Self-assessment of the performance of a company in the automotive industry based on the EFQM excellence model

BĂLAN Ștefan

Faculty: Faculty of Industrial and Robotic Engineering, Specialization: Quality Engineering, Year of study: I, e-mail: balan.stefan.195@gmail.com

Scientific leader: Prof.Dr.Eng. SEVERIN Irina

Summary: In this document are presented the strengths and areas of improvement occurred from the self-assessment based on the EFQM excellence model of the performance of the Renault Technologie Roumanie company, an organization operating in the field of the automotive industry. This company is actually a regional center that deals with engineering activities and technical consulting (CAEN 7112) for the Renault Group. Following this self-assessment, an overview of this company is created and an action plan for areas for improvement will be implemented.

Introduction

In this scientific document the company Renault Technologie Roumanie will be analyzed according to EFQM excellence model.

Renault Technologie Roumanie (RTR) is a regional engineering center of the Renault Group. The main responsibility of this company, is the global development of the Dacia range but also a small part of the Renault range, especially an adaptation of projects targeting vehicles and mechanical manufacturing in the Eastern Europe and the Mediterranean region [1].

This company have design offices in Bucharest, where engineers try to fulfill market requirements in terms of automobiles. The vehicles designed in those offices are tested and approved on the Titu Technical Center. After an authority give the approval, the vehicles are mass-produced in the Mioveni factory [1].

Current stage

The EFQM's principles of excellence are chosen in order to cover all the concepts of this evaluation, to have a whole picture to this company.

- Achieving Balanced Results [2]
- Taking Responsibility for a Sustainable Future [2]

By covering all the concepts of this model, a much clearer overview of this organization can be achieved at the end of this evaluation. Both the concepts that have a positive impact on the organization and those that can be improved can be determined. These improvements can be implemented through an action plan.

Table. 1. EFQM principles and concepts [3]

	1					2				3					4					5					6		7		9	
	Leadership					Strategy				People					Partnerships & Resources					Processes, Products and					Customer Results		People Results		Key Results	
	A	B	C	D	E	A	B	C	D	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	A	B	A	B
Achieving Balanced Results		■	■			■		■	■							■			■						■	■	■	■	■	■
Taking Responsibility for a Sustainable Future	■	■	■		■			■					■	■			■					■								

Fig. 1. EFQM principles spider chart

Based on the spider chart in the Fig 1 and on the principles and concepts from table 1, in this document will be presented the strengths and areas for improvement for concepts whose points are common and the same concepts taken separately.

The strengths of this company which are identified after going through all the concepts and principles of the EFQM, are on the side of products and services, exactly on point 5C of this assessment scorebook (Products and services are designed and developed based on customer needs and expectations), where this company scored a total of 55 points out of the total of 100 points and on the leadership side, exactly on point 1C (Leaders interact with customers, partners and representatives of society), where this company scored a total of 60 points out of the total of 100 points. On this last point (1C), even if it has the highest score from all the concepts, on the systematic deployment part there where the approach must be deployed in a structured way with the method used for deployment being planned and executed soundly, this company scored 35 points out of the total of 100 points. This systematic deployment is directly linked to the people and their results.

The main problem in this organization, according to the scoring mentioned before, is not that the people don't get good results in general, but they do not get good results compared to the goals that are set by the organization. These things can explain areas for improvement that are identified after going through all the concepts of the EFQM. Those points are on the people side, exactly on the point 3D (People and the organization have a dialogue) where this company scored 35 points out of the total of 100 points, on the people results (7B Performance Indicators) and key results (9A Key Performance Outcomes) where this company scored 40 points out of the total of 100.

Table. 2. EFQM results [3]

	1					2				3					4					5					6		7		9	
	Leadership					Strategy				People					Partnerships & Resources					Processes, Products and					Customer Results		People Results		Key Results	
	A	B	C	D	E	A	B	C	D	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	A	B	A	B
Achieving Balanced Results						50%			45%							35%			55%						55%	45%	45%	40%	40%	45%
Taking Responsibility for a Sustainable Future	55%	50%	60%		45%			55%					35%	45%			45%					55%								
Total Score	53%					50%				40%					45%					55%					50%		43%		43%	

Strenghts:

1C) Leaders interact with customers, partners and representatives of society

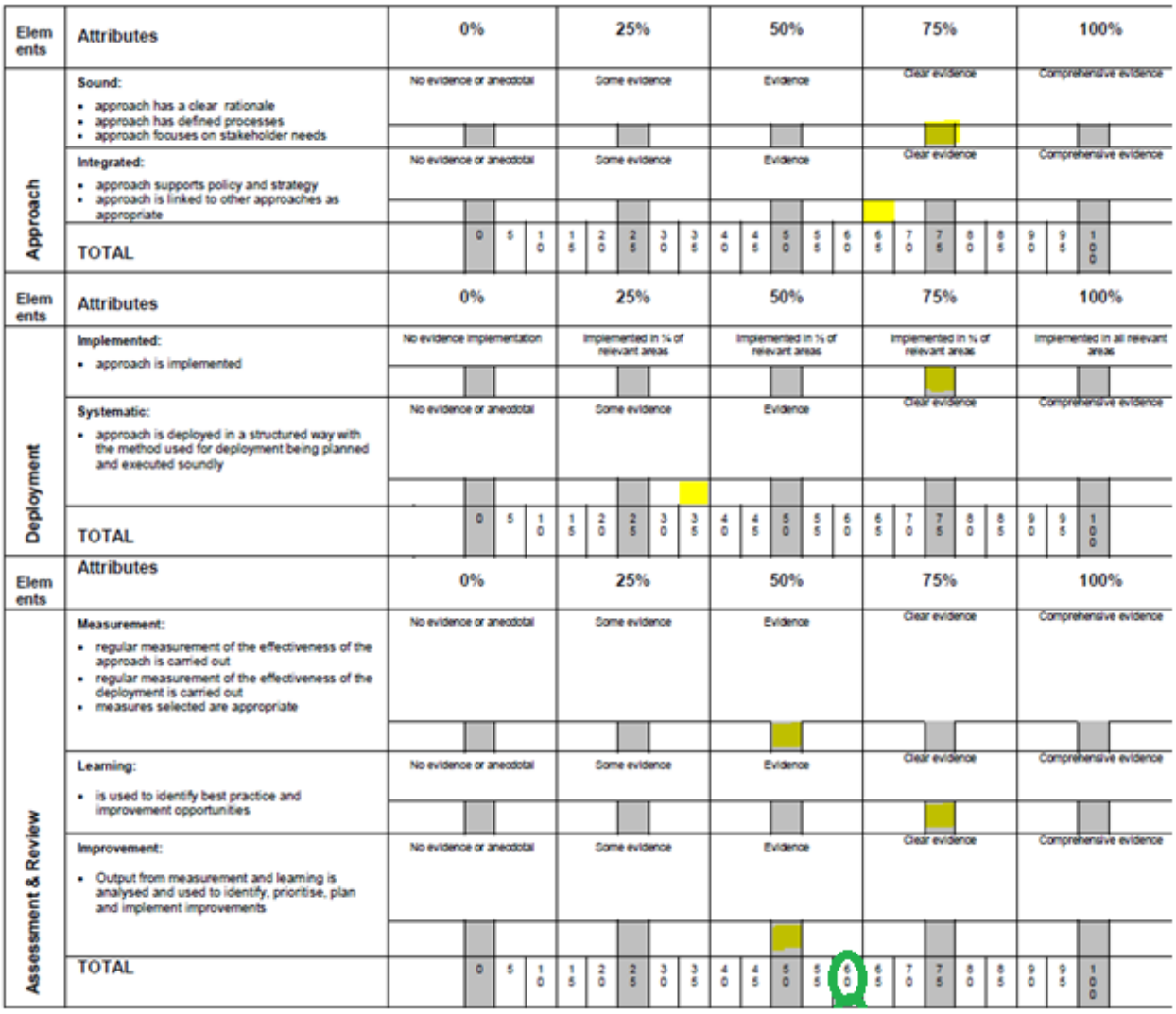

Fig. 2. EFQM 1C Leaders interact with customers [2]

a) Developing, maintaining and participating in partnerships is a strong point of the organization's leadership. This leadership frequently analyze opportunities and develop partnerships.

b) Leaders frequently participate in professional associations, conferences and seminars that promote and support excellence. This process is continuously monitored and improved through concrete graphics and actions.

c) The leaders of this organization also promote and support activities aimed at improving the environment and the organization's contribution to society, from designing projects so that they are close to 100% recyclable, as well as reducing the CO2 footprint and pollutant emissions, of the vehicles.

5C) Products and Services are designed and developed based on customer needs and expectations

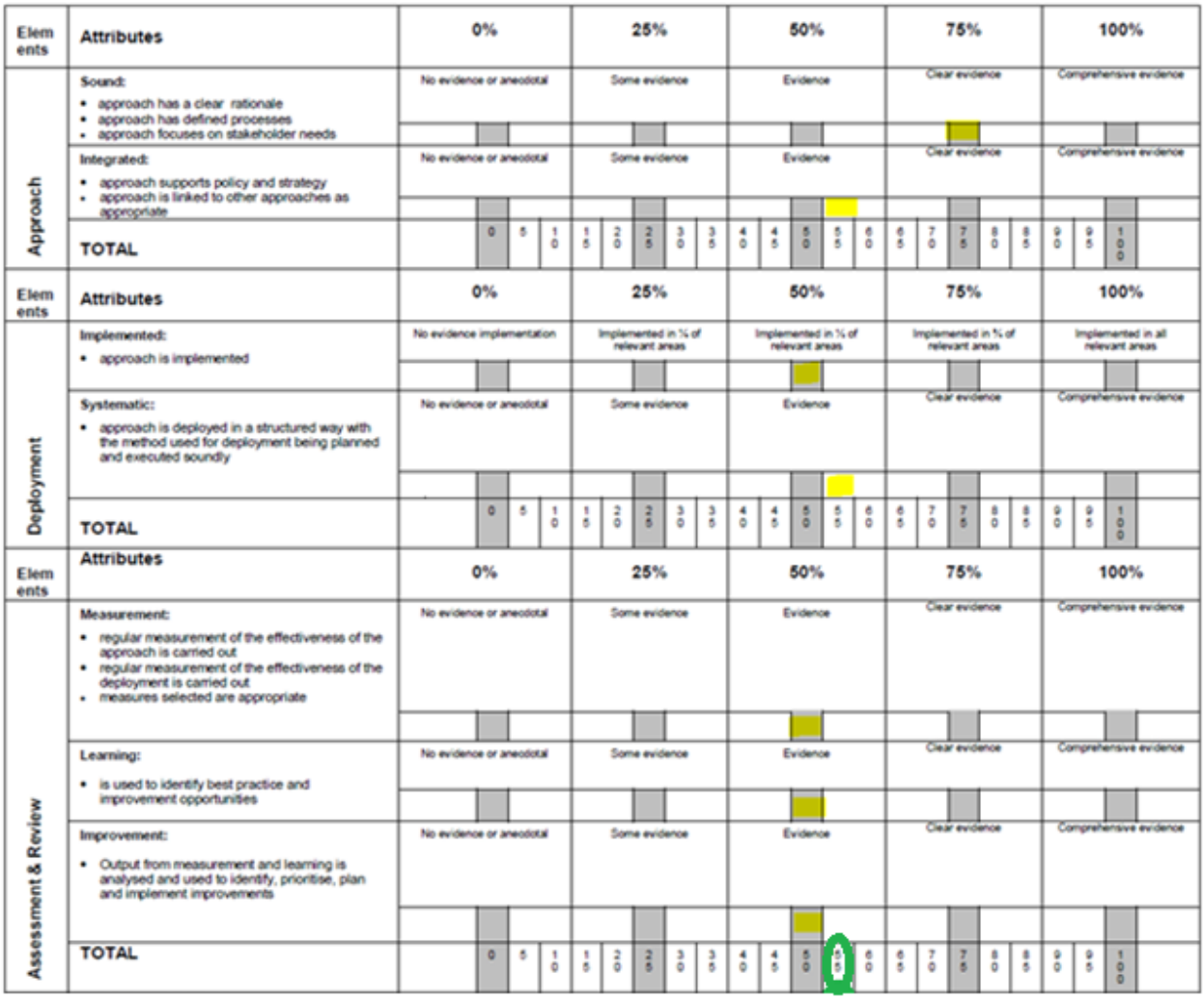

Fig. 3. EFQM 5C Products and Services [2]

a) Customer surveys and market research are often used before launching a product to determine customer needs and their expectations.

b) The products are analyzed through a special department of competition analysis and client feedback. With the help of these departments, improvements of the actual product can be well identified, and the desired results can be anticipated.

c) Products and services for clients and partners are permanently created and developed according to market requirements (ex department of the voice of the client).

Areas for improvement

3D) People and the organization have a dialogue

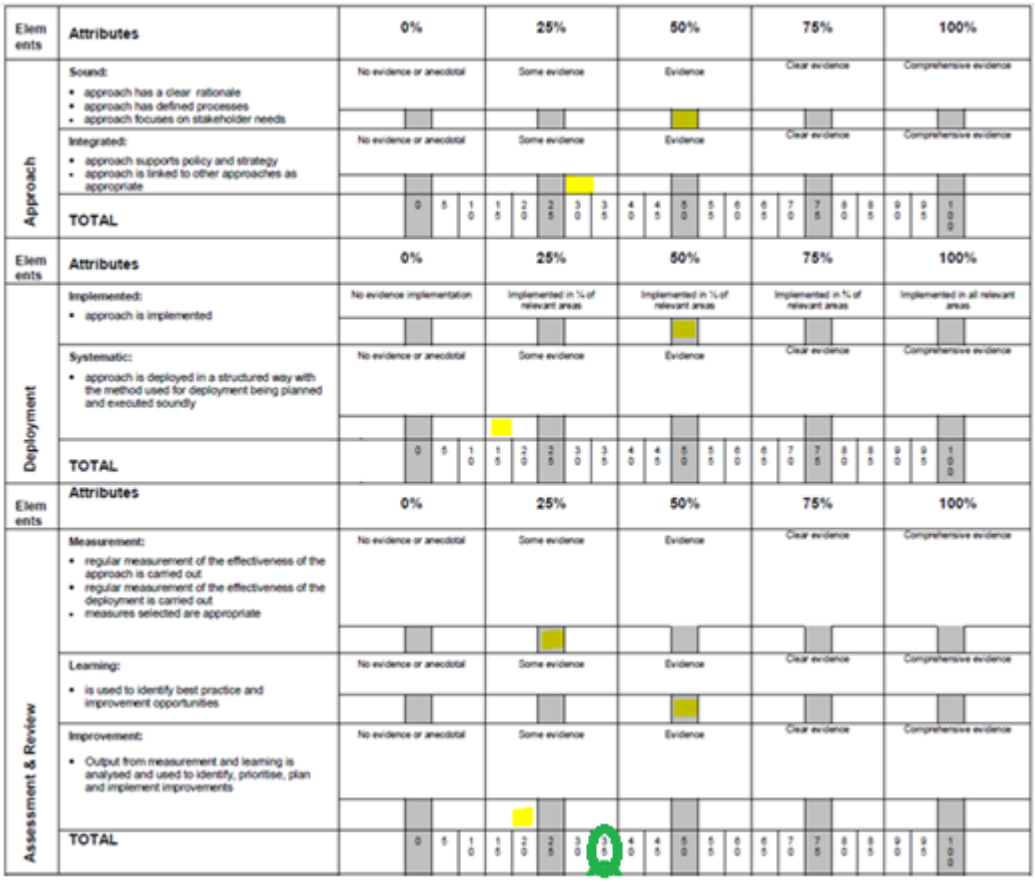

Fig. 4. EFQM 3D People and the organization [2]

a) Strategies and plans based on communication needs, have to be improved at the level of employee representatives and human resources.

b) Opportunities to share good practices and knowledge need to be further developed within this organization.

c) Communication channels are very well developed from top to bottom, but less developed from the bottom up.

7B) Performance Indicators

Elements	Attributes	0%	25%	50%	75%	100%
Results	Trends: • trends are positive AND/OR there is sustained good performance	No Results or anecdotal information	Positive trends and/or satisfactory performance for about ¼ of results over at least 3 years	Positive trends and/or sustained good performance for about ½ of results over at least 3 years	Positive trends and/or sustained good performance for about ¾ of results over at least 3 years	Positive trends and/or sustained good performance for all results over at least 3 years
	Targets: • targets are achieved • targets are appropriate	No Results or anecdotal information	Achieved and appropriate for about ¼ of results	Achieved and appropriate for about ½ of results	Achieved and appropriate for about ¾ of results	Achieved and appropriate for all results
	Comparisons: • results compare well with others AND/OR results compare well with acknowledged 'World Class'	No Results or anecdotal information	Favourable comparisons for about ¼ results	Favourable comparisons for about ½ results	Favourable comparisons for about ¾ results	Favourable comparisons for all results
	Causes: • results are caused by approach	No Results or anecdotal information	Cause and effect visible for about ¼ results	Cause and effect visible for about ½ results	Cause and effect visible for about ¾ results	Cause and effect visible for all results
	TOTAL	0 5 10	15 20 25 30 35	40 45 50 55 60	65 70 75 80 85	90 95 100
Elements	Attributes	0%	25%	50%	75%	100%
	Scope: • results address relevant areas • results are appropriately segmented e.g. by customer, by business	No Results or anecdotal information	Results address ¼ of relevant areas and activities	Results address ½ of relevant areas and activities	Results address ¾ of relevant areas and activities	Results address all of relevant areas and activities
	TOTAL	0 5 10	15 20 25 30 35	40 45 50 55 60	65 70 75 80 85	90 95 100

Fig. 5. EFQM 3D Performance indicators [2]

9A) Key Performance Outcomes

Elements	Attributes	0%	25%	50%	75%	100%
Results	Trends: • trends are positive AND/OR there is sustained good performance	No Results or anecdotal information	Positive trends and/or satisfactory performance for about ¼ of results over at least 3 years	Positive trends and/or sustained good performance for about ½ of results over at least 3 years	Positive trends and/or sustained good performance for about ¾ of results over at least 3 years	Positive trends and/or sustained good performance for all results over at least 3 years
	Targets: • targets are achieved • targets are appropriate	No Results or anecdotal information	Achieved and appropriate for about ¼ of results	Achieved and appropriate for about ½ of results	Achieved and appropriate for about ¾ of results	Achieved and appropriate for all results
	Comparisons: • results compare well with others AND/OR results compare well with acknowledged 'World Class'	No Results or anecdotal information	Favourable comparisons for about ¼ results	Favourable comparisons for about ½ results	Favourable comparisons for about ¾ results	Favourable comparisons for all results
	Causes: • results are caused by approach	No Results or anecdotal information	Cause and effect visible for about ¼ results	Cause and effect visible for about ½ results	Cause and effect visible for about ¾ results	Cause and effect visible for all results
	TOTAL	0 5 10	15 20 25 30 35	40 45 50 55 60	65 70 75 80 85	90 95 100
Elements	Attributes	0%	25%	50%	75%	100%
	Scope: • results address relevant areas • results are appropriately segmented e.g. by customer, by business	No Results or anecdotal information	Results address ¼ of relevant areas and activities	Results address ½ of relevant areas and activities	Results address ¾ of relevant areas and activities	Results address all of relevant areas and activities
	TOTAL	0 5 10	15 20 25 30 35	40 45 50 55 60	65 70 75 80 85	90 95 100

Fig. 6. EFQM 9A Key Performance Outcomes [2]

Those two points 7B) and 9A) are directly linked to each other

a) Although the trainings are very well developed, the objectives are very ambitious and cannot be fully achieved.

b) The organization was affected during the pandemic and by the current context of military conflicts and the market share has decreased.

c) The vision and mission are very ambitious, and the success rate is affected.

d) Many of the departments of this organization exceed the allocated budget.

In this page it is presented a spider chart for the concepts that can be found on the both principles and for each of these principles taken separately in order to make the image of the organization much clearer following this EFQM analysis.

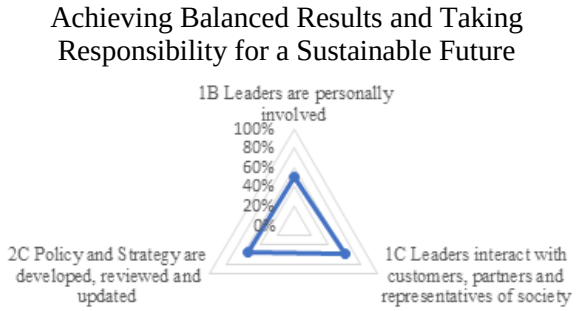

Fig. 7a. Spider chart for both principles

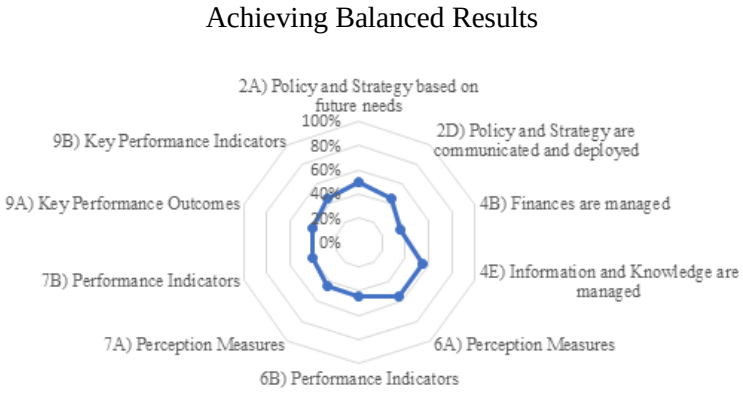

Fig. 7b. Spider chart for Achieving Balanced Results

Fig. 7c. Spider chart for Taking Responsibility for a Sustainable Future

The total score of the EFQM evaluation is presented in the graphic bellow

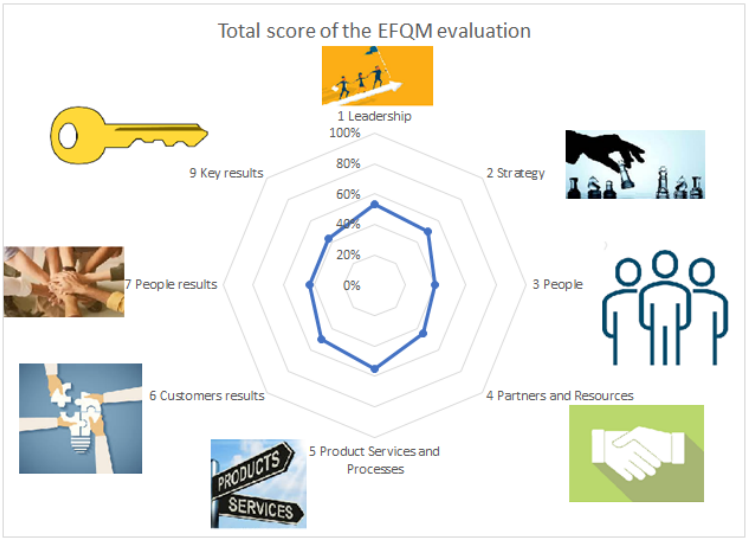

Fig. 8. Total score of the EFQM evaluation [4],[5],[6],[7],[8],[9],[10],[11]

Action Plan

As an action plan, the strategy must be modified by the leaders so that the proposed objectives to be more accessible to people from this organization and in this way, the performance indicators for the people and key results will be higher.

With this approach employees and partners which shows that they are doing their job properly can stand out and take more responsibilities much quicker. Also, the resources can be managed better.

Conclusions

According to the chart above (Fig 8), the organization respects its position on the market. There has to be a balance in order to respect the wishes of the customers and to give products as affordable as possible, without neglecting the price-quality ratio and the reliability of the products.

As in the EFQM score, there is a balance in the organization, because this organization does not want to attack luxury markets or other more dangerous markets. This manufacturer gives products for the global access market.

Bibliography

[1]https://www.gruprenault.ro/vino-echipa-noastra/diversitate-profesionala/inginerie

[2]ASSESSOR SCOREBOOK FOR USE WITH THE 2003 EFQM EXCELLENCE MODEL – LARGE COMPANY VERSION

[3]Excellence Model – EFQM 2010

[4]https://so.m.wikipedia.org/wiki/File:Crypto_key.svg

[5]https://www.despresdelsuicidi.org/ca/que-fem/

[6]https://accordemy.com/course/compensation-and-benefits-management/

[7]https://www.pngegg.com/en/search?q=productservice+System

[8]https://kafafiangroup.com/team/richard-b-trauger-jr/

[9]https://culturesync.net/about/

[10]https://vplmedya.wordpress.com/category/dis-ticaret-rehberi/

[11]https://medium.com/tag/demokrasi/archive/2020/10

MODELING AND SIMULATION OF MECHATRONIC ASSEMBLIES THROUGH TINKERCAD VIRTUAL APPLICATION

CARAIMAN Cosmina-Constantina, BONTĂ Anca-Bianca-Beatrice,
DULIBA Mălina-Daniela and CRIȘAN Ramona-Gabriela
College: Industrial Engineering and Robotics, Specialization: Managerial Engineering of Technical Systems, Year of Study: I, e-mail: cosmina.caraiman92@yahoo.com

Scientific leaders: Ș.l. dr. ing. **Liviu Marian UNGUREANU**, Ș.l. dr. ing. **Iulian Sorin MUNTEANU**

ABSTRACT: The authors set out to model and simulate two mechatronic assemblies using the TINKERCAD virtual application. To make the simulation model of the two mechatronic assemblies, they will choose the optimal components needed for the assemblies, they will assemble virtual ones, they will write the program codes necessary to display the problem of messages on LCD, as well as the observation and analysis of how electronic components interact and respond, at the given orders. The proposed goal of modeling and simulation is to create two widely used mechatronic assemblies, both in the automotive industry and in many other fields.

KEYWORDS: mechatronics, modeling, simulation, TINKERCAD, programming.

1. Introduction

The aim of this paper is to study the possibility of modeling and simulating mechatronic assemblies through the virtual application TINKERCAD.

Performing modeling and simulation involves: establishing the components needed for assembly, assembling them, writing operating codes, as well as observing and analyzing how the components chosen for assembly interact and respond to commands.

The authors set out to firstly make a mechatronic assembly for temperature measurement and displaying it on a 16x2 LCD screen, as well as a visual warning by lighting one of the three LEDs mounted, depending on the temperature range indicated as critical.

The authors also set out to make another mechatronic assembly for measuring distance by displaying it on a 16x2 LCD screen, as well as warning of critical values, both visually by lighting some LEDs and acoustically by emitting sounds by a buzzer.

2. The current stage of development

In order to carry out the two mechatronic assemblies, several electronic components are used, such as: Arduino Uno board, BreadBoard, LEDs, potentiometers, TMP36 temperature sensor, resistors, connection cables, 16x2 LCD screen, power cable, buzzer, ultrasonic sensor [1].

Arduino Uno board, shown in Fig. 1, is an open-source processing platform based on flexible and easy-to-use software and hardware.

At the bottom right of the Arduino Uno board are the analog pins (A0 ... A5), and at the top we find the digital pins (0 ... 13). The grounding (GND) is found in three places on the board, namely: one at the top and two at the bottom. The power supply is of three types: 3.3V, 5V and Vin, where an external battery can be connected (7-12V). Circuit codes are read by ATMEGA 328P PU.

The BreadBoard is required to make circuits or assemblies without soldering the electronic components. The connections between the components placed on the BreadBoard are made through the ends of the metal plate. These metal (main) ends are oriented horizontally at the edges of the BreadBoard for power supply at «-» and «+» and vertically at the rest for the introduction of electrical elements, and in the middle of it there is a horizontal delimitation called the separating area.

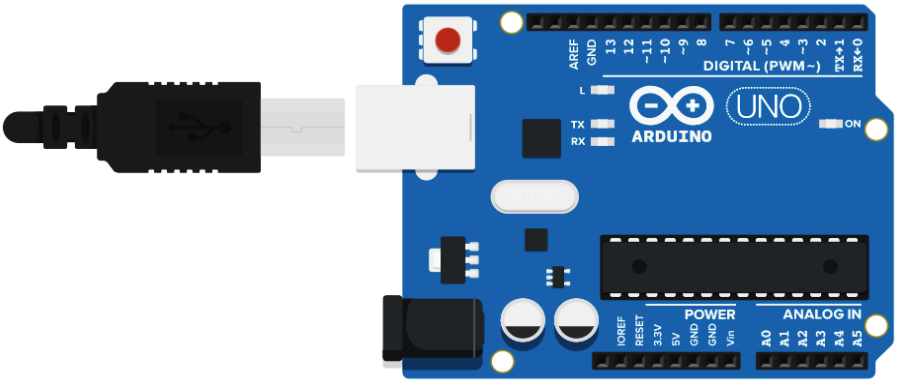

Fig. 1. Arduino Uno Board

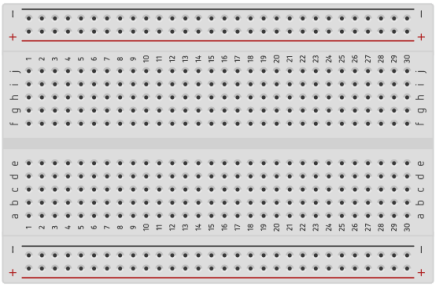

Fig. 2. BreadBoard

Another important component used is the 16x2 LCD screen, shown in fig. 3, which is electronically controlled by a numeric and alphabetic character decoder.

It can display a text of 32 characters, 16 on each of the two available lines. Liquid crystals are substances that have common properties of two states of aggregation, liquid and solid. The molecules that make up this liquid are arranged in the same way as crystals.

These crystals have the property of being able to be controlled by electrical voltage, so they order their molecules from "transparent" to "non-transparent" state.

It is an electrical polarization of liquid molecules that in contrast to the rest of the "field" form a visible image. In other words, the crystals will allow light to pass through them or stop it, causing the pixels to light up in the right colors and compose the image we see on the screen.

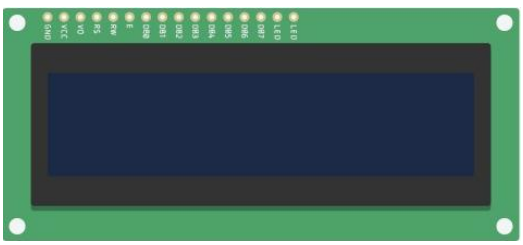

Fig. 3. 16x2 LCD Screen

The potentiometer, illustrated in Fig. 4, is an analog, passive device used to change the value of resistance or voltage in the range of 0-5V in a circuit. The voltages correspond to digital values of a range

0 - 1023, directly proportional to the applied voltage. It has 3 pins: the first is for GND, the second is for the connection to the A0 output and the third is for the value of 5V.

Fig. 4. Potentiometer

The analog temperature sensor, Fig. 5, generates the signal according to the ambient temperature. It provides a voltage at the output that is directly proportional to the temperature in degrees Celsius. It operates with a supply voltage of 2.7… 5.5 V.

Its operating range is from -40 C to + 125 C. The sensor is connected to the Arduino Uno board, as follows: we orient the sensor with the convex side I hope and the left pin is connected to 5V, the middle pin to an analog pin, and the right pin to GND.

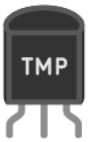

Fig. 5. TMP36 temperature sensor

LEDs are semiconductor diodes that emit light at direct polarization and have pins of different lengths, the long one is called the anode (+), and the short one is called the cathode (-).

The value of the current used to light a 5 mm LED is 20 mA (direct polarization).

An LED connects to the Arduino Uno board as follows: the left pin (right pin) connects to the GND, and the right pin (bent pin) connects to a 220 Ω resistor and the latter connects to a digital pin. The RGB LED has four legs, as shown in the picture, but can have two.

The RGB LED changes color to red-green-blue in succession when connected to a battery. At maximum intensity (255) it displays white, and at minimum intensity (0) it displays black. By combining LOW (0) and HIGH (1 ... 255) we can get any color.

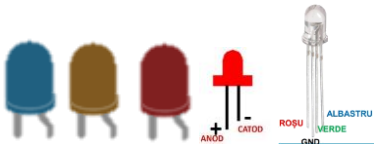

Fig. 6. LED

Connecting wires, fig. 7, are wires that connect the BreadBoad to the Arduino Uno board and mediate the connections between the electrical elements assembled on the BreadBoard (with the «+» and «-» zones). They can be of three types: male-male threads, female-male threads and female-female threads.

Fig. 7. Connecting wires