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DAMI 4.0

M Haseeb Asif (TUB, mhasif@kth.se)

Eric van den Berg (UR1 eric.berg@etudiant.univ-rennes1.fr)

Khushdeep Singh Mann (KTH, ksmann@kth.se)

Ruizi Liu (KTH, ruizi@kth.se)

Dmitrij David Padalino Montenero (Unibo, dmitrij.padalino@gmail.com)

EIT Digital Summer School I&E students project report

EIT Digital Summer School 2019 - Industry 4.0

Jul 22 - 02 Aug

Bologna, Italy

The EIT Digital – European entrepreneurs driving digital innovation & education

EIT Digital

August 2019

www.eitdigital.eu

Table of contents:

Executive Summary	2
Problem and solution	2
Business modelling and planning	4
Business modelling	4
Business planning	6
Business development process	10
Self evaluation	13
Haseeb Asif	13
Eric van den Berg	14
Ruizi Liu	14
Khushdeep Singh	15
Dmitrij David Padalino Montenero	16
References, web links	17



1. Executive Summary

During the Summer School we had the opportunity to learn a lot of stuff about Industry 4.0 and start-up planning. Along the two weeks lots of experienced people and professors shared their knowledge with us.

Our coaches were Peter Langela from University of Twente and Giacomo Venezia from Almacube. They were always very helpful in the very first part of the school during the team building phase and they gave us a lot of useful tips during the project work. Peter also was the one in charge to introduce us to the start-up topics in particular his lectures were:

- Business modelling and tools
- Team management
- An optional lecture on Blockchain

On the other side different professors took lectures on Industry 4.0 field, in particular:

- Prof. Nelson Fonseca from Brazil introduced us to Edge Computing for Industry 4.0.
- Sergio Vallesi showed us ethics and sustainability in Industry 4.0.
- Prof. Luca Foschini has taken a lecture on Fog Computing.
- Joe Weinman talked about the latest trends in the Industry 4.0 and their applications and best practices.

We also had the chance to listen to other people about the following topics:

- Workshop on public speaking by Andrea Pauri from TEDX Bologna.
- Marketing Lecture by Massimo Giacchino.
- Start-up Finance Lecture by Massimo Aliberti.

During the two weeks we had to work on a team project based on the use case proposed by SACMI, an industrial plant manufacturer based in Italy. The final goal of this school was to present to a jury the results of our project in terms of a complete start-up business plan.

2. Problem and solution

The industrial sector is key for the economy of the EU, and remains an important growth engine. The manufacturing industry in specific comprises of 2 million companies, and is responsible for 33 million jobs in the area. It is also responsible for more than 80% of exports and 80% of the research and innovation done in the private sector.



At the same time, it has become evident that a new industrial revolution has emerged, the fourth industrial revolution, which has come to be recognized under the name *Industry 4.0*. Industry 4.0 is going to change the way manufacturing is done: it will help factories increase their production while having less costs, and less need for human interventions.

	Time Periods	Technologies and capabilities
First	1784-mid 19th century	Water- and steam-powered mechanical manufacturing
Second	Late 19th century -1970s	Electric-powered mass production based on the division of labour (assembly line)
Third	1970s-Today	Electronics and information technology drives new levels of automation of complex tasks
Fourth	Today-	Sensor technology, interconnectivity and data analysis allow mass customisation, integration of value chains and greater efficiency

Table 1. Industrial revolutions

Industry 4.0 is expected to have a major impact on global economies and it's going to disrupt how industry is working, in terms of efficiency, productivity e.g it can deliver estimated annual efficiency gains in manufacturing of between 6% and 8%[1]. According to Boston Consulting Group Industry 4.0 will contribute 1% per year to GDP over ten years for Germany.

SACMI, one of the largest manufacturers of plans in Italy also realized the importance of industry 4.0. They have realized the upcoming industrial revolution and want to be on the forefront in the competitive market. They want to explore how we can address the challenges in the industry and leverage the gazillion of bytes data being generated. Hence they asked the team to propose products/services and related business models that address one or more of the following challenges

- Enabling cross-customer, cross-plant analytics
- Artificial intelligence exploitation
- Assess the value of open, interoperable data exchange between parties, both B2B and B2B2C
- Exploring B2B2C in manufacturing
- Identify value for customers
- Identify value for end-users

We did a market analysis and realized that the industry sector is already generating a huge amount of data. Most of the manufacturing plants are moving towards the internet of things (IOT). As per Deloitte [2], one of the major obstacles to harness the power of industry 4.0 is the lack of vision on the part of the leadership. Leadership needs to understand the value of this technology and invest in the future, rather than looking for a return on investment in the short term. Furthermore, data is being stored in different silos of different departments at manufacturing plants, which is a serious issue when trying to harness the full potential of this data.



According to a Deloitte survey [2], only 15% of data is actually being used out of all the data generated. It includes existing financial, sales and marketing data, as well as new IOT sources of data. Having said that, we spotted a big opportunity to explore the intersection of existing data, among which sales, with newly generated IOT data, to generate insights for companies to improve their decision making.

We are proposing DAMI (Data analytics for Manufacturing industry), a platform to ingest industrial IOT data and existing datasets, such as for example sales, finance and which will provide insights for the companies involved. It is going to be a web platform and different organizations need to integrate with this to contribute into the ecosystem in order to build more strong machine learning algorithms.

DAMI offers three major services:

1. Firstly, Industrial monitoring will be provided purely based on the IOT data to allow the plant owners. It enables to monitor and control their plants from anywhere on the planet.
2. Secondly, predictive maintenance will help them to reduce the downtime and disruptions in the production line. It will tell when is the right time to do the maintenance for certain machine, neither too late to have down time, nor too early to save the maintenance cost.
3. Last but most important one, real time control of production based on the real time sales, marketing, finance and other data sets. For example, if we have a higher number of sales in certain region, it will adjust the production line to meet the demand or vice versa.

Having explained all the main elements related to the problem we found and our proposed solution, it is time for us to delve into the business modelling, and planning, in the next section, section 3.

3. Business modelling and planning

3.1 Business modelling

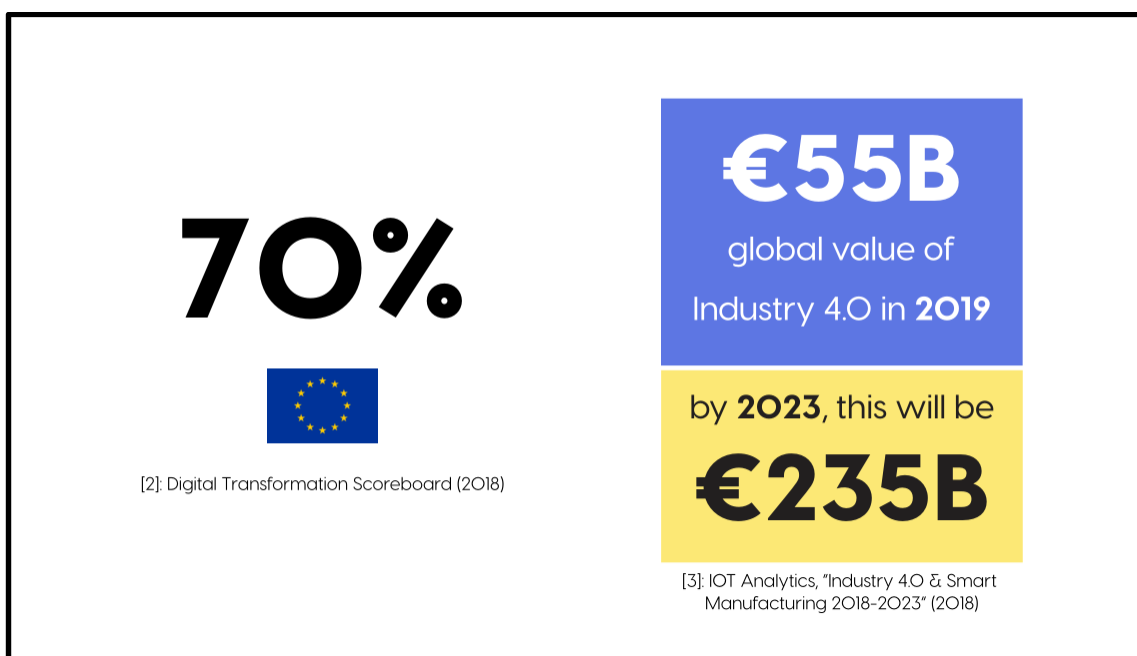
The business model will be based around the three services offered by DAMI. As the first service is really important for our data collection and a base for our further offerings, we are prepared to offer this service for free to our customers. It is both a way to get to know each other and to start building the models needed for the other two, paid, services.

These paid services are where we expect to make the money to make our business viable, and eventually thriving. As no two business clients are the same, we do not have regular pricing schemes. Prices will be defined after having a meeting set up with the firm. When we have a good idea of what we can provide the customer, and against what price, we work out a deal that satisfies both parties. So, our business will be one based on a quote-based pricing model: one firm might have to pay (just) 200 thousand euros, another up to a million, it all depends on the resources they need from us, what we think these services are worth to them, and how much they will cost us to provide.



The value we provide to our manufacturing clients is an improved insight into the whole production cycle, allowing them to make optimizations wherever possible, and saving substantial money on the bottom line. Optimizations could take place in the manufacturing process, in the supply chain, or in the warehouses, among other possibilities.

A few firms that we identified range from Airbus and Lamborghini, to Vattenfall. Firms that are located in Europe and that are part of a B2B2C relation in which they are the second B, a business that uses machinery from another business that specializes in the production of these machines (like SACMI), and that delivers to an end-customer (the C - consumer - in this relationship). There is the possibility to shape our services for one industry at a time, in order to work on existing patterns, and to reduce our operating expenses.



Industry 4.0 is an interesting market to operate in. In 2019, it has a global market value of 55 billion euros. In 2023, this is expected to have risen to 235 billion euros [3]. Another interesting statistic, as seen in [4], is that 70% of firms in Europe say that they invested into digital technologies in the last 5 years. Over the coming years, Industry 4.0 will take a larger and larger cut of this money that is being invested by firms, especially when they are more involved in this area.

Overall, we believe our solutions have the potential to bring a lot of good to the world. Improvements in manufacturing processes, supply chain and/or warehouse operations, can lead to considerable reductions in manufacturers CO² emissions, and help us in reaching the goals set in the Paris Climate agreement.

We feel it is our duty to inform the public of the optimizations that can be made in the production process of most, if not all, of the products consumed that have their origins in factories. Having this ethical edge on our side, we expect to be pushed forward by all actors in the environment that we plan to operate in: more on that in our business planning section.



The value proposition of our project is to help the Industry 4.0 enabled companies to improve their business by better exploiting their data. In particular the idea is to merge the new generation data coming from industrial plants and the already existing data from the business division in order to better support the decision making process.

Talking about the value chain, our cloud platform brings values at different levels. Starting from our customer the idea of having a “big brain” to support the decision making process is a crucial factor to get more insights from their data in terms of production and sales to improve the production performance, cost saving and logistics. These data are shared with the industry plant manufacturer in order to improve their quality and performance as well.

3.2 Business planning

3.2.1 Global market trends

Our mission is aiming at analyzing the manufacture and make these organizations get a unique look into their business to help them find ways to work better. Here we did some research on industrial analytics market.

In 2018, Zion Market Research published a new report titled *Industrial Analytics Market By Software (Operational Analytics, Marketing Analytics, Customer Analytics, Risk Analytics, Financial Analytics, And Workforce Analytics), By Analytics Tools (Predictive, Prescriptive, Descriptive, And Diagnostic), For Verticals (Manufacturing, Energy, Retail, Telecommunications And It, Transportation And Logistics, And Others): Global Industry Perspective, Comprehensive Analysis and Forecast, 2017 – 2024*. According to this report, the global industrial analytics market was valued at approximately USD 12.79 billion in 2017 and is expected to reach approximately USD 37.03 billion by 2024, having a CAGR of around 16.4% between 2018 and 2024.[6]

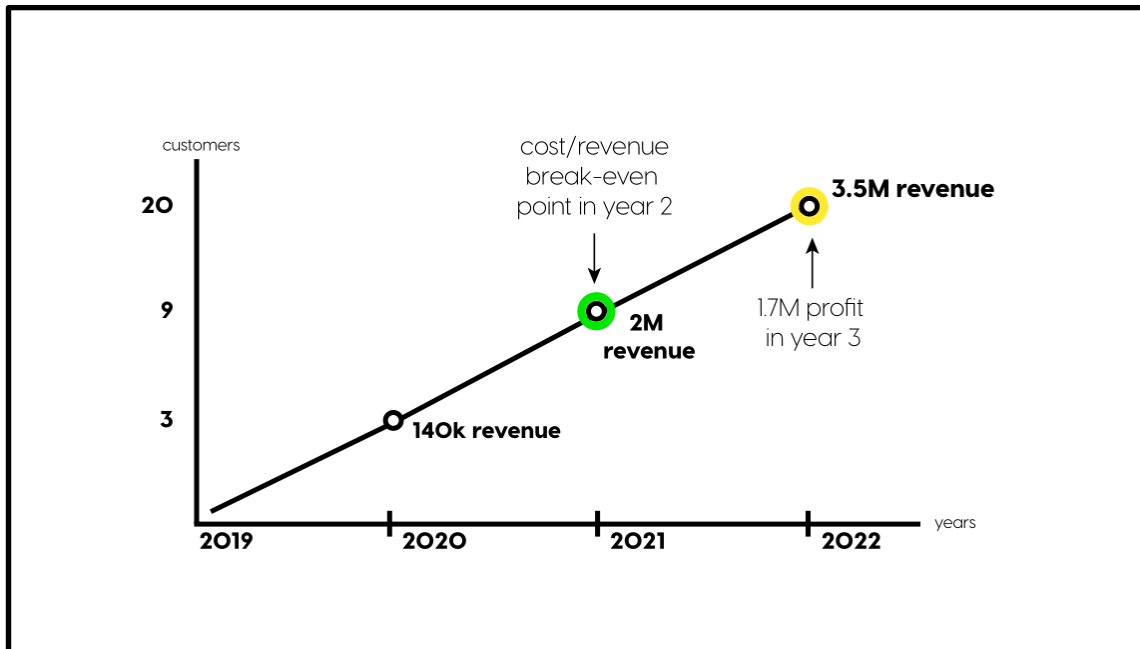
The advancement in IoT in manufacturing was predicted to promote the need for manufacturing analytics market. Furthermore, the introduction of advanced data analytics, such as Big Data in the manufacturing process, is further expected to boost the demand for industrial analytics on the global level. With the development of Germany Industry 4.0, Europe has gained massive momentum in next-generation manufacturing technology, which could lead to an increasing need for industry analytics. Besides, the implementation of IT and OT will lead to an increased demand for smart manufacturing in Europe.

Predictive analytics is considered one of the most critical technologies in advanced manufacturing. Manufacturers are expected to benefit from this analytics data technology to achieve improvements in their manufacturing processes. Over the years, increased plant safety has been one of the main concerns of the manufacturing industry. Also, machine failures cause severe production losses in the manufacturing industry. The need for better safety reduced costs and machine utilization is driving the global market for manufacturing predictive analytics. A study shows that predictive maintenance can save the world's manufacturing industry by as much as \$700 billion over the next 20 years.

3.2.2 Financial forecast



According to the financial plan that we created, the following plot depicts the difference between the estimated revenues and the expected expenses for the first three years of activity. As we can see by analyzing the scenario, the break-even point will be reached two years after the final launch, therefore at the beginnings of 2021.



Revenue

The following is how we gain income. We identified one primary source of revenue: a subscription-based fee. We provided three different services which are classified into two categories. In order to get traction and have more user data in our platform, the monitoring service is free to our customers. Only if they are willing to implement IoT data collecting devices and let us access to their data. Another two services, including predictive maintenance and real-time control of production, will be costly. The price will depend on the company's size and the amount of data that they want us to analyze. Our experts will be sent to their plants and evaluate the organizations, and then we will make the customized price for each customer.

The predictive maintenance service fee is charged by the month. The monthly subscription fee for the predictive maintenance service ranges from 10,000 € to 20,000 €. Customers will pay us the contract fee and the first-month subscription fee. Because of the low price, even small and medium enterprises could



afford, and we could gain ten to twenty users in the first year. In terms of real-time control of production service, we were planning to charge a yearly fee. The price ranges from 1,000,000 €, which is very expensive for most companies. So, we expect to gain our first big user at the second or third year at the time our product will be more mature and famous in the market.

Thus, we consider the following reason to determine the expected revenues:

- 1) Firstly, we predicted the number of users that will be using our platform for each month based on the popularity, reliability, and marketing strategy. In the first six months (M6-M12) after the product launch, the number of users improved from 0 to 50. Maybe all of them are small manufacturers who are on the way to the smart industry.
- 2) From the total number of free-model uses, we determined the percentage of users that will be willing to pay for the predictive maintenance subscription based on the research. The research said that many companies have the ambition to increase their maturity in predictive maintenance. Nonetheless, we assumed that only 30% of the total number of them were paying for the service.
- 3) Afterward, we estimated that we would sell the real-time control of production service subscription after one and a half year. Since the six initial months will be used for developing the product. And another one year would be used to directly contacting managers.

Expenses

Personnel expenses



Salaries	<p>Our initial team is constituted by 7 people, including 6 cofunders and an internship.. The salary of each founder is 3000€/month and the internship student is 1500€/month.</p> <p>Members:7 Total Salaries: 234,000€</p> <p>With the development of company, we will recruit sales team. At the first quarter of the second year, we will have one sales manager whose salary is 3000€/month, and on the second quarter we will have two more ,and on the third quarter we may recruit another two salesmen. Other founders' salaries will increase to 4000€/month</p> <p>Members:17 Total Salaries: 507,000€</p> <p>On the third year, we will have twelve members working on developing the product and analysing platform. And we will also have a big sales team whose members will be up to 8.</p> <p>Members:26 Total Salaries: 1,308,000€</p>
Social Contribution	Regular meetings with manufacturers and other managers (100€ each trip and 2 people).
Fixed Expenses	
Insurance	Health and work insurance.
Rent Expenses (Building)	The company will be based in Bologna, Italy. Thus, an expense of 3000€/month was considered for renting an office in Bologna.
Utilities	Average of 100€/month for electricity, water and gas and 100€/month for telephone and internet.
Accountant	500€/month.



Starting up expenses	International brand registration: 850€ Company registration (in Italy): 360€
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Table 2. Expenses

4. Business development process

The team figured out that decision making process can be improved using financial & warehouse data along with new industry 4.0 data. Thus, a decision to have a platform for assisting manufacturing companies was made. The scope of this idea was evident in [3]. Next follows the solution modeling that involved data from financial sector, wear-house and smart industry devices. Accordingly, three different services were developed for the customers.

Business model explains the three services involving B2B2C partners and B2C participants. This model illustrates a loop DAMI-manufacturers-customer which is beneficial for each participating member.

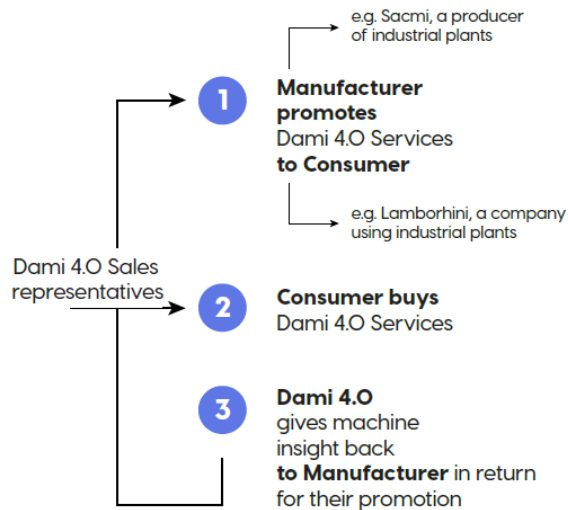


Business Model

Monitoring
as a service:

free

Predictive Maintenance & Real-time Control of Production as a service:
quote-based



The partner companies involved in this project were



[SACMI](#) - Leveraging open data interoperability for industry 4.0



[IMOLA INFORMATICA](#) - Software development, Data governance and Cybersecurity

Initially the team members came up with rough ideas for the challenge. Later, we had fruit-ful discussion with coaches, SACMI professionals, lecturers and, few colleagues. At times, we also approached the company to gain more insights on the finances part for ex. approaching Matteo Tellarini from SACMI group. Based



The team was able to find solutions which included for B2B2C and B2C participants. Accordingly, the idea of having three services of monitoring, predictive maintenance and real time control of production were developed.

The team members helped in building the solution with their different background experiences. At times when things were not clear or the team had conflicting ideas, the team undertook the brainstorming approach and made a final decision considering all the suitable factors.

At present, the team was able to deliver a possible solution. Next steps in the process are prototyping the service- forming the structure for the online platform. Testing this platform with the customers and industry partners. Incorporating all the feed-backs and finally providing the service. The team visualises to have a fully autonomous service in the near future.



5. Self evaluation

OUR TEAM



**Muhammad
Haseeb Asif**

CEO



**Dmitrij David
Padalino**

CTO



**Ruizi
Liu**

CFO & Marketing



**Khushdeep
Singh**

Operations & Sales



**Simone
Bagnolini**

Big Data Engineer



**Eric
Van den Berg**

Information & Design

Haseeb Asif

I brought a lot of industry experience to the group and couple of failed start up attempts lead to selection as a leader, CEO, of the group. Additionally, my previous studies helped me as well to understand the problem and process better. In my role, I was responsible for the execution of the whole project end to end and overseeing all the elements while keeping customers need aligned. I contributed towards the technical solution of the production itself while working with the rest of the team. I contributed towards the integration and decision making that how data is going to flow from machine to the cloud, how different apis need to be integrated. Additionally, I provided input on the business side for financial planning. We forecasted the 3 years financial plan and determined our expenses and revenue. we calculated our break-even point and forecasted when are we going to profitable. Lastly, I lead the decision for initial investment amount for how much equity.



Overall, it was an amazing experience to execute from an idea to a whole company with all the possible details including the market entry strategy, financial planning, business model and value proposition. We learnt a lot of new things related to finance especially, what is a balance sheet, how dividend works and a lot more. Furthermore, we learnt how to do the competitor analysis

Eric van den Berg

Since having been really close to launch my own start-up almost six years ago, I have been keen to try and find out the essential elements that can make or break a startup. So, I have been focussed on organizing all the information that came out of group discussions, and making sense of it, in a way that could be presented to the public in a decent presentation.

This was only possible by trying to understand the mind of those that spoke out when we were still trying to formulate our initial business idea. After some serious discussions, it started to click for me, and it was time to work on the design of the presentation. A continuous loop between me and the rest of the team was needed to make sure that we kept operated as a single mind. On different occasions, this proved to be rather difficult but in the end I think we can be satisfied with the final presentation, and the final delivery of it by Haseeb.

Personally, I was really surprised to see how quickly the group started to merge together, and show actionable results, despite being so diverse in nature. Another thing that was interesting to note, is that the group started to operate more smoothly when tasks were distributed and everyone had found some kind of purpose within the project. The time spent in the phase before this, could have been organized better, I think, but that is on Mmly in hindsight. It is always a struggle to overcome the first part of the project where everyone still operates from within their own sphere of ideas: understanding, validating and possibly merging them is tiresome for all involved.

I must confess that I myself am still not sure of the best way that this problem can be approached, to reduce as much friction as possible. It is something that definitely can be improved when looking at my own competences, especially because when focussing on this task of organization, one tends to lose the ability to give valuable new input to others, somewhat restricting the creative abilities as a group.

To conclude, I was really satisfied with the whole experience. The group was great and the project was concluded in a way that I didn't dare to imagine when it started. It is surprising to see what a group is capable of in only two weeks, with a little bit of dedication!

Ruizi Liu

The team was composed of six talents from different fields. Haseeb has years of experience in starting a business, so, he could always take an objective and calm approach to the idea and the issue. Dmitrij has excellent communication skills, which helped us get more knowledge from our partners (Sacmi) and other experienced managers. Khushdeep has always been with creativeness. His cooperation in market research with Simone helped us understanding business objectives and designing surveys to discover prospective customer's preferences. Eric played a role in clearing our head and preparing the organized presentation.



It took us nearly a whole week to clarify our task and know what we should do for the project. That's a time-consuming process. Because we are all first time in this Industry 4.0 field and what we came up with were based on the original experience and the guess. This kind of uncertainty hampered the development of our project. So, we should conclude our confusion and the statistics that we want to know. Then contact with Sacmi at the very beginning. I thought we had done well in the second week. Each member had their part to contribute to the project after setting the solution and the goal.

My job was doing a financial plan with Haseeb. The financial plan was a late part of the whole project process. Until establishing the business model that we could go about this part. I did much research such as how other startups budget at the beginning, what the reasonable price of office expenses. The most challenging thing was estimating the revenue. According to our business model, we are providing customized services to our guests, so the revenue value is not constant. Fortunately, we had the financial and marketing course during the second week. The professor gave a speech about how to price the product and do the business plan for a startup, which helped us a lot. Moreover, we also consulted the professor and asked him to advise on our financial plan, from the detailed expenses to the reasonable service price.

During the whole project process, besides learning how to make a financial plan, I also got other kinds of abilities and experience. What impressed me most was the introduction lessons about Industry 4.0. From which, I came to realize that the current trend in the intellectual industry. The hot terms, including cloud computing, fog computing, artificial intelligence are all related to this field. Both the lectures and the whole project broadened my horizons. Also, accompanying lectures about how to establish a startup and which aspect you should pay attention to at the beginning of the development were all helpful and practical.

What's more, I also learned a lot from my teammates. They are skillful in a different part. I am not good at communicating. However, Dimitrij gave me an excellent example of how to take advantage of this skill to network and catch the opportunity. Eric told me how to make a precise and advanced pitch Powerpoint. Haseeb shared his experience in startups with me, which helped me choose my future career.

Finally, I am thankful to have this experience, aiming at one goal and going all out to achieve it with so many excellent guys.

Khushdeep Singh

I have always been fascinated by technology and its inventions. Being from a research background in laboratory, I was always curious to understand the structure of industries and co-operations that implement technical innovations and serve the market. EIT Summer School provided an excellent opportunity to do so. As a young engineer I always aspire to work on cutting edge technology, this summer school provided insights on industry 4.0 led by smart machines developed on the basis of Machine Learning, Artificial Intelligence, Internet of Things. Personally, it was a great experience for me to interact with industry professionals and to understand how they are shifting from traditional means towards smart manufacturing.



The team composed of six people with different backgrounds and brought in different experiences. Initially we were unclear about the idea and how to make it happen. The organized guest lectures helped us to understand various tasks and how to tackle them. During the initial phase we had brainstorming sessions wherein our personal experiences, guidance from coaches and partners like sacmi assisted us to become more concrete. After about a week we gained insights to the problem and started to work in a focused way. At the same time, the team divided the responsibilities amongst the members for smooth functioning.

I brought in research experience for developing DAMI 4.0 solution. This involved technical services like frequent monitoring and real time control of the production. My past academic experience in performing case studies for companies, I was able to contribute well in developing the business model. This involved having a loop for DAMI -manufacturers-customers. Later I worked with simone on the market analysis. As I did not had any previous marketing experience, this exercise was beneficial for my personal growth. It was interesting to read that more and more companies under European Union are investing in industry 4.0 and it will soon be a billion euros market.

At last, it was a good learning experience which involved understanding company challenges, analysis and forming business models, developing financial and market ecosystem. Personally, I learned many new things and my aim of getting insights in different tech manufacturing companies was fulfilled.

Dmitrij David Padalino Montenero

The team was composed by six members with very heterogeneous skills a crucial factor for the success of the team project. Haseeb was the CEO and thanks to his calm and his ideas we were able to find the features that our product should provide to the customers. Khushdeep and Simone performed the Market Analysis in order to understand which market challenges have to be faced in order to release a good product. Ruizi was in charge to develop the financial plan with Haseeb and Eric has done a great job in creating the presentation for the final pitch.

Thanks to my previous work experiences as developer and computer engineer I was able to play the role of CTO. Since I've always worked in a team, from the first day of the team work I've tried to coordinate all the operations that led to the project presentation. Among the group I was probably the one that better understood the problem to solve because it is very close to my knowledge background. For this reason the first project week has been not so easy because we needed to share all our backgrounds in order to find a strong idea from which the project could start. At the end the idea to release the cloud platform called DAMI 4.0 came from my mind but most important was the contribution of all the team that let us to refine better how DAMI 4.0 should work. The second week has been very strict in terms of work to do so I understood that we needed as team to change our way to work on the project so I had the idea to assign to each of the team member a different task. I can say that this was definitely a turning point for us because since then we were able to complete the project in a smooth way. Also along the two weeks I've always tried to share my experience and my doubts with the other teams to contribute better to the my one and in order to avoid any kind of misunderstanding for the project work I've always get the help from the coaches and from the company which assigned to us the project work.



I've never participated to a summer school in my life before this one and I can say that I'm very satisfied from this experience. To be honest I expected more technological details about the Industry 4.0 state of the art however what I found were different lectures on introduction to the industry 4.0 field. Most part of the two weeks were focused on how to build a start-up from scratch and of course I've found that lectures very interesting, I had the opportunity to listen to a lot of very experienced people and professors from all over the world. For sure another big value of this summer school were the students, I had the chance to share a lot with interesting people from different cultures and during the team work I've improved significantly my communication and management skills.

Finally, I'm very happy to have experienced this summer school and having the opportunity to work with wonderful and smart people.

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