Template for submitting a proposal to Switch2Product competition:
Adapted version for the students of the Communication & Argumentation course

Name of the Project – **Smart Current Clamp**

Describe your project in less than 140 characters (Tweet):
A smart current clamp that provides old machineries with new machine learning technologies to reduce the risk of machine downtime periods.

Are you already registered as a company? **No**

Select the primary industry of your project: *[select one]*

- Health & Biotech
- Climate Tech & Cleantech
- Industries Transformation
- New Ways of Working and Living

Select which technology your product uses: *[select one]*

- AI, Big Data, Machine Learning
- Cybersecurity
- Blockchain
- Photonics
- IoT, Sensors, Electronics
- Advanced Materials
- Robotics & Automation
- Drones & Aerospace
- Quantum Computing
- BioTech & Healthcare
- AR & VR
- Other

Describe your project (2500 characters)

Provide a description of what you do, of your product/service and an explanation of the problem it solves

The term “machine downtime” refers to those periods of time in which industrial machineries don’t work due to unexpected faults. This is one of the most serious problems in the manufacturing industry since, as a consequence, the production has to be stopped, employees cannot work, and the company loses a lot of money.

According to a research conducted by the Aberdeen group, in the last 3 years, 82% of manufacturing companies have experienced machine downtime periods which have led to average losses of 250’000 € per hour, reaching up 3’000’000 € per hour in the specific case of the automotive industry.

It is possible to reduce the risk of machine downtime periods by preventing faults. One of the most effective ways to prevent faults is to collect and analyze data related to the electrical consumption of industrial machineries. The problem is that only modern Industry 4.0 machineries are capable of collecting and analyzing this kind of data.

In the world, only 28% of manufacturing companies are 4.0 while the remaining part doesn’t have machineries capable of collecting and analyzing data useful to prevent faults. In Italy, our target market, the situation is even worse: only 14% of manufacturing companies are 4.0 while the remaining part is critically exposed to the risk of machine downtime periods.

To reduce the risk of machine downtime periods, our idea is to develop a smart current clamp that can be easily clamped around to the power cables of non 4.0 industrial machineries and that is able to automatically collect and analyze electrical consumption data in order to prevent faults in real time.

The smart current clamp is cheap, easy to install and can provide old machineries with new fault prediction functionalities that only machine learning can offer. As Google's Chromecast allows old televisions to take advantage of the functionalities of modern and expensive smart TVs, so our smart current clamp would allow old machineries to take advantage of the functionalities of most technological ones.

Competitive Scenario (2500 characters)

Describe who are your main competitors and how you are different from them

There are many worldwide players that offer fault detection systems and that operate also in Italy. They can be divided in 2 categories: the ones that analyze data in real time and the ones that analyze data not in real time.

As for competitors that analyze data not in real time (such as Loop Systems, one of the biggest players in the field of fault detection), the problem is that they focus on the "a posteriori" understanding of the problem instead of the "a priori" prevention. We don't only want to explain the causes of machine downtime periods, we also want to prevent them so that companies don't lose money.

On the other hand, there are competitors that focus on real-time fault detection. Numenta is the leader of this category. The problem with its software is that the fault detection algorithm has been developed considering only stock prices data (a completely different field with respect to ours) so it performs poorly when applied to our field. Other important players in this category are Avora, AnoDot and Splunk Enterprise but, just like Numenta, their algorithms are not specifically designed on electrical consumption data, therefore they won't perform well enough for our goal.

Among all the differences between our competitors and us, the most important one is that they start from the assumption that companies are already able to collect data, therefore they offer "software-only" solutions to analyze it. The point is that 72% of companies in the world are not 4.0 and their machineries don't have the possibility to collect data, so this assumption is not valid. To fill this gap, we provide a "software + hardware" solution that also gives to companies the possibility to collect data that has to be analyzed to prevent faults. We give to companies that are not 4.0 and that are currently excluded from the market the possibility to enter it.

For what concerns the market, in the world, only 28% of manufacturing companies is 4.0 but our plan is to start focusing on Italy, where the situation is even worse: according to ISTAT data for 2022 there are 3.7 million manufacturing companies and only 14% of them is 4.0. Among all the companies, we will initially focus on the largest ones (about 1 million) which, having a higher number of machines, are more exposed to the risk of machine downtime periods.

BUSINESS MODEL (EVEN IF IT IS AN HYPOTHESIS) (2500 characters)

Describe how you are or will generate revenues

Our idea is to sell smart current clamps directly to those companies that want to install them on their non 4.0 machineries.

High quality current clamps are easy to find on the market (for instance, on Alibaba, where the price is lower than 20€). In addition to the cost of the current clamp we have to consider the cost of the hardware components on which our machine learning algorithm will be installed (about 15€) and the cost of a network interface card (about 15€) that is necessary to send an alert to the person in charge when a risk of fault is detected.

The cost for all the components is around 55€. To this we have to add the cost for the assembly. Our idea is to buy everything from one of the different electronic components vendors that we can find on Alibaba, to ask him to assemble all the components and to install our software on the clamp. These custom orders are currently priced under 20€ per unit. The total cost will therefore be 75€/unit.

The smart current clamps will be sold at a unitary cost of 250€, which is more than affordable for any manufacturing company.

We plan to start from the Italian market as it is small enough to allow us to easily manage warehouse and logistics and, at the same time, it's large enough to have a sufficient number of customers (3.2 million manufacturing companies that are not 4.0). We will start focusing on the companies that have a high number of machineries since they feel the pain of machine downtime periods the most.

In the long run, the number of 4.0 companies will increase and therefore our sales will decrease: the smart current clamps will be replaced by the functionalities of modern machineries. For this reason, our plan is to contact manufacturers of modern machineries to sell them our algorithm. We will be a better choice with respect to our competitors since our algorithm is specifically designed for electricity consumption data. Moreover, our solution is more robust than designing a new algorithm from scratch since our algorithm will have been tested for years and will have been improved using feedback from our clients (that will also be the buyers of their modern machineries).

What is the level of maturity of your technology?

- Idea
- Lab Prototype
- On Field Prototype
- Commercialized

Describe the technology behind your project* (2500 characters)

Describe the technology underlying your product/services: how it works, its main features, estimated cost and benefits

Standard current clamps are already available on the market: they're electrical devices with jaws that allow the clamping around electrical conductors (such as alimentation cables of industrial machineries). They are used to measure the current flowing through conductors.

In addition to standard ones, our smart current clamp will be equipped with a built-in touch screen that is used to insert the phone number of the person that has to be alerted if a risk of fault is detected, with a network interface card needed to send alerts, and with hardware components that will host our machine learning algorithm for the fault prediction (specifically developed for the field of electricity consumption).

The setup of our smart current clamp is extremely easy: the only things to do are to insert the phone number of the person that has to be alerted if a risk of fault is detected and to clamp the device around the alimentation cable of the machine that you want to monitor (as a standard current clamp). Given that the set-up is so simple, buyers can install the smart current clamp by themselves, without the help of a technician.

Once attached to the machinery, our smart current clamp starts measuring the electricity consumed. This data is provided in input to our fault prediction machine learning algorithm that learns to recognize the standard consumption of the machinery.

The smart current clamp needs a week to learn what the standard electricity consumption of the machinery is. The reason is that the algorithm has to understand if the machinery works, for instance, only during the day from Monday to Friday or also during nights and weekends. Over time, the algorithm will become progressively more accurate as it has more data to work with.

The fact that the algorithm is able to learn the weekly-schedule of the company is very important for effective prediction of faults. Our algorithm is able to recognize this weekly pattern because it is specifically designed for the electricity consumption of industrial machineries while our competitors' algorithms are trained on different kind of data that don't present these kind of regularities (such as stock prices, that don't have a weekly trend) and are not optimal for this task.

Technology Roadmap* (2500 characters)

Describe what are the next steps and milestones needed to reach your goals

In the following, we will discuss which are the steps that will lead us to the implementation of our solution. Please note that the development of the fault prediction algorithm is not mentioned since it has already been developed during the thesis work of one of the members of the group, therefore it is still available.

Milestone 0

1) We will start looking for suppliers available on the market that are able to produce a prototype of the current clamp equipped with all the components that are needed to host and support the fault prediction algorithm.
2) We will compare the various prototypes and then we will choose the best one according to a "value for money" criterion.

Milestone 1

1) We will promote our product starting from the largest Italian manufacturing companies. The reason behind this choice is that they have a high number of machineries, therefore they're more prone to the risk of machine downtime periods. Companies will have the possibility to try samples of our product and see how it works.
2) In the initial phase we will adopt a "production to order" approach, therefore we will ask companies how many current clamps they need and then we will send an order to our supplier. In this way we reduce initial production and warehousing costs. Notice that we will order a slightly supernumerary quantity of required products to cope with factory defects and other unforeseen events.
3) We will ask companies for feedback in order to improve our product but also to promote the smart current clamp to other companies.

Milestone 2

1) Once we have consolidated our position on the market, we will adopt a "production by warehouse" approach in order to reduce the delivery time of the smart current clamps.

Milestone 3

1) When the number of 4.0 companies will begin to increase and our sales to decrease, we plan to contact manufacturers of modern machineries to sell them our algorithm. This solution would be advantageous for them since they would have an algorithm specifically designed for the electricity consumption and that has been improved using feedbacks of our customers, future buyers of their modern machineries.

Did you think about how to protect your idea? Yes/No

Has the research been pre-disclosed by the inventors? Yes/No

What has been disclosed?

- Thesis
- Paper Publication
- Conference Presentation
- Other

Has your research been financed?

- No, it is autonomous research
- Yes, we have been financed by a company (ex. Research agreement, framework agreement, PhD company scholarship, etc.)
- Yes, from a grant (eg. H2020, Regione Lombardia, etc.)

How many team members? **3**

What would be the most important thing to obtain for the future of your project, if you won?

- We need funds to complete this research and publish/patent our invention
- Winning the grant to get to a POC/MVP and being chosen for the accelerator program to understand how to validate our ideas in the marketplace
- Obviously we could use the grant, but the most important thing is to be chosen for the accelerator program. We believe our idea is very promising and we would like to learn what it takes to start a successful startup

How did you hear about Switch2Product?

- Website PoliHub
- Website Polimi
- Website Bocconi
- www.polilink.polimi.it
- Technology Transfer Office
- Social Media (Facebook, Twitter, Linkedin, Youtube, ecc…)
- Friends
- Professors
- PoliHub Events
- Other Events
- Roadshow MIP
- Roadshow E-Club Polimi
- Department Roadshow
- Press/Blog
- Other