin as a start since we would be able to hit and interact with a large number of viewers. Looking ahead, we hope to expand into insurance and automotive sites and

applications as these markets are strongly tied to the EDR target market. These platforms would have specific information and promotional content that will allow a reduced price contract and loyalty program. A developed website will also help improve consumers to be informed on the product and how it can improve safety while reducing yearly costs, and provide contact information if they have questions or require further assistance. A digital market is important as it will help cover more ground to reach more customers than traditional methods.

Traditional

Traditional marketing approaches for us include promotions for companies and workers shown through direct sales, mail, and print advertising. In the beginning, it will be vital to do direct sales to build a solid foundation between us and clients and possible business partners. After the ground is created we can take more distant approaches to garner more clients like mail and print advertising. For mailing, we will mail and email documents to companies that relate to our target market or share similar goals that would benefit from our product. In the hopes of improving traffic to our site and garnering the attention of more possible customers. This would be an inbound and email marketing strategy that would supplement and further the in-person strategies like industry events, meetings, and conversational marketing. These are important strategies as many large automotive events happening globally; being able to network and build solid relationships with businesses at similar companies is of the utmost importance in a B2B company.

Pricing and Start-up Finance

As previously anticipated, in the initial phase, we will need an investor to sponsor the starting up activities combined or substituted by the participation of a pilot customer that will help us deploy a better service for all the other customers.

The financial life of the company is catalysed by one key factor: the number of running devices. This determines the income of the company and the relative expense and as the number grows, also conditions the costs and the depreciation of the hardware and consequently the net income coming from our offer.

In a prospect, we estimated the cost for the development of the first version of all of our components as follows:

Bee-box

Activities	Hours	Price/hour	Total per activity	Total hours	Final price
HW design	100	€ 40,00	€ 4.000,00	502	€ 12.330,00
Case design	20	€ 40,00	€ 800,00		
Firmware design	60	€ 40,00	€ 2.400,00		
Firmware development	200	€ 15,00	€ 3.000,00		
HW testing	50	€ 15,00	€ 750,00		
Firmware Testing	60	€ 20,00	€ 1.200,00		
Connection testing	12	€ 15,00	€ 180,00		

Bee-man

Activities	Hours	Price/hour	Total per activity	Total hours	Final price
DB Design	40	€ 40,00	€ 1.600,00	587	€ 18.230,00
BE Design	30	€ 40,00	€ 1.200,00		
FE Design	300	€ 40,00	€ 12.000,00		
DB development	20	€ 15,00	€ 300,00		
BE development	20	€ 15,00	€ 300,00		
FE development	80	€ 15,00	€ 1.200,00		
Testing FE	54	€ 15,00	€ 810,00		

Testing BE	8	€ 15,00	€ 120,00		
Mobile transport	20	€ 20,00	€ 400,00		
Delivery and configuration	15	€ 20,00	€ 300,00		

Back-end

Activities	Hours	Price/hour	Total per activity	Total hours	Final price
DB Design	40	€ 40,00	€ 1.600,00	627	€ 18.080,00
BE Design	200	€ 40,00	€ 8.000,00		
API design	60	€ 40,00	€ 2.400,00		
DB development	12	€ 15,00	€ 180,00		
BE development	50	€ 15,00	€ 750,00		
API development	30	€ 15,00	€ 450,00		
DB testing	150	€ 20,00	€ 3.000,00		
BE testing	30	€ 20,00	€ 600,00		
API testing	15	€ 20,00	€ 300,00		
ProM integration testing	16	€ 20,00	€ 320,00		
Delivery and configuration	24	€ 20,00	€ 480,00		

So the summary cost for the design, development and test process is resumed in the following table:

Product	Partial price	Hours
Bee-box	€ 12.330,00	502
Bee-man	€ 18.230,00	587
Backend	€ 18.080,00	627
TOTAL	€ 48.640,00	1.716

This imposes that for the development, we will need a team of three to four people if we want to get a working product after 3 months, with different skills and capabilities.

From the hardware point of view, we have to consider also a cost that can be distributed in the duration of one year of depreciation as follows:

Board cost	€ 25,00
Installation	€ 25,00
Duration (in months)	12
Monthly costs	
Hardware depreciation	€ 4,17
Connection	€ 3,00
Total	€ 7,17

In the end, to cover those costs, we decided a monthly fee for our standard customer to prospect earnings in time:

Monthly fee	€ 20,00
Agent perc	-€ 4,00
Cost	-€ 7,17
Total earning	€ 8,83

The top-down income forecast is as following:

Years	**2023**	**2024**	**2025**
Revenue			
Gross sales	3000	3234	4011
Net Sales	€ 720.000,00	€ 776.160,00	€ 962.640,00
Expenses			
Advertising	7.200,00	€ 9,761,6	€11.626,40
Accounting and attorneys	€800	€788,08	€750
Commissions	€12.000,00	€ 12.936,00	€ 16.044,00
Depreciation	€ 2.400,00	€ 2.587,20	€ 3.208,80
Employee benefits	€ 12.600,00	€ 14.400,00	€ 10.800,00
Furniture and equipment	€ 11.000,00	€ 300,00	€ 640,00
Insurance	€ 750,00	€ 750,00	€ 750,00
Maintenance and repairs	€ 1.350,00	€ 1.440,00	€ 1.680,00
Office supplies	€ 400,00	€ 400,00	€ 575,00

Payroll taxes	€ 12.600,00	€ 14.400,00	€ 10.800,00
Rent	€ 8.600,00	€ 8.600,00	€ 8.600,00
Research and development	€ 4.000,00	€ 5.575,00	€ 6.720,00
Salaries and wages	€ 210.000,00	€ 240.000,00	€ 180.000,00
Software	€ 2.500,00	€ 2.800,00	€ 2.600,00
Travel	€ 3.700,00	€ 2.580,00	€ 4.120,00
Utilities	€ 1.200,00	€ 1.200,00	€ 1.200,00
Web hosting and domains	€ 3.200,00	€ 400,00	€ 480,00
Other	€ 300,00	€ 300,00	€ 300,00
Total Operating Expenses	€ 294.600,00	€ 309.456,28	€ 260.894,20
Operating Income (Loss)			
Non-operating revenues, expenses, gains, losses	€ 3.000,00	€ 3.250,00	€ 6.040,00
Income Before Taxes	€ 422.400,00	€ 463.453,72	€ 695.705,80
Net Income	**€ 342.144,00**	**€ 375.397,51**	**€ 563.521,70**

Appendixes

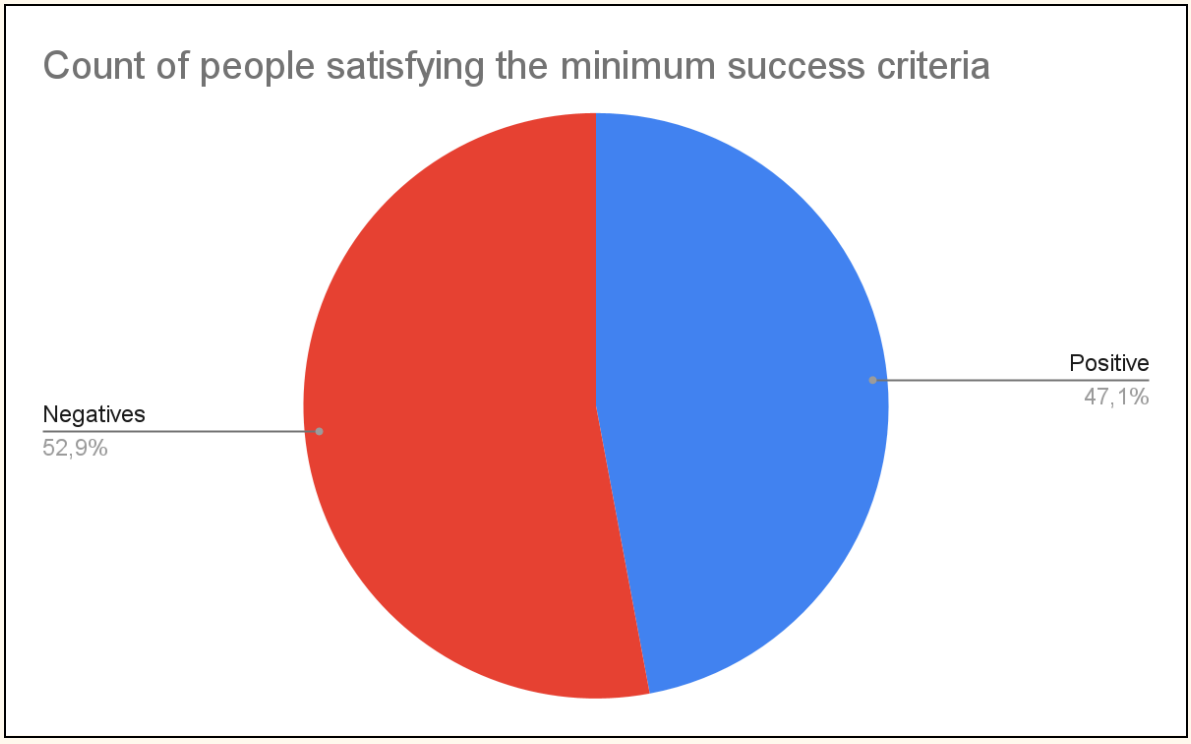
Survey for the first validation, questions

The questionnaire was asking the following questions:

1. How much do you spend on car maintenance per year?
2. How frequently, in the last 10 years, have you called an emergency car service?
3. How much have you spent, during the last 10 years, on an emergency car service?
4. How much did this intervention weighted on your trip success? What were your feelings about that? (delays, bad mood, cancellations, loss of coincidences with other transports, etc.)

Survey for the first validation results

The positive test on our results are shown in the following graph:



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