

# A Business and Technical Approach on Startups Applied on an Automotive System

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**Abstract:** A new promising trend of businesses called startup threatens to overthrow the old fashioned business life we've grown accustomed to. With multiple advantages, the startups are growing in popularity and applicability. The only problem is that they require another type of management and organizational skills. In our paper, we have studied the way a business model can help better manage a startup and applied it in a real life example for an automotive startup, called 4WheelSecret.

**Key-Words:** startup, business model, onboard computer, automotive industry, car control

## 1 Introduction

The "Communication" with the owner of a vehicle is done through the lamps in the vehicle, frequently called WITNESSES BOARD. They announce the specific vehicle damage, if there is something worn out, problems or errors in certain systems of the car. Depending on their color we can know if, there is a serious problem, a problem involving the car's safety (red) or a replacement/repairing issue (yellow or orange). Diagnosing these problems is done with an OBD (On-Board Diagnostics) system found in most vehicles. OBD can give out important information about the operating status of the various parts of the vehicle to the technician that deals with it. The OBD2 standard uses five communication protocols and the automotive systems can be diagnosed by connecting with a device that is compliant with OBD2.

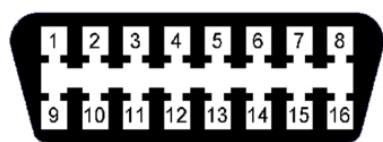


Fig.1. 16-pin connector (2x8) J1962

4WheelSecret is a startup that aims to help car owners better understand their cars and be able to know the value of the car at all times, in case they ever decide to sell it. Like any other startup, 4WheelSecret started with an idea and developed around it. In this paper we presented the basic aspects of our startup and our product as well as the

tool that enabled us to define the startup as a business.

Growing in popularity after the dot-com boom, startups have become an asset for individuals with great ideas and a powerful desire to make things work. Due to the major advantages they bring such as: competitive pricing, ease of access, personality, agility, team chemistry, and not only, startup businesses are gaining more ground in today's business market

But what is, more precisely, a startup company? According to Wikipedia, a startup company or startup or start-up is an entrepreneurial venture or a new business in the form of a company, a partnership or temporary organization designed to search for a repeatable and scalable business model (1).

Other put, a startup is a small, new business that offers services and/or products which are not already on the market in hopes of further development and/or being incorporated into bigger business. Their founding can come either from one or multiple investors, bank loans or even crowd funding.

## 2 Evaluation idea

We created a device that makes the communication with the vehicle easier, and uses the information it obtains to directly inform either the owner or a service center/technician. The device we created enables us to gather and store the data from the

OBD in a secured database that can be later on accessed from anywhere in the world. This database can connect to a service center or more, in order for a certified technician to advise the owner of the car about certain errors that occurred and which might lead to bigger problems if not checked. It also enables us to create a car history by identifying the errors that occurred in the course of a certain time and makes it easier for a possible buyer to access this information.

The protocols use in OBD2 standard is:

- SAE J1850 PWM (Pulse Width Modulation-41.6 kB/sec, standard use by FORD)
- SAE J1850 VPW (Variable Pulse Width 10.4/41.6 kB/sec, standard use by General Motors)
- ISO 9141-2 (10.4 kB/sec)
- ISO 14230 KWP2000 (Keyword Protocol 2000)
- ISO 15765 CAN (250 kBit/s or 500 kBit/s). (Control Area Network)

Our idea derived from observing two main problems with today's car market:

On one hand, the market share for used cars is growing, exposing the buyers of used cars to vulnerabilities such as: being overcharged for the car or not knowing its full history and the problems the car encountered.

On the other hand, given the fact that today's modern society integrates new machines in the Internet of Things market, it seems only fair to consider the cars as the next necessary part of the IoT as well.

With those two reasons in mind we thought about developing a product that would solve both problems at the same time: allow the user to know everything about its car and the price he would get for selling it, while connecting the car to the IoT at the same time.

That's why 4WheelSecret's base product is a device that allows the user to connect to his car and gather data from the car onboard computer using it in order to give the owner a user-friendly idea about the errors the car encounters and it helps determine a fair price for the car based on its current state and its history.

Giving the fact that 4WheelSecret is a startup, it was hard for us in the beginning to determine how we would be able to create and deliver value to our customers, define our customers and the way we plan to interact with them. Initially, we tried to form a business plan but as it turned out, it wasn't fit for a startup.

## 3 Solution

### 3.1 Canvas business model

Why should a startup focus on writing the business model rather than the traditional business plan? In order to answer that question properly, we must first understand the main benefit startups have – their “liquid” state. The startup can develop, grow, or even change according to its clients preferences, without being bounded to a particular way of doing business by limitations such as: high costs of producing new goods, high costs of training or hiring personnel for the new types of products or services it aims to offer, and so on.

A startup can change naturally, swiftly, without raising extra costs, therefore a business model, which by its nature is also dynamic and constantly changing is a better fit for the requirements of a startup rather than the traditional formal business plan. Now let's take a look and understand what is a business model and how is it any different than the business plan.

A business model is a company's action plan for generating revenue and ensuring the fact that they deliver quality products and/or services. It can also be seen as a collection of building blocks that focus on defining the key points of a business.

Business models come in handy to both entrepreneurs and managers inside the company, in order to better understand the type of products/services they offer and explore the possibilities of future development. Even though it is not mandatory, the business model can be easily incorporated into the business plan and cash flow projections.

The most representative thing that comes to mind when it comes to business models is the bait and hook business model which became popular after being used by companies such as Gillette – for its low razor prices on one hand and the price of blades on the other, Hp – cheap printers but expensive toners/refills (2).

The Canvas business model is the most widely used business model because of its applicability and ease of implementation. The canvas business model is made out of 9 construction blocks as it follows: customer segments, value proposition, channels, customer relationship, revenue streams, key resources, key activities, key partnerships and cost structure. Once applied to our startup, the Canvas business model helped us shape our action plan and better define the startup. Below, you'll see the business model in action:

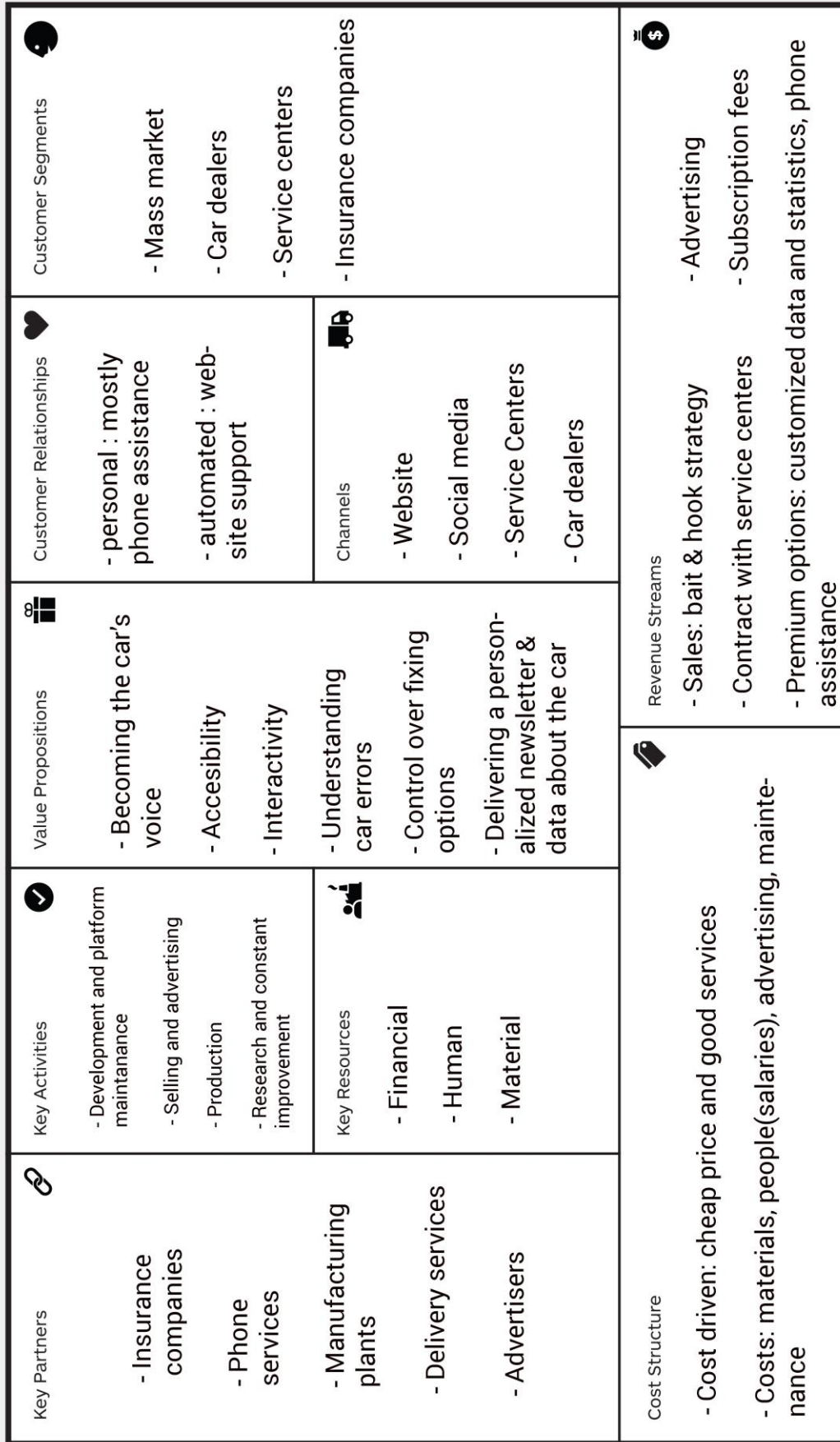
# The Business Model Canvas

Designed for: **4wheelsecret**

Designed by: **Raluca Dovleac**

Date: **17.11.15**

Version: **2**



DESIGNED BY: Strategyzer AG  
 The makers of Business Model Generation and Strategyzer

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### 3.2 Technical Solution

The K-line ISO9141-2 protocol is a protocol for automotive diagnostics, used from many years. Even if the protocol is quite "old" it is commonly used nowadays, both for diagnosis and to create projects involving data transmissions. Unfortunately, over time, new diagnostic protocols emerged which are much faster and more efficient. Such examples include: CAN or Ethernet. ISO 9141-2 no longer plays an important role in the new research projects, which are based on data transmission because now sending / receiving information is quicker, with a larger transfer speed and great accuracy. The ISO 9141-2 remains a communication protocol widely used in all areas starting from ECU communications to single wire communications that require data transfer or any other property of this protocol. However, there will be cars, motorcycles and trucks that will still be using this protocol as well as suppliers, stores and manufacturers, so they cannot overlook this. Initializing this protocol for diagnosis with ECU is done by sending an address byte (0x33h) with a 5-speed baud / sec. This address byte consists of:

- one start bit – logical 0
- 8 bits – bit 0 is sent first that is LSB (0x33h – 00110011b)
- one stop bit – logical 1, ECU responds by accepting data synchronization byte with a value (0x55h) and two bytes specific to this protocol called Key Bytes with value (0x08h) that are used for identification formats header and timing parameters.

*Acceptance synchronization byte transfer (0x55h) is composed of:*

- one start bit – logical 0
- 8 bits – LBS is sent first (0x55h – 10101010b)
- one stop bit – logical 1, at least 5 ms and max 20 ms to be able to reconfigure the diagnostic device.

*Key Bytes (0x08h) contain:*

- one start bit – logical 0
- 7 bits – LSB is sent first (0x08h – 00001000b)
- one parity bit – odd number "1"
- one stop bit – logical 1

After receiving the second Key Byte there is checked its correctness and send its inverted value, i.e. the value (0XF7h - 11110111b) for hand-shaking purposes. The response from the ECU is the address byte (0xCC h - 11001100b), that mean the inverted value of the 0x33h initialization address byte from the beginning, then we can send messages in order to receive the desired information. For sending a message the CheckSum

byte (CS) is inserted at the end of the block message. It is calculated using Modulo 256, that is the series of 8-bit sum of all bytes of that message (of course excluding the CS byte). Composing a message is made in three main blocks.

- Header – 3 bytes
- Data - 7 bytes
- CS – 1 byte

There are ten operating modes described in SAE J1979 OBD2 standard, these modes are expressed in hexadecimal.

Mode Description:

- **01** For real-time data (reading sensors etc.)
- **02** parameters recorded by injection computer
- **03** returns DTC (Diagnostic Trouble Codes)
- **04** Clear DTC
- **05** For data from the oxygen sensor (lambda)
- **06** For monitoring system and other components that impact emissions testing
- **07** Hours possible errors of certain components or systems
- **08 09** Information about vehicle OBD2 period
- **0A** signal DTC (Diagnostic Trouble Codes) consists of:
  - a letter: P (Powertrain), B (Body), C (Chassis), U (Network)
  - 4 digits

```
void receive_data_init(void)
{
    if (init_ok_var == 0)
    {
        rec_data = USART_ReceiveData(USART1);

        if (rec_data == 85) // 0x55h
        {
            recdata[0] = rec_data;
        }

        if (rec_data == 8) // 0x08h
        {
            if (recdata[1] == 0) {recdata[1] = rec_data;}
            else {recdata[2] = rec_data;}
        }

        //-----Received kw1/2-----
        if ((recdata[0]==85) && (recdata[1]==8) && (recdata[2]==8))
        {
            // W4 - 25 - 50 ms
        }
    }
}
```

Fig.2. Code example

## 4 Conclusions

4WheelSecret is a startup that provides solutions which help integrate cars into the Internet of Things by supplying the device which connects to the onboard computer and giving the car a "voice".

Our device helps car owners better understand their cars by using the data it gathers from the onboard computer, and it also helps determine a fair price for the car based on the way that it runs, the improvements the owner brought to it, the errors it encountered in the past and whether they were fixed or not.

Applying the Canvas business model helped us shape the direction in which our startup was heading and determine the ways in which we will achieve our goal. It was very useful for us to use it from the beginning of the project since it helped us manage the startup from an early stage, even before testing the prototype.

K-line ISO9141-2 protocol is very compact. Its main advantage is that it is easy to use both from software and hardware point of view.

As a disadvantage, being an old protocol the transfer speed is low compared to other new protocols, but it is still very suited for prototyping.

In the current paper, we noted the technical aspects of the prototype, describing the way it works as well as its functionalities, while also

showing how the business model Canvas helped us shape the direction in which the startup is heading, proving therefore the utility of using a business model instead of the traditional business plan.

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