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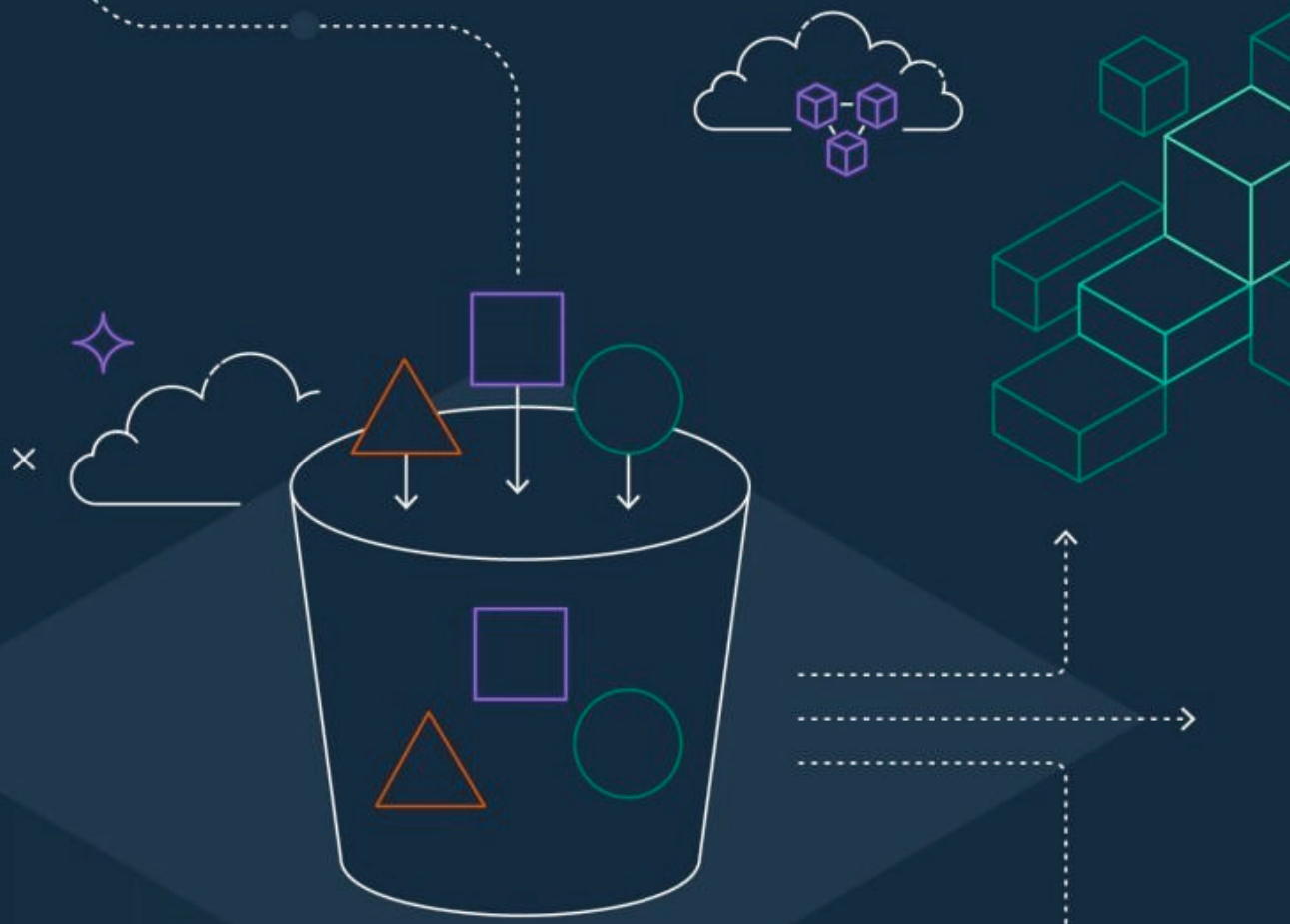

life.augmented

A+ Team

Team 26

Politecnico di Milano
MSc Management Engineering
Group project 2022

Leadership & Innovation
x
St Microelectronics

Note:

This project was part of the Leadership and Innovation course at Politecnico di Milano, conducted in partnership with ST Microelectronics. The team was made up of seven students, but information about the other members was kept confidential for privacy reasons.

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Executive Summary

Our project is oriented toward a broadening of the meaning of the current sensors.
To achieve this objective, we performed a deep investigation of the current reality: we proceeded aware of the historical moment, guaranteeing a conjunction between our proposal and the dimensions which are pervading our reality.
First, the perception of the **changing environment** has been strengthened by some events as the 2008 crisis, the pandemic, a war within the European territory. It predisposes to the will of a protection against adversities, which are not perceived remote as decades ago.
These facts affect all of us indistinctively, but even some more personal issues are arising, namely person-centric, like the **population is growing ever older, cases of chronic diseases are increasing dramatically, and healthcare costs are exploding.**
In parallel the medicine research progresses at an amusing pace but there is a vacuum left behind.
In parallel, we have highlighted that **our society is getting more used to the idea of being controlled**, this is not considered invasive anymore as most of us wears 24/7 a smartwatch.
This is testified by **Octo** for example. The underlying idea of this technology is enhancing the monitoring performed by the insurance company over the customer to allow a decrease in the fee charged to this one. It promotes the collaboration among different sensors, but Octo impacts the customer in a quite discreet way, because no instant response is triggered by the data provided in the daily life.
Despite its daily inactivity, it covers a very important function in case of car accidents, thanks to the installed camera for example.
What is missing now on the market is basically a convergence of the empowerment of the insurances (e.g., home, life, and health insurances) and the empowerment of the premises which pushes toward an insurance (not just the car policy).

The above-mentioned premises are clearly offered by our environment, as the chronic diseases and growing health care costs previously cited, but the response offered by the insurance companies is quite poor. They do not look like following the pace. The availability of monitoring instruments is getting wider and wider but the models which home, health and life insurances rely on, are quite outdated.
The turning point of our proposal is the exploitation of sensors for a better risk assessment for the insurance market and for a correction of the customer-insurance information asymmetry.

Analysis

02

User's needs analysis

Often, the starting point is a well-defined problem, as for example can be supposed during each meeting of the BCE over the last period. The rising inflation does relieve the participant from the burden of the choice about the possible problems to address, the signal is very clear.

But the "benefit of the boundaries" is not always granted. During an innovation project the boundaries are very faint.

The random overview of the life dimensions, from the relationships to the nourish needs, in our case was soon conveyed toward the risk axis every person must manage in the daily life. Every person, in every era, in every second has been threatened. By the witches during the middle-age or by the atomic bomb during the WWII. But the focal point of our era, in high-income countries are the chronic disease.

"The proportion of deaths worldwide caused by noncommunicable disease is projected to rise from 59% in 2002 to 69% in 2030" [1]

As this short abstract suggests, the alarm is launched not by the chronic diseases but by the trend these ones show.

"In 1990, more than 28 million (57%) of all global deaths were caused by chronic disease.
This number increased to 36 million (63%) of all global deaths in 2008 and 39 million (72%) of all global deaths in 2016" [2] (Fig. 1).

This rise of chronic disease might be biased in some way by the fact that over time, the mortality rates for infectious diseases have dropped with advancements of vaccinations, antibiotics, sanitation, and the development of prevention measures.

A **metaphor** for this point could be that the chronic diseases are the last survivors of a long list of killers over the human history and now the light falls just on them. The chronic diseases have advanced from the background to the foreground, while all the other menaces have been tackled.
Heart diseases, cancer, and diabetes are the leading causes of death and disability in the United States, this might offer a clear picture of the current evolution.
Given the magnitude of the issue, the straight line toward the prevention behaviours has been covered many times but this is not what this project is supposed to do. By the way, even in this case the list of them cannot be avoided, for a matter of completeness.

1. Mathers and Loncar, 2005 - Source WHO
2. www.sciencedirect.com/science/article/pii/S266633761930006X

According to the italian goverment, any chronic diseases are caused by the following risk behaviours:

- **Tobacco** use and exposure to second-hand smoke;
- **Poor nutrition**, including diets low in fruits and vegetables and high in sodium and saturated fats;
- **Physical inactivity**;
- **Excessive alcohol use.**

In addition to these should be highlighted that there are many shadows between the absence of chronical disease and the chronical disease itself, as for example high blood pressure, weakness for nutritional deficiencies such as iron, lack of vitamin D, unbalanced cortisone levels.

Many efforts have already been spent in order to convince people to put in practice some healthier habits but what will be proposed here is not simply a list of good advices, in a mother-like voice, but a powerful solution for the risk management. To not be confused with risk reduction.

Changing Environment

The need of risk management is supported by the changing environment.

There is a huge difference between being a diabetic in a river of a lake with a InsulCheck NovoPen 5, so kindly shipped to the customer, and being a diabetic in a river of lake, bucolic setting, and the Google News of the iPhone talking about pandemic, crisis, bitcoin oscillations, savings threatened by the inflation and other plot twists.

Probably it is just a matter of density. Each person, because of the increasing interconnection, must absorb not just the "vibrations" of its own area (psychological or physical) but even those which arise much further.

The other side of the coin, resulting from the empowered interconnection, is that each person has even the possibility of propagating its own oscillations further.

A perfect example is the GameStop bubble, which was generated by few, on Reddit, and affected many. The perturbation was pushed more distantly of what would have been possible 50 years ago.

The synthetical judgment is that we all live in an oscillating world. The vibrations travel through the system we live in, which is a "perfect electrical conductor" for the events, and affect us, even if they were generated in other continents.

If the pressure arose from the external world gets excessive, challenging the system and turning off the television might be not a great idea.
We must stay connected to be informed. For example, about the next law about the masque usage, or the next elections of a leader which will shape at least the five next years of our reality, or the next Google Certificate which can prevent your children from attending the college.

"When we think about the future we are fearful (73%) and insecure (75%) and this makes us more pessimistic than before the pandemic"

44% saw an increase in concerns about future working conditions

46% saw an increase in concerns about their school/university future

1. www.cdc.gov/chronicdisease/about/index.htm

Current response to needs

Unfortunately, simply setting the boundaries of a problem was not enough but to emulate the path of the development of the final idea the frame must be bifocal. The picture should be focused not only on the increase in the chronic disease or changing environment, but it should even embrace a different problem which is perceived to be not so urgent, but the turn of which probably has come, considering that all the instruments to tackle it are already existing.

The second point to introduce is the staticity of the risk assessment performed by the insurance companies.

It can be considered proven that the public is getting more exposed to the need of the risk management. The width of our lives is enlarged, in terms of our daily activities and possibilities. The length is enlarged too, and even in a less metaphorical way, considering that we are simply leaving longer lives on average.

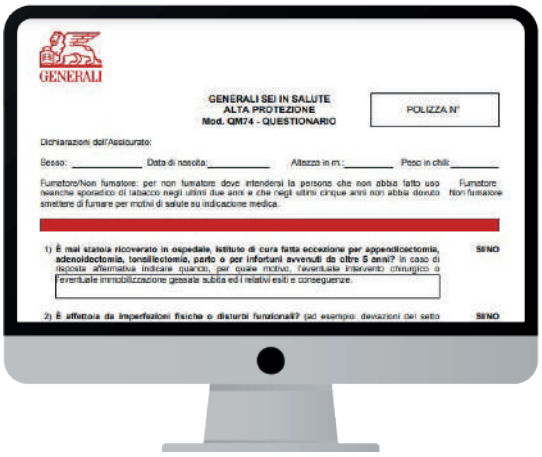
But the support offered to us is poor.

On the **first image** on the right it is reported an example of the packages offered by Generali, an insurance company very representative for its sector.

To adopt a cost perspective, on the **second image** it is shown an overview of the services related to the different packages.
It is noticeable that the costs they bear is huge, but the wisdom of these expenses might be argued to be not optimal.

The **third image**[1] provide the current source of data, the fundamentals which drive the displayed expenses of the insurance.

A life insurance company charges higher premiums for race car drivers. A car insurance company charges more for customers living in high crime areas. A health insurance company charges higher premiums for customers who smoke. But the current approach is unprecise and not dynamical.



Are the insurance companies at the height?

1. www.files.spazioweb.it/2d/c7/2dc7e2d5-bdd0-466f-8c76-54ade0cc5e77.pdf

Current changes in the insurance market

Even though the metaphoric accusation moved to the current insurance system relies on the fact that the progress in this field is not sufficient, it would be underserved not mentioning some movements which are currently taking place.

The pandemic has prompted many companies to develop new insurance products, in response to an increase in Italians' attention to these instruments. About additional 6.5 million Italians they were planning to take out an insurance policy. This is what emerges from the survey conducted by Up Research and Norstat. This is an endorsement to the fact that this sector deserves attention.
But as mentioned before, a simple change of the product offered is not enough. The real question is if the data collected by the insurer are really related to the services which are offered.

Current insurance companies work like fees, completely uncorrelated to the risk. And they manage the situation simply charging the customers accordingly to the highest level of risk which can be hypothesized. In this case the information vacuum is even damaging. It works exactly in the opposite direction where the insurances are supposed to go, and consequently brings even the customer back, because the offered product is not efficient. It is like thinking of a parked car or thinking of a one which is moving backward.

The concept of adverse selection

This undesired movement in known in the literature as adverse selection, a phenomenon which groups those bad decisions, such as doing more business with less profitable or riskier market segments, related to the information asymmetry. The insurance market is traditionally representative of this pattern, where the balance of information owned leans toward the customer, leaving the insurance companies with basically unreliable data.

Because of adverse selection, insurers find that high-risk people are more willing to take out and pay greater premiums for policies. If the company charges an average price, only high-risk consumers buy. The company takes a financial loss by paying out more benefits or claims.
As result the company increases the fees and has more money with which to pay those benefits. In contrast, customers who do not engage in risky behaviors are less likely to pay for insurance due to increasing policy costs[1].
Basically, they are driven out of the market.

The current situation presents a distortion if compared to the simple function the insurance is supposed to cover: the amortization uncertainties-related costs for the customers.
Each insurance can be conceived as a slider or a cursor on a line of precision with two extremes.
Insurance is a method for reducing individual risk by pooling with many others who have similar but not perfectly correlated (in ideal circumstances uncorrelated or even negatively correlated) risks[2].

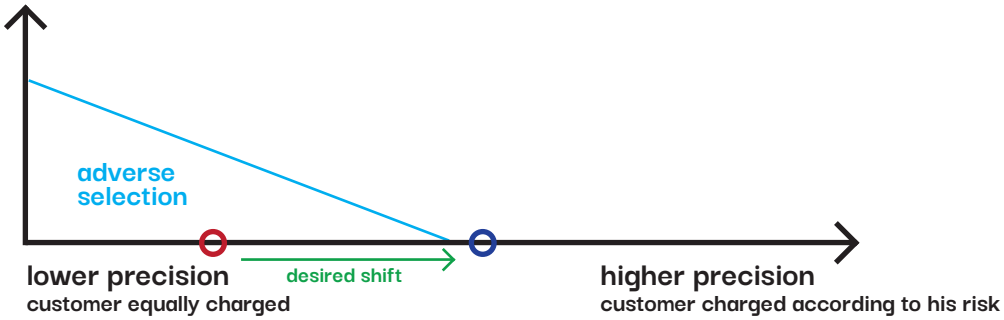
1. www.investopedia.com/terms/a/adverseselection.asp
2. www.princeton.edu/~dixitak/Teaching/EconomicsOfUncertainty/Slides&Notes/Notes09.pdf.

The less precise insurance company is the one which charges the different customers in the same way (large pools), the most precise is the one which charges the customer exactly for the costs they bear (narrow pools), at this point becoming useless as organization itself, because the customer might simply directly pay the expenses. Insurances exists as dampers of the possible hits of some unforeseen events. This amortization works in two ways:

- **Horizontally,** among different customers: it is possible that two persons charged with the same fee might entail two different expenses for the insurance company
- **Vertically,** for the same customer: even assuming the same fee probably some life periods are less expensive than the others.

This amortization of costs system, from a customer perspective, is a way of making bearable and feasible some costs renouncing to a portion of precision. It is a kind of compromise millions of individuals accept and it seems even quite logic.

What we feel like a mistake to be fixed is the current position of the cursor: the insurance companies are not precise and this widened pooling entails the adverse selection of collateral effect (exclusion of low-risk customers).



The designed solution proposes a shift of the cursor toward an increased precision on the horizontal axis, but not at the expenses of the customer. The most obvious conclusion, considering what was said above, is that the solution is charging the customers more according to their expenses, but this is not what the customers want. It would certainly be a shift back in the progress of the sector. In the project concept a "third party" could pay for this increased precision: the adverse selection. This effect is in debt with the insurance companies, for all the not captured customer surplus. If limiting it, the fees might be lower and even the less risky customers might be captured. The underlying idea is basically an intervention in the balance of information between the insurer and the customer.

The final precision might be considered increased because the less risky customers would be those ones charged less, but the riskiest customer would not be charged more if compared to the current situation.

It would be a crucial turnover for the whole sector. The main issue is always the symmetry/asymmetry concept, but even though the proposal allows to minimize the information asymmetry, the effect would be completely not symmetrical.

The intuition probably might suggest a post-innovation picture where, because of a higher precision, the less risky segments would be charged less and the riskiest (or more expensive, in this context) would be charged more, if compared to the current situation. This intuition is wrong. This is a fundamental point to understand the whole evolution.

So, if someone is charged less who is the one charged more? No one, and moreover: this is completely logical.

It is the result of reshaping the customers served by the insurance companies, moving the average riskiness down. This achievement is made possible through the curb on the adverse selection phenomenon and a flow of new-generation customer would flood into the insurance network, because for the first time they will not be victimized by the gap between the risk they represent and the risk according to which they will be charged.

Quantifying the adverse selection impact in the separating equilibrium

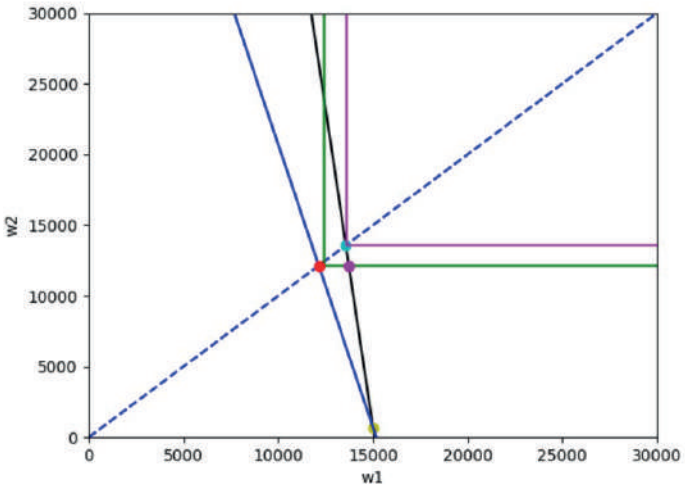
Theoretical appendix avaliable at the end

There is no better mean than precision to support an idea which aims at increasing the precision in a market.

A specific quantification of the impact that the adverse selection has over the low-risk customers will be provided through a model which measures the "distance" between the optimal theoretical situation of full information and the output resulting from an asymmetrical situation.

The chosen source for the mathematical fundamentals is a Princeton Lecture of 2004, based on the Rothschild-Stiglitz model of 1976.

The provided details will be only those ones strictly necessary to understand the impact.
The underlying idea for the chart reported above is that a customer can face only to possible levels of wealth, namely the value w1 (horizontal axis) in which the customer keeps his initial wealth, and the value w2 (vertical axis) in which the customer undertakes an undesired loss. The taken assumptions are the following:



- **w = initial wealth** equal to 10.000 €,
- **The probability to incur in a loss** is equal to 10% for the **low-risk** customers and the one for the **riskier** customers is equal to 20%.
- **The loss hypothesized** (notice this model is dealing with a two-status model: loss and no-loss, no intermediate configurations are evaluated) **is equal to 700€.**

Exploiting the **Von Neumann Morgenstern** expected utility property, can be computed that in a full information configuration the fee collected from a low-risk customer would be 1.430€, while the fee collected in case of separating equilibrium is 1.271€.

For **separating equilibrium,** it's meant that the fee to be set to not incentive the high-risk customers to change from their full coverage insurance to the one designed specifically to the low-risk customers.
Below the Pyton code used to estimate the adverse selection:

```
import numpy as np
import math
import matplotlib.pyplot as plt

w = 15000 ##initial health
wd = 700 ##health with loss

ph = 0.2
pl = 0.1

ch = -(1-ph)/ph
cl = -(1-pl)/pl

costl = wd - w*cl
costh = wd - w*ch

def uh(x,inters): # sample function
   c = -inters
   k = inters
   return np.exp(-x-c)+k

def fl(x):
    return (x*cl + costl)


def fh(x):
    return (x*ch + costh)
```

```
# evaluation of the function
x = np.linspace(1, 30000, 100)


l = fl(x)
h = fh(x)
inters = costh/(1-ch)
interslow = costl/(1-cl)
udih = uh(x,inters)
udil = uh(x,interslow)

b = 0

for i in l:
    if i < 15000 and i > 10000:
        for e in udih:
            if e < 15000 and e > 10000:
                a = i - e
                print(a)
                if abs(a)<1000:
                   print('il valore trovato e:', a)
                   b = e
                   break


subx = (b-costl)/cl
```

```
print('a low risk customer would pay {} as fee to the indurance. Instead, in
   the separating equilibrium he will pay {} '.format(w - interslow, w -
  subx))


plt.plot(x,l,'k',w,wd,'oy',x,x,'--b',x,h,'b',x,
  udih,'g',inters,inters,'or',interslow,interslow,'oc',subx,b,'om',x,udil,'m
  ')
plt.xlabel('w1')
plt.ylabel('w2')
print(inters)
print(interslow)
print((b-costl)/cl,b)
plt.xlim([0,30000])
plt.ylim([0,30000])

plt.show()
```

Control: a two sided coin

03

Control or benefit?

In the current frame the insurance companies impersonate the struggle toward efficiency and profits, supported by a plenty of software, servers, and experts. In depicting the problem, many precise KPIs, imposed by the managers, offer a guideline. In this context, the need of a highest precision and the employment of all the required tools is not difficult to conceive. The same cannot be extended to the people. The engine of the masses does not rely in the logic, even because the most of us is not aware of its own needs and problems.

This aspect is testified even by an advice given by Simon Sinek.

If the public were wired like a software the communication method would move from what to how to why, but the reality behaves in another way, to be precise exactly in the opposite one.
The engine of a person is the why, not the what. Not the utility function given as 1 – e^{α} but the feeling triggered by determined aspects. Having set this point, the possible feeling, triggered by an innovation cannot be overlooked.

Every idea passes through a test, not a mathematical one but based on timeliness. The customer will give to an idea two or three seconds, not a night solving difficult equations.

The focal point for the customer will be understanding at which extent he wants to be controlled in the name of precision.

Probably not at all. Mainly because the precision is not an inner value. Everyone can be on time for the job to not be fired but this is not inner precision. Our mind thinks roughly, otherwise there would be no explanation for the fact that the pricing the 18.99 $ still has a marketing validity.

But if thinking to at which extent people wants to be controlled in the name of savings, the response might give more hope.

It is a matter of finding a good reason. The good reason has pushed people toward cameras among the house.

We all care about privacy, technically. We are ready to give it up practically if something interesting is offered back.

The smartwatch is the most emblematic example. No third party has ever been admitted so close to our private area.
And it was possible because have passed decades since people have seen that given data are not always used against them (e.g. Census).
You might be ashamed for you bad sleeping habits, but no one really cares.

1. http://files.spazioweb.it/2d/c7/2dc7e2d5-bdd0-466f-8c76-54ade0cc5e77.pdf

Cultural artifacts

The following abstract will portray the evolution of the relationship between society and control. The control will be investigated in both directions. The one addressed toward the customer and the one the customer addresses toward the external world.
This part should be interpreted as a preview of the possible reaction toward our control idea.
Going beyond the limits of the current maturity level of the society is always a risk, so we should have a precise idea of the current boundaries.

The first chosen cultural artifact is the novel "1984" (George Orwell, 1949) about a monitored society and control in "analogical" terms (no sensors, no AI). The given interpretation can strongly affect the final idea. A possible one might be that people hate control and perceive it in such a threatening way to write a book about that. An alternative reading, which is even the one considered as the most proper, is that people recognize a great value to the freedom of ideas and then the possibility of choice. It is very different from being jealous of its own data. Even the cookies on sites are probably considered more "immoral" because they can affect the buyer's behavior more than a "fair" collection of data.
The difference between the Control as "act" vs control as "see" should be clear. This project adheres to the control as "see".
"You can be supported in better expressing your freedom by a third party which is watching you."
This is what we suppose the society has discovered since 1984 was written. Simply these three images below capture how the wall against an external power or control is falling apart.

#Not influencing people's actions

Another important dimension is the practice of control over our lives, and it is captured by the movie "Margin call" (J.C. Chandor, 2011) and the movie "The big short" (Adam McKey, 2015) which is about the risk management. They instill the anxiety of massive events, which are exactly the "vibrations" cited previously. This testifies a shift from the inner psychological romance of '900 to the pragmatic decision taking. Timeliness is transversal challenge in our lives.

#Help for the risk management

"Ex machina" (Alex Garland, 2015), as third element introduced, is a clear signal of the fact that people do not want additional population to our planet: sensor must be born as sensor and die as sensor. It is not supposed to take decisions, express suggestions or taking initiatives.
It should be stressed that in this report the reference point is given by the market as the masses, not by the "innovator" (adoption curve as key to understanding) who is ready to give custody of his life to a robot.

#Easiness of the technology

The conclusion is that the right path is that the boundaries of any idea, in 2022, lies where the freedom of the action is preserved. Anyway, people perceive the anxiety for the risk management as a personal problem. It offers to the market some customer surplus to capture, especially if safeguarding the discretion and the "ease" of the usage of new technologies.

Innovation of meaning

Till this point have been set many requirements, result of a wide analysis and research.

Can be said that the transitory phase of the idea development has finished, and the asymptote has been reached. The asymptote is, by definition, the result to which the following development process will stick. It is the value to which the transitory phase converges and in our case this asymptote is exactly the sensor, as tool. All the reasonings have pushed us toward it, as solution.

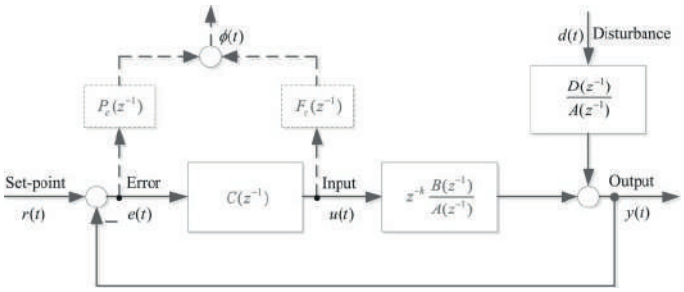
The inspiration line for the sensor to be designed, will be provided by a piggy bank, not by a mechanic.

This is not just a shift but a negation.
Through this sentence is negated basically the most spread model of the sensors, which is the mechanic. People are used to sensors which then trigger actions.

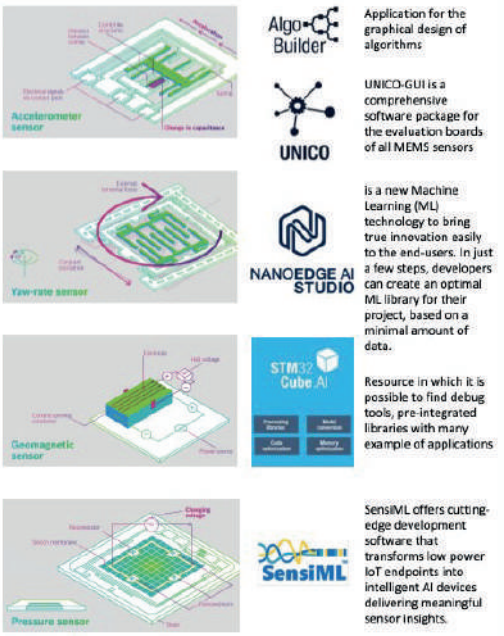
A smartwatch is supposed to receive calls, to provide to us how many steps we have done real-time. A phone allows us to share the position on WhatsApp. A thermostat is supposed to regulate the temperature in our home, not simply sensing it. Then in the list can be inserted even some other hidden sensors as the ones involved in the abs in the automotive industry.

In general, different types of sensors can be found in wide range of different applications, appliances, and other usage areas like Automotive industry, Aerospace/Space Satellite, Airlines, Home appliances Power sector. And every time an action in generated.
A spread working system for current sensors is the following one.

Sensors are exploited to generate feedback



The traditional type of sensors exists in the name of the action. The one(s) which will answer to the requirements of this project will exist in the name of precision, if assuming the insurance perspective, and in the name of savings, if adopting the customer's perspective.



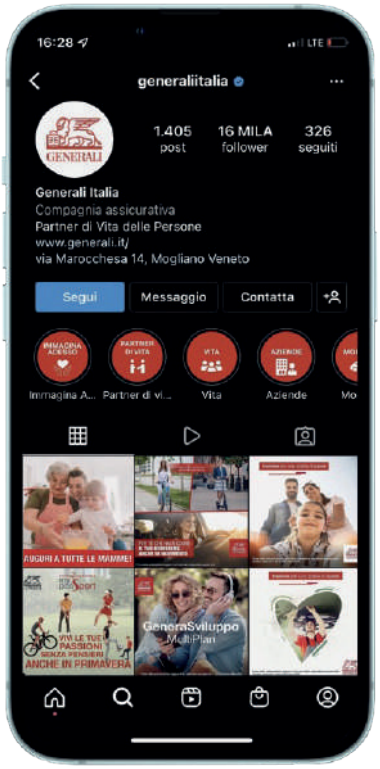
The connection with the customers

04

Advertising

Jumping to the technology development phase might be misleading if not taking into consideration those ones who daily will interact with it. Fictional personas can lead us toward previously overlooked criticalities.
The choice of the personas has been shaped accordingly to the data provided by a consultation with an insurance company. Usually, people elder than 35 are more likely to have a health insurance.
This fact is clearly displaying the action of the adverse selection and testifies the margin of action which is currently available. It is possible to capture a basin of new potential clients leveraging on the possibility of preventing expensive invoices for health issues. An insurance that provides them a premium fee which reflects their actual level of risk.

On the sides a possible advertisement for the official Instagram page is provided. It might be the first touchpoint between the customer and the company.



A possible offer of the insurance company might sound like:

"The traditional insurance would charge you a fee which is x €. By the way there is even another option. If you install some sensors in your home, safeguarding your privacy of course for their own mechanism, it is possible that your fee will decrease, according to the measured parameters. Every month you will be able to monitor how much you have saved. Remember that it is even possible that the charged fee is not lower than x €, but certainly without sensors you will pay x € every month."

Personas

The pool of existing customer can still be attracted because the premises for a better risk assessment are still valid for them. An over 35 can still be high risk or low risk and a distinction is required.

Given that, it is possible to identify two possible customers:

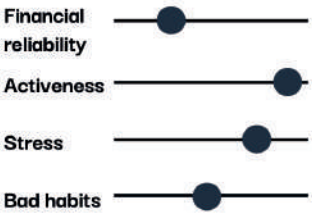
Claudia Ferrari

She rents a studio apartment in Via San Gottardo, south of Milan, proud of having become financially independent from her parents. She leads an active life, working as freelancer. Sometimes she needs to disconnect from her demanding routine, so in the weekends she goes trail running and climbing. Last year she was forced by a plantar fasciitis to a rest period from her trainings. She has undertaken several tecar sessions to alleviate the swelling, which resulted in a cumulated expense of more than €400. To not ask again for money to her parents, she had to give up all the dinners out: a drama for her social life.

Age: 28 years

Job: Freelancer

Income: € 23.000



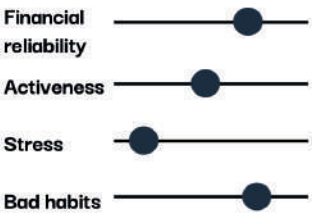
Massimo Stefanoni

Moved to Milan few years ago, after a job promotion. Even though he lives alone, he rents a 150mq flat in Porta Venezia in which he often does smart working all day long. Although his role is very challenging, he manages to have some free time. The portion not allocated to social events, is spent in the gym and in aesthetic centres for waxing, solarium, anti-age treatments.
He has overpassed his 50s but during the aperitivos he still lies about his real age, declaring to be 40. He feels himself at the peak of his life and does everything what is needed to prove this is true to his acquaintances. Last iPhone release, socializing only with younger people, lying about inexistent injuries when he gets out of breath during paddle sessions.

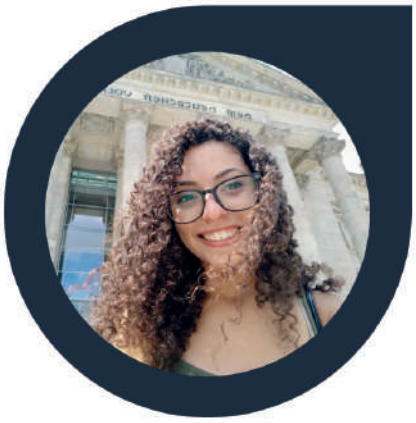
Age: 50 years

Job: Production Manager

Income: € 70.000



Customer Journey

	AWARENESS	CONSIDERATION
 **Claudia Ferrari**	Considering she is a young adulthood, even the topics which she touches with her friends has changed completely the nature. If some years ago the chats were about gossip, now they tackle personal financial management, expenses, marriages. Sometimes even health issues enter in their meeting. In one of these occasions, a friend has introduced to Claudia the new model of the "Connected Health Insurance". It was displayed as easy, cheap and innovative.	The financial constraints and the unstable Claudia's career force her to monitor constantly her expenses. She is used to split them by source and her last check has displayed how impactful the health-related expenses were. Especially during the months of the specialized foot medical treatments. If she cannot erase the expenses, she decided that she could at least flatten them and spread them uniformly along the years. Of course, here mind went to the "Connected Insurance" she has heard about previously, which appears as a suitable tool for her situation.
 **Massimo Stefanoni**	While waiting for his turn at his dentist and scrolling down his Instagram feed, he saw an advertisement of a new insurance set up. Massimo, by swiping up the advertisement, was directed to the insurance website and he is curious to know more about this new insurance model.	He is already in possession of an insurance, but he wants to keep the pace. He recognizes in this service a further occasion to be on the cutting edge and he gets intrigued about the advanced version. He starts even to think about the release clauses of his current policy.

After having portrayed two possible personas, a possible Customer Journey, divided into 5 parts, was assembled:

DECISION

Claudia downloads the app and through that she schedules an appointment to get more information about the new insurance model. The agent, in a video call, exhibits the features of the contract and reassures Claudia about the convenience she will experience in the following months. Even for Claudia the hot points were those mentioned by Massimo, but the received explanation was convincing enough. The vivid fear of her past expenses pushes her to decide for the "connected insurance".

Massimo calls one of the agents at the company who expose in detail the new insurance model. He gets reassured about some issues which has touched him. The first point is the privacy issue, but the agent explains him the data are not saved in their raw version: only the meaningful extraction for the insurance in stored: for example, for the microphone, only the volume level, and not the content. Massimo is even concerned of giving to the insurance company the power of increasing the fee, and not just decreasing, in the case his data collected through the sensors are not meeting the requirements. Even in this case the agent explained him that the fee charged with the traditional system represents the upper limit for the "connected insurance".

IMPLEMENTATION

Claudia, provides her digital signature of the contract, entering officially in the pool of customers of the company. According to what was stated in the confirmation mail, she received at home here sensor package in three working days. The installation and configuration of the sensor, guided through the easy steps on the app, took fifteen minutes. Now she is waiting for the end of the first month, willing to see if her life habits help decreasing her costs.

Massimo, after understanding the easiness of the mechanism, signs for this policy.

After just two working days, he receives his sensor package through home delivery. He easily managed to install the sensors using the app guidelines.

Mario feels very pleased by the low amount of time required for the sensor's installation.

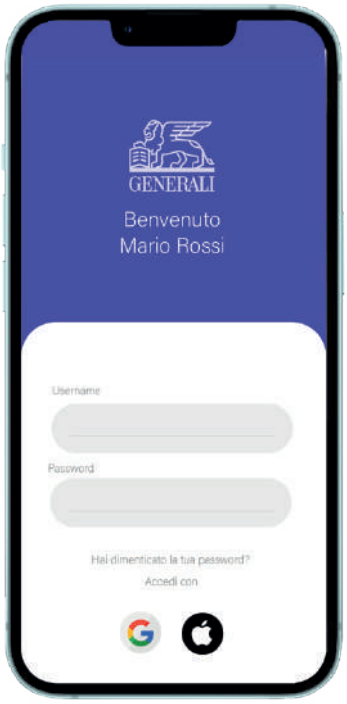
USAGE AND BENEFITS

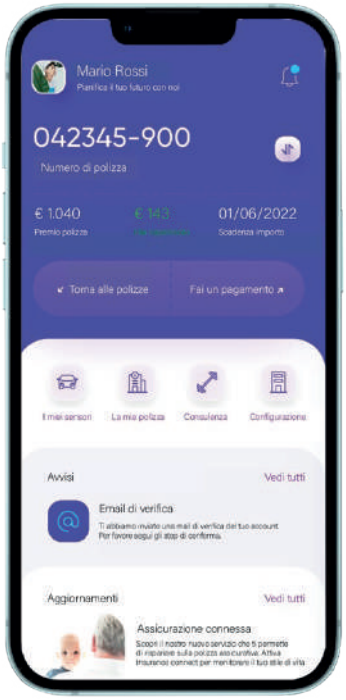
Even if the sport-related issues are not completely solved, at least she got rid of the anxiety of scheduling a new medical appointment: she knows the costs will be covered by her insurance company.

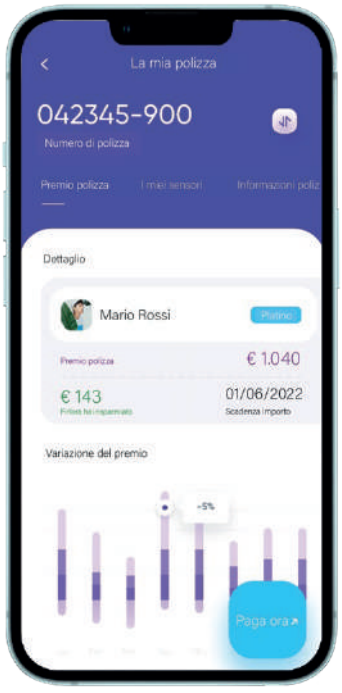
Massimo exhibits how innovative he is among his acquaintances. During the first day of subscription, he got a lot of fun discovering the features of the "Connected Insurance" app.

Sensors implementation

Mockup app


GENERALI
Benvenuto
Mario Rossi
Username
Password
Hai dimenticato la tua password?
Accedi con


Mario Rossi
042345-900
Numero di polizza
€ 1.040
01/06/2022
Torna alle polizze
Fai un pagamento
I miei sensori
La mia polizza
Consulenza
Configurazione
Avvisi
Vedi tutti
Email di verifica
Aggiornamenti
Vedi tutti
Assicurazione connessa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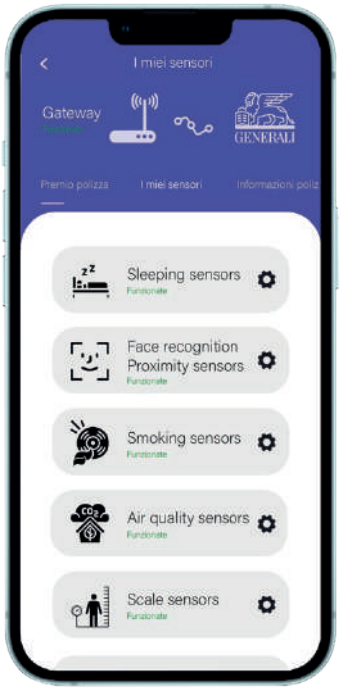
I miei sensori
Gateway
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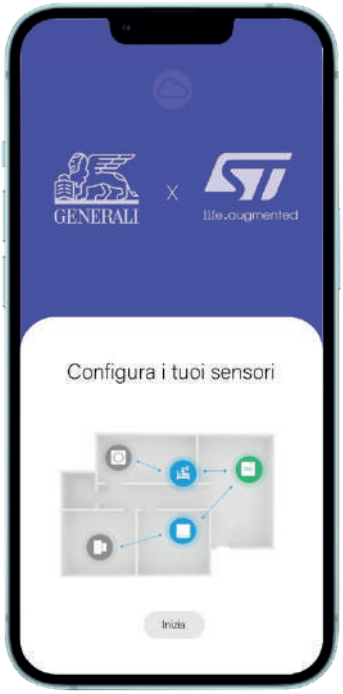
Premio polizza
I miei sensori
Sleeping sensors
Face recognition
Proximity sensors
Smoking sensors
Air quality sensors
Scale sensors


GENERALI
X
life.augmented
Configura i tuoi sensori
Inizia

The gears of the solution

The sensors and the meaningful data

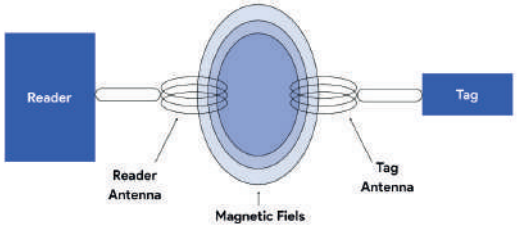
The path from the customer perspective is certainly the most consequential one. It determines the success or the failure of the project. But there is even another hidden path.
The latter is the mechanism which guarantees the service. The customer path sees just on the surface some sensors and the possibility to save money thanks to them, but he does not see under the surface. He does not enter the details of how the meaningful data are provided, and how they work for his advantage.
This is a recurrent situation. We are used to different technologies of which we, as the customer side, are not able to explain the mechanism.
To be able to collect the data information about the insurance takers, an ecosystem of sensors is installed in their homes. Each of these sensors deals with different sorts of information and the combined data will evolve into meaningful, portraying the customers' lifestyle.
One of the most important parameters to an individual's health is the sleeping habits. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5449130/#:~:text=have%20been%20reported.-,Short%2Dterm%20consequences%20of%20sleep%20disruption%20include%20increased%20stress%20responsivity,problems%20in%20otherwise%20healthy%20individuals.)
To provide the insurance company the related data, pressure sensors (https://www.st.com/en/mems-and-sensors/pressure-sensors.html) will be located under the bed mattress. ST's MEMS pressure sensors are perfectly suitable for this function because of the high accuracy level, low power consumption, thin and compact packages and its stability and performance in vertical direction over time. Today these sensors are found in automotive industry, life-saving medical applications. Thanks to recent innovations, tiny pressure sensors can even be implanted into the body, known as In Vivo Blood Pressure Sensing for more accurate monitoring.
In addition, the sleeping habits might be monitored through the microphones https://www.st.com/en/mems-and-sensors/mems-microphones.html, placed close to the bed.
A disclaimer about the fact that the content provided by microphones will not be saved, is considered enough to reassure the customer. The unique data elaborated will be the volume and the simple presence of noise.
Through these sensors can be catch movements and sounds. A noisy environment is not optimal for an effective rest. The literature furnishes plenty of proofs about the chain of effects which starts with a bad rest, touches the high level of cortisone, and ends up with undesirable consequences. Today, the ST's MEMS microphones are employed in multiple areas, such as personal electronics, automotive and computers.
The basic idea is always comparing this data with an optimal benchmark, and then measuring the gaps. The benchmark is not a point in a multidimensional space but a portion of space itself, which is the cross of different ranges. For example, the studies give as optimal value of sleeping hours per night of 7-9 hours. Moreover, the existence of different chronotypes is proven. This theory provides other acceptable ranges of waking up time. The cross of these two intervals is the "place-to-be" for the low-risk customer which is not willing to pay more than what he is going to require.
https://www.businessinsider.com/how-to-find-your-perfect-daily-routine-2016-9?r=US&IR=T

According to this scheme can be considered within the healthy ranges a waking up time between 5 a.m. and 8 a.m. In this way the insurance company will safeguard the diversities, which are a beauty of humans. Someone might argue that even a polyphasic sleep has to be contemplated but unfortunately Leonardo Da Vinci (which traditionally is cited as an example of this approach) would fall beyond of the boundaries of the healthy concept. A fragmented sleep interfere with the muscular restore for example. And many other collateral effects.

The permanence out of home is another dimension which might be added within the **multidimensional space of healthiness.**

The time spent out has a great value is psychological terms. Psychology seems very intangible, till the moment an emotional unbalance generates overeating, obesity, diabetes etc. The proof of the magnitude of the implications of the psychological stability is given by the attention which was addressed toward the "Bonus Psicologo".
To be able to track the amount of time spent outside of home, **RFID sensors** will be located at the home entrance(s) of the home. The underlying idea of recognizing which person in the household is coming or leaving. This will be possible through wearing an **RFID Passive Tag**, applied to bracelet or a keychain-accessory, and a transreceiver, to be installed close to the entrance.

Of course, the placing of the RFID chips must be customized according to the customer needs. Could be the marriage ring for example, or the key chain.

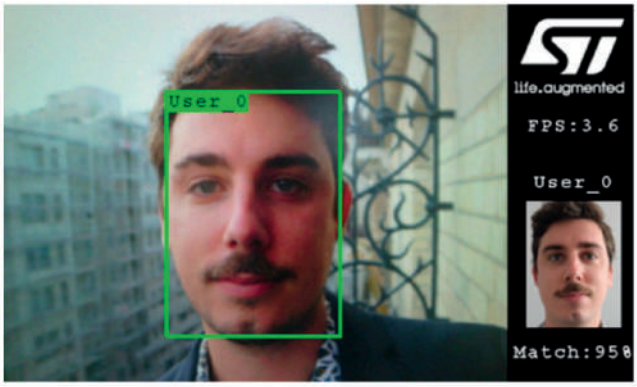


Let's compare Passive & Active

Passive	Active
No battery. Antenna picks up on electromagnetic waves	Built-in battery power, enabling constant data transmission
Reduced data storage capacity compared to active tags	Battery powered capabilities allow for greater data storage
Without the battery, passive tags are a more cost-effective solution and can also come in smaller sizes	Often a more expensive alternative due to the added battery and data storage capabilities of the tag
Generally have a shorter read range than active tags	Battery powered response leads to more extensive read range

Advantages:
- No internal power supply
- Obtain operating power generated from the reader
- Small in size, lighter and cheap
- Short read range
- Embedded in a sticker or under the skin

An alternative to the RFID sensor might be represented by a camera powered by the Face Recognition Software, put close to the entrances of the house. https://www.st.com/en/embedded-software/fp-ai-facerec.html#st_description_sec-nav-tab



The air quality importance does not need endorsements. For measuring it, and more particular the smoking habits, air quality sensors and smoke detectors will be used. These sensors from ST offers low power consumption and preciseness. https://www.st.com/en/applications/home-building-and-city-automation/fire-alarm-smoke-detector-and-air-quality-monitor.html

The last parameter is the measured temperature in the house. https://www.st.com/en/mems-and-sensors/temperature-sensors.html

The temperature in the houses issue was touched in the recent period because of the lack of gas the Europe is supposed to face the following winter, but it has been known since many years that an excessively high temperature in the house has adverse effects on the lungs.

These data will become ”meaningful“ if crossed with time spent at home.

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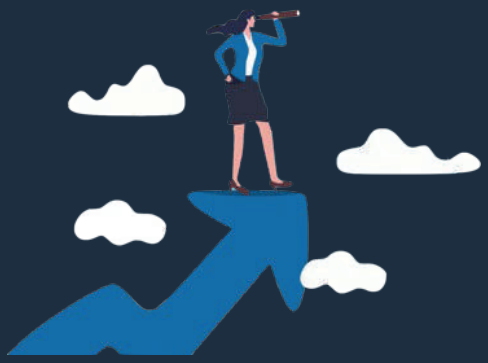
Business model canvas

The focus is the customer, but a business idea has different interfaces through which it is connected to the real world: the suppliers, their own employees, with their own competences, the capacity, the inventories. Exactly as gearwheels.



PROBLEM

Currently the risks assessment carried out by Insurance Companies is based on static data to assess Consequently the charged fee is not consistent with the exact level risk of each customer.

Moreover, because of the information asymmetry, the sector is affected by the adverse selection phenomenon.

SOLUTIONS

1) Use of real-world data, collected through ST Sensors in the domestic environment.
2) Long-term measuring and monitoring of the parameters that guarantees a fair premium for each individual.
3) Possibility to save financial modification user habits, limiting Opportunistic behavior.

UNIQUE PROPOS

The risk evalu
system is hido
the customer
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exploited by ir
companies for
information as
creating a fair

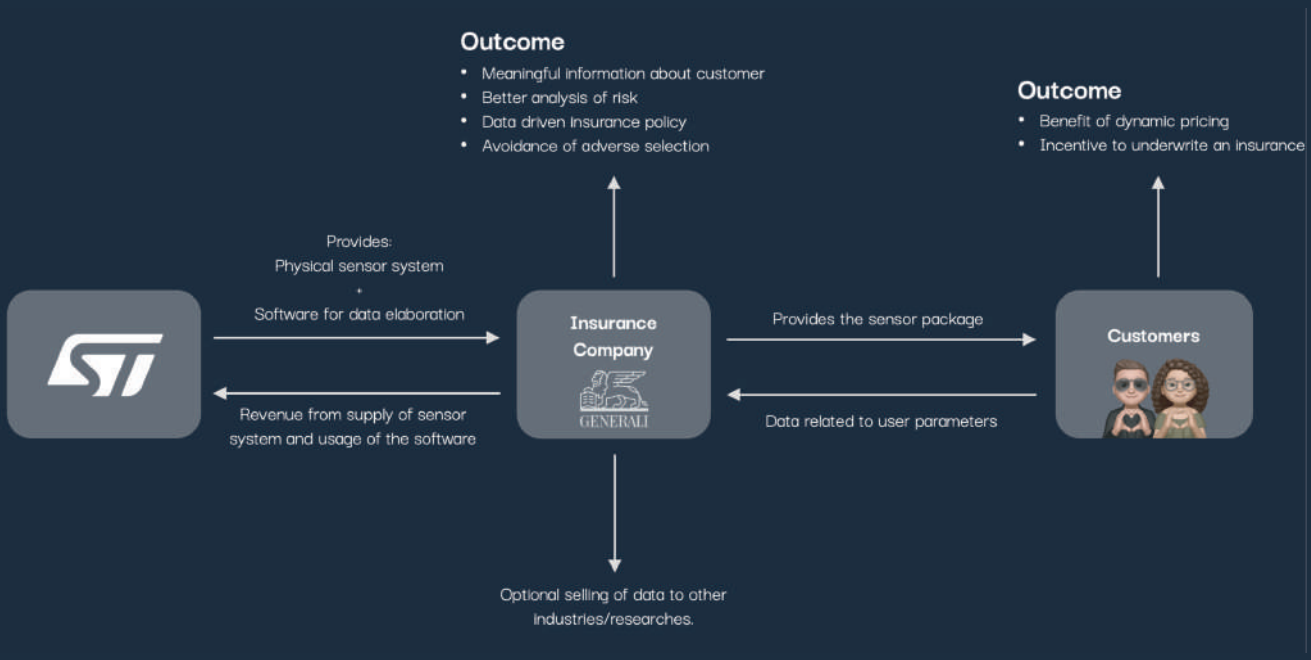
KEY METRICS

1) Key Activities
Assembling of the sensors packaging specifically addressed to the insurance companies.
Development of partnership and marketing channels management.
Providing software packages for the data collection.
Drafting of contracts with Insurance companies.
2) Key Partner
Suppliers, which might practice more convenient prices as the result of the increased volumes.
The same can be said for the logistic partners.
Insurance companies, which are the main filter for the ST proposal.
3) Key Resources
Specific competences in the sensor field
Already owned specific assets
Established supplier network

COST STRUCTURE

Considering the ST role, the leverage the company is supposed to exploit, in order to increase the profits is the cost curbing. That's because the proposed products are quite basic.
The fact that new products/technologies will not be required allows us to assume that, at least during the initial phase, only the variable costs will be impacted. No change in capacity is required, therefore neither initial investment has to be taken into account.

- **Raw materials and additional manpower**
- **Customer acquisition cost:**
  a. Additional direct salesman
  b. Lawyers (assuming a new freelancer has to be hired, not a full-time contract)
- **Tech professionals to instruct the insurance companies in the usage of the supporting software.**
- **Distribution of sensor packages on behalf of insurance companies.**
- **Inventory cost: the additional demand will present some uncertainties, therefore additional inventories will be required, with a corresponding immobilized capital.**



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CHANNELS

The whole business model includes three actors: the ST as sensor provider, the insurance companies, and the final user. For a matter of coherence will be taken in considerations two channels related to different sections of the model.

1) ST and insurance companies are supposed to get in touch through direct selling agents, which is the main mean in the B2B context.
2) The insurance companies will engage its customers through more diversified channels like advertising on social media platforms.

CUSTOMER SEGMENTS

The portrayed customer segments are those at the end of the chain of the whole project, so we are referring to the final user. These are not the "intermediate" customer the ST microelectronics will interact with, the targeted customer are classified as:

Young Adulthood:
This is the additional segment if compared to the current layout of the insurance sector.
Generally lower financial capabilities.
The adverse selection has contributed to exclude them, but they would still benefit from a "cost amortization"

Middle-aged Adulthood:
This segment is already served by the insurance companies, as they usually have higher financial capabilities, but they might take advantage from a more precise risk assessment as well.

REVENUE STREAMS

The stream of revenue is generated by:

- **Asset sale**
  The main portion of the revenue stream derives from this source. ST will deliver the physical sensors on behalf of the insurance companies.

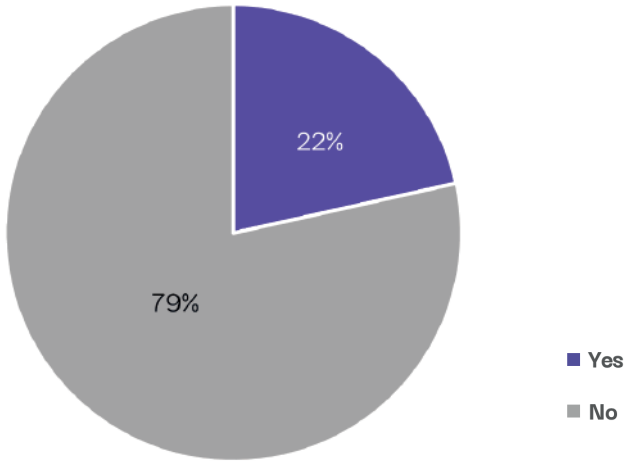
- **Access fees**
  ST will collect access fees from the insurance companies. This portion is less impactful but very significant from a strategic perspective because it will work as a binding investment (RSI).

Survey

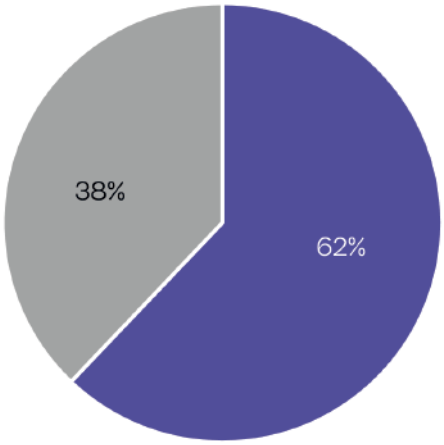
If the Lean Model Canvas is based on assumptions, the following market investigation provides some pragmatic pillars to sustain our model. We developed a survey to capture the market sentiment about the developed innovation, and the signal was actually very positive.

174 responses testify the insurance market has wide margins for the expansion, as only 22% has a health/life insurance. Just 19% considers the insurance market as "fair". More than the half is well disposed toward monitoring sensors, if supported by the right advantages.

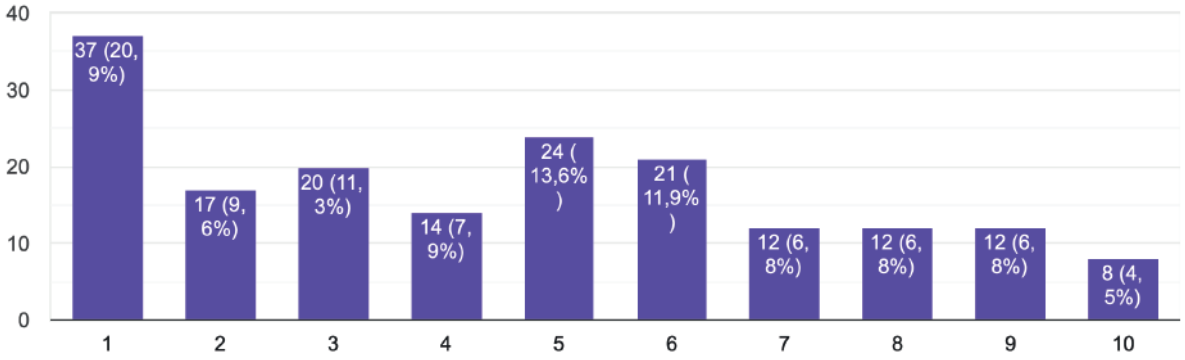
Do you already have health insurance?



Would you install sensors in your home if they would save you money on insurance?



"I don't have insurance to avoid costs, I think I pay more than what I will receive back."
From 1 to 10 how much do you agree with this statement?



Feasibility

06

Feasibility

Along all the project, the development proceeded forward, linearly. But the last validation must be provided by the "closure of the cycle" proof.

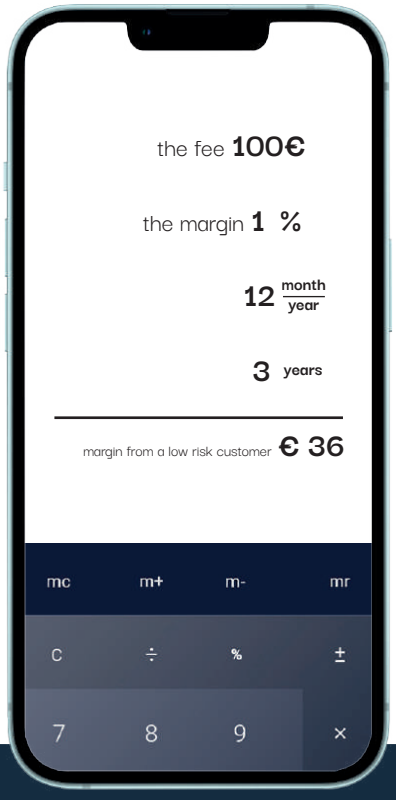
The industry makes a proposal to the customer, but the margin provided by the customer must be compatible with the cost requirements of the industry to make the proposal feasible. It is an issue of perfect joint.

From a merely theoretical perspective the customer is willing to pay for the "amortization of the costs" service, so the insurance company does not simply balance the costs among the customers but charges even this "pooling" service. According to investopedia[1], the margins are very low, equal to 2%-3%.

Referring to the data provided by mutuasemlice[2], the average health insurance costs 120 €/month to an average working person, in the current layout in terms of risk.

It means that the margin related to one customer, along a contract which lasts 3 years, is equal to €129,6.

Considering that the customers who the project aims at discovering are those with a lower risk and those less disposed to pay for the "amortization service", the whole pool is supposed to be reshaped. The new type of customers is assumed to represent 1/5 of the post-project composition. For them the margin is lowered to 1%, and of course even the real price charged to them, affected by the discounts provided as premium for the health behaviors, resulting in a margin along a 3 years contract of €36 for a low risk customer.



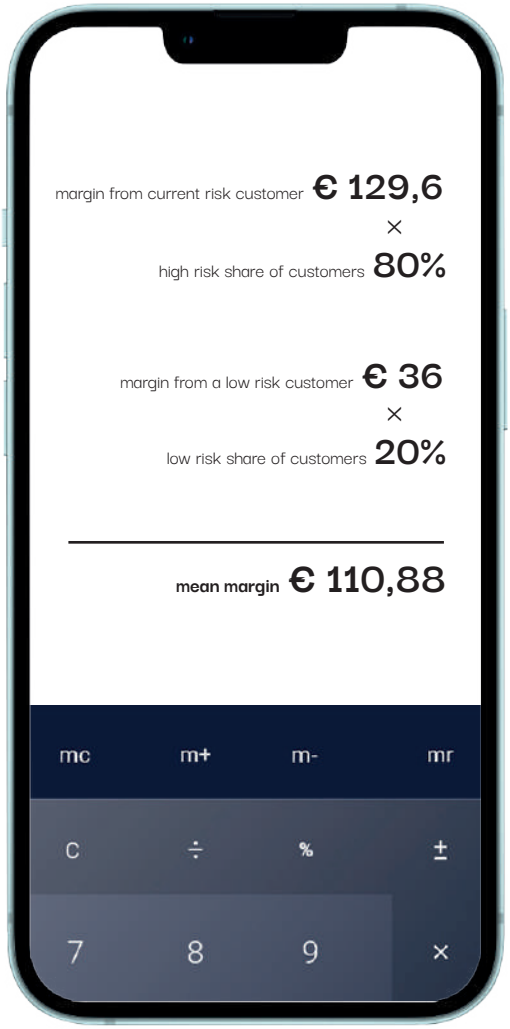
Disclaimer
Considering one package for each person is a very conservative assumption. Many people, in the age group 25-35 years, are already married, have children and even more than one. A consistent amount of them still lives by themselves, especially if recent graduates at the beginning of their carrier, passing through the settlement phase of their life. The fact of grouping the contracts is a very sensitive issue, if considering that in this way a package of sensor can be paired with more than one covered customer. According to this evaluation, the prospected profits might be slightly higher than in the computation here developed.

1. https://www.investopedia.com/ask/answers/052515/what-usual-profit-margin-company-insurance-sector.asp#:~:text=Insurers%20and%20Profit%20Margins&text=Many%20insurance%20firms%20operate%20on,generate%20profit%20and%20remain%20solvent

Therefore, the expected profit coming along 3 years from a contract which involves one person is €110,88.

The considered period is three years because we expect the insurance companies to require three years as the period needed for the repayment of the investment for each sensor package.
Having assumed the margin as fixed parameter, it means it has already internalized all the additional costs related to the enlargement of the customer pool.
Hypothesizing the insurance company is willing to invest 40% of the profits in the packages, ST has to manufacture each sensor package not exceeding the constraint of 44€ with the extreme assumption of one package per person.
This evaluation by the way is not precise because it does not embody the additional value for the insurance company of enlarging the pool of the customers. Basically, even if the percentage margin is assumed constant, the insurance will increase its profits as the result of the rise of the customers in absolute terms.
The above-mentioned constraint of €44 for the manufacturing costs of a single package, can be relaxed of 15% (explanation provided on RHS), returning a value of €51 and this amount will be transferred to ST under a two-fee solution.

The contractual procedure of collecting the revenues does not change the allocated amount to produce a package of sensors, which is still €51.



Two-fees payment
ST will practice a price of €44 per each package and the 15% of this amount, multiplied by the number of expected customers of the single insurance company, will be the fee for the partnership with ST and the usage of the ST software.
This form of payment will add some content of uncertainty for ST, because of the parameter to be estimated in advance (the number of customers), but it will prevent the shift of the insurance company toward competitors. It will emulate a "sunk cost", in the insurance company perspective.

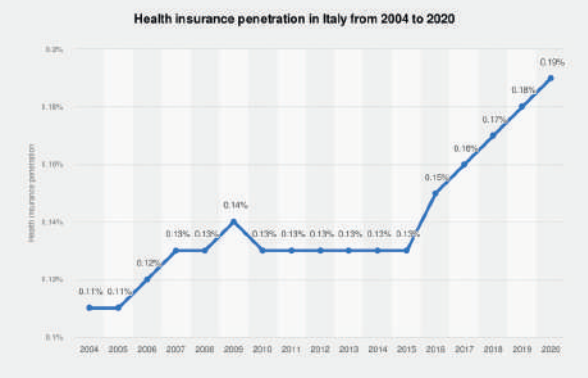
2. https://www.mutuasemplice.it/elenco

Collateral benefits

1. Customer pool enlargement

The inclusion of the lower risk customers, and the consequent widening of the coverage, have many collateral benefits as the increased market power, strengthening of the reputation, creating a favorable environment for the expansion in additional markets, offering additional services. The list is very verbose and promising. In our perspective it is sufficient to support the additional 15% required.

The expansion of the pool of customers is not just an opportunity for the single insurance companies, but is even an imperative, launched very loudly by the market. The steep line of the insurance penetration, displayed in the chart below, is a call to action, with even an embedded threat. The threat of being excluded from the market, which is the bill for the inertia and inadequacy which curb the current insurance sector.



A further collection of responses from a representative sample of the national adult population aged 18-74 as of April 2020, shows that more than 3.8 million are taking into consideration to protect themselves with an integrative health policy (+50% compared to the 2019 survey).
By the way, it is very important discerning the simple enlargement of the pool of customer, which is the current circumstance, and the specific enlargement of customers, consequence of the extirpation of the adverse selection phenomenon, proposed by the project we are offering.
In this document, the assessment of the general enlargement of the market covers the function of the endorsement of the chosen direction.

We are giving the means to perform the enlargement of the customers in a very specific way. It won't result in a flood of new customers just for magic, but it is the realization of a precise mathematical scheme.

2. Selling data to external companies

The intrinsic benefits of the ST packages system are very heterogeneous but a specific one falls aside from those previously presented. It can be stated that the profits are quantifiable in a quite precise way. The empowered reputation of a company, for its nature, is very faint and fluid as advantage. But another window of opportunity is given by the market of data, which presents hybrid characteristics: it is very difficult to quantify the profits generated by the sale of data ex-ante but, unlike for the market power, there is an established market for the data, populated by a plenty of daily transactions.

Companies often analyze the data collected from the individuals. They know it can be a tool to improve their operative efficiency. Our concept has embedded a natural response to this natural need of data which the companies display.

And of course, not for free.

Some organizations or companies that buy user data are the government, research and consulting companies, individual companies research and labs in health and medical industries. The last field reported is the one more akin to the operating context and here data are used to:

- **Tracking and maintaining personal records and understand health patterns,**
- **Prediction of disease transmission and epidemics,**
- **Treatment protocols and potential cures,**
- **Tracking and improving quality of life patterns.**

If considering possible scenarios of applications for the data in the hand of the insurance company:

Dyson sells an air purifier, therefore can be interested in having the data of the air quality inside the citizens' houses. **Electronic cigarette** producers can target the smokers. **Bonomelli** produces a chamomile with additional melatonin, spotting those niches who have sleeping issues enables more effective marketing campaigns. This information might be even more valuable for pharma companies. An extrovert the house of whom is frequently attended by different guests, might be a target for a wine campaign.

Modern analytics approaches such as customer journey analytics, behavioral data can be leveraged to solve problems and impact KPIs at every stage of the customer journey. Some common examples ->

Customer Acquisition	Customer Retention and Growth
Improve rate of customer acquisition	Improve retention/lower churn
Lower cost of customer acquisition	Increase repeat purchases
Increase conversion rates	Increase cross-sell, up-sell
Increase velocity to purchase	Decrease cost of service
Increase purchase sizes	Improve customer satisfaction and loyalty
Improve marketing ROI	Increase lifetime value

We are convinced that, if this kind of approach in collecting data will be adopted in the long run, insurance companies will be able to get a huge amount of personal data, continuously increasing in dimension and available instantly in their database. They will cover a lot of different aspects related to customer health in a punctual and reliable precision, creating a value translated in additional revenues that is going to be inestimably huge.

Big data aredescribed with 5V's:
volume, velocity, variety, veracity and value
- Grover et al, 2020

Conclusions

As result of all these evaluations, a conservative estimation of all positive implications and hidden opportunities for each insurance company which would adhere to the ST Microelectronics packages system corresponds to 15%. Basically, even though the insurance company might be willing to devolve only 40% of the profits for the sensor packages, ST Microelectronics might ask 15% more. It is reasonable because the facets previously presented have bolstered its bargaining power.

It quite easy to estimate the costs which ST will bear to produce a sensor package:

Temperature: 4€
Pressure: 5€
Air quality monitoring: 2€
Camera hardware: 7€

+

Additional Changes to meet the design requirements (as a black box to cover): 10€
Technicians required for the training of the software usage (lump sum): 30€/hour.

It can be easily computed that even if hypothesizing the extreme condition of one package per person and having a resulting constraint of producing a package not exceeding the cost of 51€ (obtained as 44€ x 115%), the business model is perfectly feasible.

Our team

Tukman team development

The overall team experience can be summarised using the Tuckman team development model, composed of 4 main phases, each of them characterised by specific and individual group issues.

FORMING

In our case, we can say that this condition characterised the first meeting. In these moments, in fact, in each member there was a contrast between the worry of overexposing themselves and the desire to start performing. This impasse was overcome thanks mainly to the initiative of Francesco, that intrinsically proposed himself as team leader and showed what tasks needed to be accomplished.

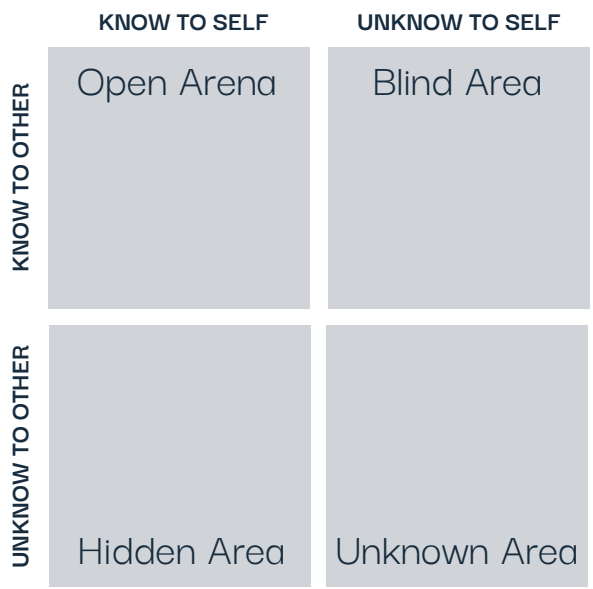
STORMING

The first situation of storming was reached during the realization of the "Technology Identikit". During the discussion, different ideas about the contents and how to approach the task were proposed but very often team members were not listening each other. Coherently with the Thomas-Kilmann conflict handling model, people involved in the debate were mainly Diana, Gabriele and Francesco: all of them, in fact, have a predominant "Competing" component, meaning that they were approaching to the conflict trying to satisfy their own concerns. However, the biggest conflict that characterized the team concerned different approaches maintained toward the deadlines. Some members perceived a different level of required workload that also resulted in a disparity in overall engagement, and this resulted in the emergence of a harsh confrontation.

NORMING

Dealing with such a significant moment of conflict, allowed the group to grow stronger, increasing the sense of cohesion and trying to make clear the workload this project required. Drawing on the debate that has arisen regarding unequal effort, we tried to improve the situation recurring to a feedbacks' system, allowed us to understand what the individual's thoughts were. All members achieved a sense of alignment with common goals and understood that the team needed to act in a cohesive manner to reach the final scope.

The aim of this evaluation process was making everyone's Public Area the biggest possible to develop a strong sense of trust all around the team. At the beginning, indeed, there was no form of mutual acquaintance, each of us had such different backgrounds, meaning that also past experiences were not comparable and only two of us (Gabriele and Diana) had already worked in a project with a similar approach (Comportamento Organizzativo course). At the end, instead, we can see that all the team members were more or less able to move themselves towards the **"Glasshouse"** quadrant, although it was difficult to overcome the fear of showing vulnerability.



PERFORMING

It represents the actual situation, in which most of the members are focussed on get their job done and on helping others when they need it, since in the team developed a sense of psychological safety. In this phase still exist margins for improvement for the alignment about the required effort and the deadlines to contemplate.

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