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a structuring project
for the Compiègne Applied Mathematics Laboratory

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A STOP-COVID SYSTEM SET UP IN THE ALLARD RESTAURANT OF CHEF ALAIN DUCASSE.
The Covid-19 crisis has affected the entire world population in health, economic and social terms. It is a race against time, or rather against the spread of the SARS-CoV-2 virus that has been set in motion all round the globe since its appearance in Wuhan, China, in November 2019. This race is based not only on the development, validation and approval of vaccines, but also on modelling the spread of the virus in order to forewarn populations of the risks of epidemic upsurges. This modelling work is a long-term development, given that the creation of the most reliable models possible requires the collection, aggregation and assimilation of huge amounts of data appertaining to the evolution of the pandemic. The first data came from China, the country of origin of the pandemic. Then, in January 2020, the Johns Hopkins University, whose experts were surprised by the scale of the epidemic and the speed of its spread, became the global referee of statistical data on this particular coronavirus. France also is in the forefront for the collection of data. Santé Publique France presents a daily dashboard on confirmed cases, deaths, the positivity rate, patients hospitalised in ICUs (intensive care units), the number of clusters under investigation and the number of departments with a high vulnerability situation. This provided valuable information for the modelling specialists who, from last March, were called upon to take action. In response to this call, the National Institute of Mathematical Sciences and their Interactions (INSMI), one of the ten CNRS institutes, decided to set up, while the county was in full lock-down, a platform, MODCOVID19, to coordinate modelling actions on COVID-19. Lecturer-cum-research scientists from UTC and more particularly from UTC-LMAC (the Compiègne Applied Mathematics Laboratory, spontaneously responded to the call. First, individually and then, following the call for expressions of interest launched by the research division of UTC, a group of 3 “pairs” was formed around the Coveille project - a modelling project with several levels of granularity. The Coveille project can thus both meet the needs for monitoring as well as forecasting the spread of the SARS-CoV-2 virus among the population. This tool will be a valuable aid to decision-taking.

The keyword for this new school year was pedagogical innovation.

First there was the admission procedures for new students, quite different from other years, of course. “Until now, admission to UTC was based on an analysis of the candidates' academic record and possibly with an oral interview conditioned by results above a certain threshold,” explains Valérie Kopinski, head of the UTC Admissions Office. “This year, due to the health context, we had to cancel the oral interviews, but we still took the option of maintaining an additional element to the academic file; an individual project dossier.” As an alternative to the oral interviews, the dossier allowed us to discover the candidates' motivations, their extra-curricular activities and their career desires after their studies. This initiative also helped maintain equality between candidates, as the Ministry of Higher Education has said that it is not in favour of on-line interviews, which prove to be too random depending on the candidates' Internet connections.

And then we had to come back to the class-rooms and lecture-halls at the beginning of the academic year. For the September intake, first of all. “Even if we were able to initiate back-to-“Uni” activities as we do every year, but with our masks and hydro alcoholic gels, all the evenings of the student induction-integration period were cancelled, and that period had a different taste,” says Pierre Gibertini, a UTC third-year student (read his testimony on page 12). Distance learning lectures, a semi-remote system for seminar group classes (TDs, with half of the class present and the other half at home); the keyword for this new school year was pedagogical innovation. To accompany these transformations, the UTC's Pedagogical Support Unit has been developing distance learning platforms since last March. “We didn't start from scratch,” explains its manager Manuel Majada. “We already had distance learning platforms. But the lock-down and this hybrid back-to-“Uni” season have forced us to develop new systems on a massive scale.”

Consequently it is true to say that time can sometimes seem long for students, but here and there initiatives are emerging to maintain social links. Thus in line with the virtual “team building” operations organised by several UTC associations, used to "forge solid, remote on-line links", or the live show-programmes on UTC’s school's social networks, run by the administration and animated by students. A major competition was even held, bringing together students and local residents to elect the Compiègnos' favourite bar. A welcome memory of life before ...

Nevertheless, in these confined periods, time takes its toll. "Honestly, I can't wait to get back to class, I can't wait to see my friends again and I can't wait to get back to normal student life," says one female student who happened to be active in a Messenger chat exchange. “It's not easy to be 20 years old in 2020,” said the President in one of his most recent speeches. At the UTC, as elsewhere, we're waiting for better days.
One of the issues with the successive lockdowns decided over the last few months is how to maintaining good physical and, above all, psychological fitness. From the temporary lowering of vitality and physical condition to the occasional minor bout of depression, these periods of forced isolation are having an impact on the psychological health of the students.

"With my friends, we have all experienced a spot of uselessness at one time or another," explains a fourth-year student at the school. "But with time you get used to it and it goes away." The fact remains that the University of Technology of Compiègne has tackled the problem head on and moved out the heavy artillery to deal with the students' discomfort and misgivings.

Starting with the Preventive Medicine Bureau. Dr Alice Hoogendoorn, UTC's house physician, and nurse Dominique Albanese look after the students who stay in Compiègne. "The students can contact us by e-mail", says the doctor. "We take care of them or we redirect them to such contacts dedicated specifically to their difficulties."

The first lockdown provided an opportunity to observe some recurrent problems among young students. "We were able to observe things like burnouts for certain young people," continues the doctor. So we set up on-line “teleconsultations” with our psychologist to accompany the students experiencing the most difficulties. "In parallel with this medical support, audio sophrology sessions have been implemented by the administration. With the aim of enabling students to refocus and relax. What I am hearing is the combination of studying, excessive work, stress," explains Christella Lequeux, sophrologist at the UTC. "But you have to manage to develop good moments and see the better side of things."

In order to support the house physician, nurse and sophrologist, UTC has drawn its secret weapon; the student health relay centre. For the past two years, the region has been accompanying, training and employing students to create a link between preventive medicine and students. “We are intermediaries between the medical profession and the student body,” explains Manon, a student at the health relay centre. “Our role is to make it easier for students to speak up and contact with the medical services and to discuss subjects that are sometimes taboo with them.”

Whether it was through listening to students suffering from temporary depression, or helping some of them to find the right people to assist in overcoming financial difficulties, the health relay students had their work cut out for them during these lockdowns. “For this second lockdown, we have set up a group for confined, isolated students where we offer live sessions on Facebook with sports, cooking recipes, where we open the floor for everyone to express their difficulties.” It’s a great way to brighten up the lives of confined students and recreate links... while complying with the social distancing rules.
**UTC IN THE NEWS**

**# UTC IN THE TIMES HIGHER EDUCATION (THE) 2021 AND TIMES HIGHER EDUCATION YOUNG UNIVERSITIES (THEYU) 2020 RANKINGS.**

The international ranking of Times Higher Education 2021 has been published: UTC is between 801st and 850th place in the overall ranking. UTC is also the 3rd French university in the "International Outlook" category (international outreach) and the 15th French university in the "Industry Income" category. UTC is ranked between 201st and 250th in the "International Outlook" category (international outreach) and the 13th French university in the "Industry Income" category. UTC gained 50 places in the "YOUNG UNIVERSITIES" CATEGORY OF THE THE RANKING.

**# THE BEST PAPER COPA 2020 AWARD GOES TO SOUNDOUSS MESSOUDI (UTC-HEUDIASYC) COPA**

Soundouss Messoudi, a PhD student at the UTC-Heudiasyc Laboratory (CID team), was awarded the prize for the best student publication at the COPA 2020 conference, for her publication on conformal prediction entitled “Conformal multi-target regression using neural networks.”

**# THE "WELCOME TO FRANCE" LABEL AWARDED TO UTC FOR 4 YEARS.**

UTC has been awarded the "Welcome to France" label, at the 2-star level, for the quality of its welcome for international students, and this remains valid until 2024. A sign of confidence, the label attests to the quality of the welcome and represents a promotional and outreach tool for the HE establishment. The indicators particularly recognised for the UTC are those of the quality and accessibility of information, the quality and accessibility of the reception facilities, the quality and accessibility of the training offer and teaching support, the accommodation and quality of life on campus, and the quality of post-graduate follow-up for non-French students.

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**ECOLOGY & SOCIETY**

**For an ecological reconversion**

Professor Dominique Méda is a sociologist and philosopher, Chair of Sociology at the University of Paris-Dauphine, where she directs the Institute for Interdisciplinary Research in Social Sciences (IRISSO), a joint CNRS unit. She gave the second inaugural lecture at the UTC on September 2, 2020.

Labour sector issues are familiar to her, since in her earlier career, Dominique Méda was initially Inspector General of Social Affairs, the controlling body of the Ministry of Labour and Social Affairs. She then worked for 15 years as head of research at the Directorate for the Coordination of Research, Studies and Statistics (DARES) in the same ministry and as Director of Research at the Centre for Employment Studies.

Why and what initiated this interest? “In the early 1990s, the dominant discourse emphasised the exclusive importance of work. Work was seen as an essential and structuring activity for individuals: I wanted to understand the genesis and causes of such a valuation of work and its central place in our society,” she explains.

This interest led her to undertake philosophical research, and to write her first book in 1995: Le travail, une valeur en voie de disparition? (published by Flammarion). "I wanted to understand philosophically how work came to be recognised as the central social activity. My proof here? In the GDP, only work is taken into account and political, family, domestic and leisure activities are completely ignored," she adds.

An interest that has also led her to do research in the sociological field. "By conducting field surveys in France, I have shown that work is indeed a central value for people. I would even say that they have a "pathological" relationship with work, unlike the Nordic people, for example, who, while respecting work, consider that their other activities - family, leisure, civic commitment - are every bit as important," says Dominique Méda.

An interest that has also led her to question the relevance of the "fetishisation" of GDP as measured and to relativize its relevance. “We need to pay attention to other indicators, two of which are, in my opinion, major. The first is the carbon footprint, the reduction of which is our absolute challenge faced with climate change. The second is the indicator of social cohesion. A social health index that measures the degree of inequality in a society,” she points out.

An interest that has finally led her, even more so as the Covid-19 health crisis developed, to advocate a total paradigm shift in the way our societies function. “Our societies must embark on a genuine "ecological reconversion" in which it will no longer be a question of promoting the biggest GDP, or the biggest profits, but of satisfying the social needs of all. An ecological reconversion which, moreover, should create many jobs”, concludes Dominique Méda.
It was in the context of the ongoing health crisis due to Covid-19 that the National Institute of Mathematical Sciences and their Interactions (INSMI), one of the ten CNRS institutes, decided to set up a platform to coordinate actions involving modelling Covid-19 phenomena. This platform, MODCOV19, was set up under full lockdown in France. Quite naturally, several lecturer-cum-research scientists from the UTC-LMAC Lab. (the Compiègne Applied Mathematics Laboratory), interested in the problem, were mobilised. First, individually on the platform MODCOV19, then with the call for expression of interest launched by Marie-Christine Ho Ba Tho, Director of Research at UTC. Immediately, 3 “pairs” of lecturer-cum-research scientists were formed around the Coveille project. The first two, consisting of Ghislaine Gayraud, professor, Miraine Davila Felipe, lecturer, and Nikolaos Limnios and Salim Bouzebda, both professors, are particularly interested in stochastic models and tools. In other words, models where factors of randomness are introduced. The last “pair”, with Florian De Vuyst and Ahmad El Hajj, both professors, works on deterministic mathematical models and approaches. So, what is the aim of COVEILLE? It is to model the dynamics of the Covid-19 epidemic at different levels of granularity of data analysis. In short, models which will be used to help monitor the spread of the SARS-CoV-2 virus and the risks of secondary upsurges.

A full university professor, Florian De Vuyst has been Director of the Compiègne Laboratory of Applied Mathematics (UTC-LMAC) since 2018. With more than 30 personnel – lecturer-cum-research scientists, associate professors, temporary teaching and research attachés (ATER), doctoral and post-doctoral students – UTC-LMAC has two teams. The first, EPIA, is devoted to "inverse problems and numerical analysis"; the second, S2, to "stochastic systems". Currently, 6 lecturer-cum-research scientists, are mobilised on Coveille, a modelling project linked to the Covid-19 epidemic.

After 15 years as a university professor - 8 years at the engineering school, Ecole Centrale Paris in the laboratory of mathematics applied to systems, followed by an additional 7 years at the École normale supérieure de Cachan in the Centre of mathematics and their Applications - Florian De Vuyst came to UTC in 2017, a year before taking over the direction of UTC-LMAC in January 2018. “Currently, LMAC has 13 lecturer-cum-research scientists, 2 associate professors, 2 ATERs and some 15 PhD students. Within the lab, we work of course on purely theoretical aspects but also on algorithms and more practical applications”, explains Florian De Vuyst. As a host team, LMAC is also a member of the Fédération de mathématiques des Hauts-de-France (FMHF), a CNRS research federation. What are the specialities of the two research teams? "EPIA works on the problems of "inverse problems", "partial differential equations" or "numerical model reduction". Pure deterministic modelling with practical applications in many fields. We can mention the detection of anomalies, medical imaging, fluid mechanics or road
traffic, for example. The S2 team is particularly interested in stochastic modelling, characterised by the introduction of randomness, mathematical statistics, data analysis or even machine learning. Theoretical fields which lead to models allowing, among other things, the extraction of knowledge, forecasting under uncertainty, detection of changes in trend, robust estimation, etc. Models applicable, in particular, in the fields of health, physical systems such as mechanics - the study of cracks in a material, for example - the reliability of complex systems, or simply human activity, he stresses.

What can we see as a LMAC’s strong point? “It is the existence of two teams, one with a so-called 'deterministic' approach, i.e., working on so-called "continuous", homogenised models, and the other with a stochastic approach which is interested in finer samples or scales of time and space. This makes it possible to describe a reality in two different but often complementary ways and to give elements of response in different ways and with different criteria”, details Florian De Vuyst. Far from the image of disembodied mathematics, the UTC-LMAC teams collaborate on concrete applications, particularly with health institutions and industry.

"The EPIA team has notably worked with the Amiens University Hospital. The objective was to detect anomalies in the brain or other parts of the body based on the response of living tissue to different types of waves emitted by medical devices. In short, the aim is to reverse the perspective of unintelligible observations or measurements in order to make them intelligible. The team is also collaborating, within the framework of Cifre PhD theses, with the manufacturer Renault on a project to optimise vehicles. A first task related to the problem of making the vehicle lighter while maintaining the same performances or "services". A second, to come, will concern the reduction of drag, i.e., the so-called CX coefficient, due to air friction. This translates into lower energy consumption,” he explains.

Finally, LMAC has been involved in collaboration with other UTC laboratories. "A joint collaborative platform has been set up with Adnan Ibrahimbegovic of the UTC-Roberval laboratory and a senior member of the Institut universitaire de France. The aim? To work together on joint projects dedicated to digital mechanics. We are also working with the BMBI, particularly with Anne-Virginie Salsac, on problems related to microcapsules and their transport in blood vessels. The main objective is to enable innovation in medicine. In particular, we have a PhD student under co-supervision who is pursuing a thesis on model reduction techniques", concludes Professor De Vuyst. ■ MSD

Miraine Davila Felipe is a senior lecturer at UTC-LMAC Compiègne Applied Mathematics Laboratory (LMAC). She is a member of the S2 team dedicated, in particular, to stochastic models and tools. In other words: models where a degree of randomness is introduced. She is leading the Coveille Project, a modelling project based on COVID-19.

I was after a call for expressions of interest (CEI) that three pairs, presenting jointly skills in deterministic and stochastic approaches and tools, were formed within LMAC to work on Coveille. “I’m the most recently arrived colleague at UTC in 2019. The fact that my colleagues chose me to lead this...
Objectives for the Coveille Project

Forecasting and Monitoring

What are the specific features of the Coveille Project? The involvement of lecturer-cum-research scientists with expertise in mathematical models and approaches, whether deterministic, stochastic or random, who will be supported, from January 2021, by two students on a final internship. How will the Coveille project unfold? It consists of three phases: the first involves classical statistical analysis, with Miraine and Ghislaine, the second, with Florian and Ahmad, establishes ordinary differential equations; as for Salim and myself, in a third phase, we will add randomness to the deterministic equation,” explains Nikolaos Limnios, a university full professor. Coveille's research is based on two lines of research, the first dealing with deterministic and random modelling, estimation and quantitative forecasting, and the second with identifying classes of interacting individuals. However, these two axes are in no way disjointed and the success of the project will, they are aware, depend on a permanent dialogue between the three pairs.

The theme of this thesis? “I worked on phyldynamic models, a relatively recent field of research. The aim is to study the spread of diseases in the population using the genetic data of the pathogen - virus or bacterium. These are models used particularly for diseases such as flu, HIV or Ebola, characterised by a high mutation rate of the pathogens involved. Finding different genetic sequences of a given pathogen in patients allows us to reconstruct the transmission tree. In a nutshell: to say who infected whom over time, provided we have enough data to reduce uncertainty,” says Miraine Davila Felipe.

This is a new field of research that makes it possible, for example, to estimate the date of the beginning of the epidemic and which research scientists are trying to apply to Covid-19. In this, they are helped by the emergence of sampling techniques that are fairly quick and inexpensive compared to what existed previously. “Currently on Covid-19, there is a site on which nearly 10,000 patient genetic sequences are stored. It should be noted that each individual hosts a certain number of viruses, with, however, always one that is over-represented. In general, it is the one that is most likely to be transmitted. Hence the possibility, thanks to the signature left by the virus, of reconstructing, with the help of statistics, phylogenetic trees of transmission. Of course, there are still many uncertainties, but this nevertheless allows us to make estimates in relation to the evolution of epidemics. We can thus estimate the reproduction rate of the virus or R0,” she points out.

This is a field of research that she explored further during her post-doc at the Institut Pasteur from 2017-18 and then as a temporary teaching and research associate at the University of Nanterre, which she has been pursuing since her arrival at the UTC. “I have developed this type of model from a mathematical point of view and have obtained fairly robust theoretical results from an epidemiological point of view. The idea is to couple two very different but highly correlated variables: the dynamics of the epidemic at the population level, through the curves of patients over time, and the genetic dynamics of the virus thanks to mathematical transmission trees. We thus have dual sourced information”, concludes Miraine Davila Felipe.

Finally, this is a field of research that she intends to apply, with other colleagues, at Coveille, a transverse project based on the modelling of Covid-19.
Concerning Covid-19, we have the expertise, by taking a direct model of the virus, to determine the rates of infectivity, incubation and death, the recovery time, etc. These are all epidemiologically relevant variables that can be calculated from observable data such as the number of infected people, hospitalized people, etc.

professor, a specialist in mathematical statistics and Miraine Davila Felipe, lecturer, specialist in probability? "With Covelle, we want to develop tools that would allow us to describe the evolution of the pandemic at different levels. Indeed, the great difficulty in epidemics in general, and for Covid in particular, is due to the heterogeneity of the population in terms of age and social background, for example. This, from a mathematical point of view, poses a major challenge. Ghislaine and I are more specifically interested in the contact network of individuals. Our aim is to model the social network through which Covid is likely to spread," explains Miraine Davila Felipe.

"The idea is not to predict who will or will not be infected in the long term, but to be able to monitor and identify clusters within the population based on individuals' contacts. In short: we are more interested in the network of relationships through which the virus will spread than in the transmission itself", adds Ghislaine Gayraud.

What are some characteristic of the models and deterministic approaches of the second phase? "We are working on models that do not take into account the random aspect. In fact, in the deterministic approaches where the theme of "inverse problems" and numerical analysis in general are addressed, we consider that we know very well the parameters used to build the models. Modelling that applies, among others, to mechanics or biology. In this field, several projects have thus been carried out with the Amiens University Hospital, notably on the detection of cancer cells in the human body based on measurements of the electrical brain activity of patients, or the characterisation for epilepsy, a project carried out by the region through which Covid is likely to spread," explains Ahmad El Hajj, university professor and head of the deterministic team.

Prof. Florian De Vuyst, director of LMAC, agrees: "It is indeed a question of characterising a tumour, for example, at a certain place in the body, on the basis of signals or measurements that are not images in the strict sense of the word. This is what we call "inverse problems". In short, it is possible to transform signals that cannot be directly interpreted into intelligible data that can be used to establish a diagnosis".

Concerning Covid-19, we have the expertise, by taking a direct model of the SARS-CoV-2 virus, to determine infectivity, incubation and death rates, recovery time, etc. These are all epidemiologically relevant variables that can be calculated from observable data such as the number of infected people, hospitalized people, etc. "With Covid-19, we have the expertise, using a direct model of the virus, to determine the infectivity, incubation and death rates, the recovery time, etc. "*, he adds.

So what are the possible hazards that could be taken into account in the case of Covid? Based on the previous data available, for example on individuals susceptible to infection, asymptomatic individuals, those with severe symptoms, those with undeclared symptoms and finally those cured or deceased, Florian and Ahmad will propose a deterministic SEIR (Susceptible–Infected–Removed) model enriched with categories that best reflect the reality of the current epidemic. To this model, we are going to assign random disturbances such as the rate of infectivity or the percentage of severely infected people that depend on several factors and cannot be totally controlled in a deterministic way*, explains Nikolaos Limnios.

The objectives set for such models? "The first objective is to determine the dynamics and evolution of the virus in the population. However, the development of stochastic models is mainly a response to the need for forecasting. It is a question of being able to say that, if we have a number of patients N at time T, we will have, for example: N X 2 patients at T+10. A reliable forecast is a valuable tool for decision support. In the case of Covid, it would make it possible to decide on the containment of this or that territory or to reszie the capacity of hospitals, for example," concludes Salim Bouzebda, university professor, head of the stochastic team. MSD

**USING THE SEIR MODEL FOR COVID-19**

The SEIR model (susceptible, exposed, infected, recovered), is a system of differential equations which models the evolution of four population classes in the total population (N). The variable S (susceptible) represents the number of people likely to contract the virus; the variable E (exposed to the virus) represents the number of people who are infected but in an incubation state; class I (infected) refers to those who are infectious, while class R (recovered) is that of those who have recovered from the disease. The SEIR model is summarised by the following system of equations:

\[
\begin{align*}
\dot{S}(t) &= -\frac{\beta SI}{N} - \gamma S \\
\dot{E}(t) &= \frac{\beta SI}{N} - \sigma E \\
\dot{I}(t) &= \sigma E - \gamma I \\
\dot{R}(t) &= \gamma I 
\end{align*}
\]

where \(N = S + E + I + R\) is the total population ; \(\beta, \sigma, \gamma\) being model parameters representing the infectivity rate, the inverse of the incubation time and the recovery rate respectively. In the evolution equation for S, the rate of people exposed to the virus is proportional to the number of people likely to be infected (S) as well as to the fraction of the infectious population (IN ratio). In the equation on E, there is a gain term coming from the population S and a loss term proportional to E for people becoming infectious. In the third equation on I, there is a gain term coming from population E and a loss term proportional to I that expresses the rate of people recovering. The latter term is found as a positive value in the equation on R. Figure 1 shows an example of a numerical simulation carried out with the SEIR model taking into account a period of confinement (between day 95 and day 190 after the start of the epidemic). The model intrinsically "captures" a second wave which begins around the 9th month after the start of the epidemic in January.
It was during the first full lockdown that these two research scientists met, at least virtually, since personal travel was impossible. The reason for this “contact”? “It was to work with Martin Morgeneyer’s team on the problem of aerosols and droplets associated with Covid-19 in the air. A project designed to manage the health safety of the hospital’s patients as effectively as possible. Indeed, since the beginning of the Covid-19 crisis, I have been helping my colleagues in the various departments to organise infection prevention and to provide better care for Covid patients”, Jérôme Robert assures us.

Martin Morgeneyer agrees with him: “The collaboration came about quite naturally and we started to do ‘experimental’ work even before taking on the red tape paperwork part of the project in a good spirit of ‘all locked down now’. We just rolled up our sleeves and thought about what we as engineers could do with the doctors on the front line.”

A collaboration that accelerated with the adventure of Alain Ducasse’s restaurant Allard, an institution in the heart of the Latin Quarter. Martin Morgeneyer’s team was called in to test and validate the quality of the chosen system. “Alain Ducasse quickly understood that barrier gestures and distancing would drastically reduce the number of tables available. As specialists in particle systems, we developed a system that allowed us to simulate all possible permutations. In short, to simulate all potential aerosol contamination paths from table to table by reproducing the various behaviours of people at the table. For example, there are those who are chatting quietly, others who are laughing out loud. Tests have shown that the air quality is optimal with regard to airborne particles and, as a side effect, allergens”, explains Martin Morgeneyer.

But the adventure began well in advance, since Alain Ducasse called on designer Patrick Jouin, designer of the Plaza Athénée restaurant room, and architect Arnaud Delloye to think about a solution that would save the restaurant’s economic model. A solution that could only emerge through intense collaboration between his team, doctors and particle specialists.

“Alain Ducasse's decision to start with this restaurant, symbol of the Latin Quarter... “He could have taken a larger restaurant in a large hotel, for example, but he made this choice because there are thousands of restaurants of this size in France. His only concern being the safety of the customers, he wanted to find a solution so that they would feel really reassured and that this solution would be reproducible. We started from the premise that hand hygiene and social distancing were under control, but that air ventilation and air movements in an enclosed space could facilitate the circulation of the virus from one table to another. Sprays can be stopped mechanically. Hence the idea of screens between each table. There was still the problem of the small particles that remain in the air for a long time and can therefore circulate through mechanical ventilation or draughts. So we and the architect came up with the idea of a sort of hood, with filters similar to those in operating theatres, which would suck the air over each table. We still had to prove that it worked. That’s where Martin Morgeneyer and his team came in”, says Robert Jérôme.

Martin Morgeneyer, lecturer-cum-research scientist at UTC in its TIMR laboratory, specialising in particle systems and Professor Jérôme Robert, head of the Bacteriology Department and head of the Hygiene team at the Pitié-Salpêtrière Hospital in Paris, have, each in their own field, lent their support to the “stop-Covid” system set up in the Allard restaurant of chef Alain Ducasse.
A new and patented medical implant device

Like the three musketeers who, as everyone knows, were four, Anne-Virginie Salsac, director of research at the CNRS in the Biomechanics and Bioengineering Laboratory (BMBI), Professor Jean-Paul Couetil and Dr Éric Bergoënd, both cardiac surgeons, and Adrien Laperrousaz, then an engineering student at the UTC, designed an innovative implant for the treatment of functional mitral insufficiency. The implant is already patented nationally and is awaiting approval for a European extension patent.

The creation of any new system is always accompanied by a phase of experimentation. The aim is to see how it works under the most realistic conditions possible.

It all began in 2014 with an e-mail sent to Cécile Legallais, director of UTC-BMBI, by Professor Jean-Paul Couetil, then head of the thoracic and cardiovascular surgery department, and his colleague, Doctor Éric Bergoënd, both cardiac surgeons at the CHU Henri-Mondor de Créteil. They explained the concept of a new type of cardiac implant and wanted to put their idea into practice with the help of BMBI researchers and engineers. The e-mail was sent to Anne-Virginie Salsac and led to a meeting to assess the feasibility of the project.

"They were looking for people specialised in biomechanics, with skills in medical device technology and bioengineering, familiar with the world of research and who could collaborate with them. In short, for a research team with the ability to see the needs from a clinical point of view and capable of proposing device ideas, design them and support the project through to completion. It was at a meeting held shortly afterwards that they explained to us the problem of functional mitral insufficiency, its serious consequences from a clinical point of view, particularly on patients who cannot tolerate existing devices," explains Anne-Virginie Salsac.

We therefore had to think about other solutions. "Discovering means defining the problem or issue precisely. They are the ones that, depending on your state of mind, you have the certainty that there will be various possible solutions. It's up to the team to try to find the best one," says Jean-Paul Couetil, who has several patents in cardiac surgery to his credit. It's important to recognize that he's come from a good school, since he was one of the last students of Professor Alain Carpentier, a leading specialist in mitral reparatory surgery and mitral valve repair at the Broussais Hospital. A field that he continued to explore when he joined the CHU Henri-Mondor in 2010 as head of department.

What reasons led Jean-Paul Couetil and Éric Bergoënd to think about a new system? "There are two types of mitral insufficiency: organic mitral insufficiency and functional mitral insufficiency. In the first case, the mitral valve that is structurally defective. In short, the valvular tissues, pillars or cords attached to the left ventricle which may be defective. In the second case, it is the valve function that is damaged but not the structure itself. A function that may be impaired due to an anomaly in the anatomy of the valve. In principle, the valve allows blood to flow in one direction only from the left atrium to the left ventricle, like a double non-return valve. However, when the two sheets of the valve, for example, no longer come fully into contact during the contraction of the ventricle, some of the blood flows back into the atrium, making the heart less efficient as a pump. This can eventually lead to heart failure, i.e., a severe deficiency of the ventricular muscle. This is all the more critical that some patients cannot tolerate existing treatments," explains Professor Couetil.

So, how did the idea of a new type of implant come to be? "Professor Couetil's particularity
is to have several ideas per minute. We often discuss pathologies for which existing treatments are either ineffective or too invasive, and how to improve patient care. We have been particularly interested in the treatment of functional mitral insufficiency, which is due to a deterioration in valve function characterised by an imperfect contact between the two leaflets of the valve in systole. It was during discussions on this topic in 2011-2012 that he launched the idea of compensating for this lack of contact by filling the unwanted space between the leaflets with an implantable device; the exact nature of the device had not yet been defined,” says Dr Éric Bergoënd.

Until now, the only existing technique for repairing a defective valve in a “minimally invasive” way (transcutaneously, without open-heart surgery) consists of placing a small clamp connecting the two valve leaflets in the middle. This promotes improves the contact between the two sheets, but it does disturb the functioning of the valve and the blood flow.

And what about the particularity of the project being carried out within UTC-BMBI? “Once the problem was defined, we thought that the design of a new device consisting of re-establishing the valve's tightness was an ideal project for setting up a research project for engineering students as part of their training. This is how a project team was set up, bringing together heart surgeons Jean-Paul Couetil and Eric Bergoënd, multidisciplinary groups of UTC students (bac+3 to bac+5) and some UTC-BMBI research scientists,” emphasises Anne-Virginie Salsac, adding “We formed groups of 5-6 students who worked on the project over a six-month period. Of course, as lecturer-cum-research scientists, we monitored the project at regular meetings with them to check that it was moving in the right direction and to provide the students an appropriate level of impetus.”

As a 4th year engineering student in mechanical engineering, Adrien Laperrousaz served, according to Dr Salsac, as a guide throughout the entire project. “Until then, I had only been interested in mechanics in the sense of the science of movement of mechanisms and had never approached the medical field;” says Adrien Laperrousaz. “In February 2014, Anne-Virginie Salsac submitted a CC-project subject (‘PR’ in UTC jargon) on the dedicated UTC digital workspace around this new mitral valve repair device. I was interested and was selected among the five students for the start of the first PR dedicated to the cardiac implant. I was the only one from mechanical engineering, the other four from bioengineering, and the only one to master the design software to do 3D modelling. This makes it possible to create more meaningful visuals. We then met, accompanied by Anne-Virginie Salsac, the two surgeons who described their idea to us and we set to work for five months”, Adrien Laperrousaz explains.

The creation of any new system is always accompanied by a phase of experimentation. The aim is to see how it works under the most realistic conditions possible. Hence the idea of implanting the prototype in vitro, in an experimental heart model – at University College London (UCL) – a model which accurately reproduces the flow of blood as in a human heart.

“Once the CC is over, what can you do?” he wondered. All the more so as the four other class mates had left for their final internship. Having taken a liking for what he was doing, he decided to reapply in September 2014. Being the only one present from the beginning and the only one who had mastered the state-of-the-art for this project, we decided to set up several PR groups - one group working on materials, for example; another on the patient status, etc.; he says. “In January 2015, we realised that we had enough material to put together a dossier and start looking for funding to develop prototypes,” he says.

Thus, in March 2015, Adrien and his colleagues submitted an application to the national I-Lab competition in the category ‘Emerging Projects’ and were declared laureates, in May 2015. At the end of the competition, they received a grant of 25 000 euros. This allowed UTC to finance Adrien’s final internship at the UTC Daniel Thomas Innovation Centre. “It was in September 2015, during this internship, that I started to develop a prototype implant in order to be able to carry out in vitro tests”, adds Adrien Laperrousaz.

The innovative approach developed by this UTC-CNRS team consists in restoring the valve's tightness by attaching an inflatable balloon to one of its leaflets, via a transcutaneous insert route.

"The creation of a new system is always accompanied by a phase of experimentation. In short, we wanted to see how it works in the most realistic conditions possible. Hence the idea of implanting the prototype in vitro, on an experimental heart model - at University College London (UCL) - which reproduces the flow of blood as in a human heart. The pathologies linked to the mitral valve were also reproduced to be as close as possible to reality. These tests were successful, as there was a real reduction in residual leakage. This enabled us to provide a proof of concept,” describes Anne-Virginie Salsac.

What motivated the choice of UTC? "A colleague who has developed several projects in the field of biotechnology advised us to call on the engineers and researchers of the UTC if we wanted this project to succeed. An opinion shared by a teacher-researcher from the École polytechnique whom I had contacted and who gave me the names of Cécile Legallais and Anne-Virginie Salsac. They both praised the dynamism of UTC and assured me that we would find real skills in bioengineering there,” explains Éric Bergoënd.

It took a lot of energy for the whole team to come up with such a successful concept and work on the drafting of the patent claim.

But the adventure is not over given that a Cifre PhD student, Thibaut Alleau is pursuing - under the supervision of Anne-Virginie Salsac, in partnership with the company Segula Technologies - the creation of a digital model of the dynamics of the mitral valve, enabling the positioning of implants to be modelled and tested.■ MSD
I studied for one semester in Sofia, Bulgaria

Augustin Clément, third year student at UTC, chose to go to Sofia in Bulgaria for his Erasmus exchange semester. Between apprehensions about the possible cancellation of his stay, travel and courses in very small groups, he tells Interactions about his experience.

Where did you go to study this semester?
I went to Sofia, Bulgaria to study at the UCTM, the Bulgarian University of Chemical Technology and Metallurgy.

Why did you choose this destination?
I am a student in my final semester of the common core (Editor’s note: the first two years of study at the UTC) and I didn’t have many courses to do here. So I told myself that the best thing to do was to validate these last courses abroad, in a context that I didn’t know. I was very keen to discover Eastern Europe, but the situation in Poland worried me and only Bulgaria offered biology courses adapted to the branch I wanted to follow. So my choice was quite easy and natural.

Were you afraid that your semester would be cancelled?
It's true that with the health situation, the closer I got to the departure date, the more I stressed. I had nevertheless had prepared a plan B if I stayed in Compiègne with certain courses I had chosen. But all the same, I was hoping to be able to leave. In the end everything went well, my flight was not cancelled and I was able to fly to Bulgaria last September.

How was your arrival there?
The first thing that struck me was the fact that the Covid-19 is not very present among the population. Social distancing was clearly not a priority and, unlike France, restaurants, nightclubs and bars remained open. It must be said that to pass the COVID tests here you have to spend more than 60€. It’s a high price for people and that surely explains the low number of cases recorded. But since December 8, 2020, the country has taken measures to close some establishments.

And what about your integration in the university, how did it go?
On site, there is an association that takes care of welcoming all Erasmus students. There were a lot of activities and meetings at the beginning of the semester and there is a real follow-up throughout the year. It’s really ideal. But meeting Bulgarians proved a bit more complicated.

Why so?
Well, because I didn’t have a lot of classes with them. I’m in a French-speaking biology course, and there are only three or four of us in my classes. In other words, it’s not the best way to meet new people...

And what does the pedagogy in your Bulgarian school look like?
I must admit that the mentality there is quite different from the French one. I have the feeling that people are less stressed and this can be felt in the organisation of the courses. The start of the school year was postponed for a few weeks but that didn’t worry anyone at school. I have both face-to-face and some distance learning courses. But unlike the distance learning courses I followed at UTC, where there was a lot of video-conferencing, here the distance learning is more like a few PDF files sent by email and reminders from the teachers to find out where we are in our course primer reading.

But unlike the distance learning courses I followed at UTC, where there was a lot of video-conferencing, here the distance learning is more like a few PDF files sent by email and reminders from the teachers to find out where we are in our course primer reading.

So, you were able to make some trips?
Yes, of course! I visited Bulgaria a lot. It was a country I didn’t know at all and I fell in love with it. Between the mountains, the hot springs, the small villages. There is something very wild in the places I visited. I also went to Istanbul and Macedonia. I also wanted to venture into Rumania but I was turned back at the border because of the COVID measures.

And how do you envisage the end of your stay?
I will try to stay as long as possible in the country. Why go back to France for the holidays, for example, when there is a lockdown and I am not sure I will be able to return here? I have so many other things to explore in Bulgaria that I won’t be bored!

Are you fluent in Bulgarian?
Far from it! I learnt the Cyrillic alphabet so that I could get by a little but I have a lot of progress to make yet.
UTC students Auxane Caseiro and Charlyne Kerjean won the national James Dyson Award 2020 for designing Tuli, a tulip-shaped menstrual cup. Their goal? To democratise access to these hygienic protections. We zoom in on this 100% feminine and 100% innovative project.

How did your Tuli Cup project originate? It began with a disappointing observation made by the two students: "Today, there is no hygienic period protection adapted for women", explains Auxane Caseiro. "Too expensive, poorly adapted to our anatomy, sometimes dangerous for health, and above all polluting". The situation seemed bleak for the two industrial design students. So they decided to carry out research on the subject. "We discovered that menstrual cups are the most suitable devices for women," continues Charlyne Kerjean. "But when we looked more closely at this device and conducted a survey of 1,344 women, we realised that there were problems with folding and use." What were the problems? The suction created when the appliance is removed.

So, in February 2020, the two young women decided to look into this everyday object to try to find solutions. Long evenings of research, analysis and tests to build a prototype different from the cups already existing on the market. By choosing to give their device a tulip shape, they have created a system that is easier to remove and therefore more practical for its users.

Last July, they decided to be candidates for the James Dyson Award, an innovation and design competition. "With the help of Anne Meuleau and Emmanuel Corbasson, lecturer-research workers at UTC, and Nicolas Piton, head of the prototyping platform at the UT Cr Daniel Thomas Innovation Centre, and thanks to the long hours spent on the FaceTime video-conferencing channel, which we spent in lockdown, we set up this new device for women. First in the form of an origami, then in the form of a real prototype."

And their innovation proved attractive. Last September, the two inventors won the national competition prize ahead of dozens of other participants. "Three reasons explain the success of our two students in this competition, explains Emmanuel Corbasson, Director of the Industrial Design Department of UTC at the time. Firstly, they put together a very relevant product that meet a need expressed by millions of women all over the world. Secondly, because it is a subject not frequently dealt with by engineers, which nevertheless remains a highly taboo topic. Finally, because it's an ecological issue to which Dyson has been sensitive."

I there a future for Tuli cups? First of all, the two students want to refine and enhance their prototype and 3D print it in medical silicone for testing in real conditions. "There might be a lot of changes compared to our usual prototypes," Auxane anticipates, "but it will be proof that our idea is a good one. "And who knows, maybe tomorrow they will be able to start their own business? "Why not, but for now, our goal is to have a product that works well," concludes Charlyne Kerjean. }
Digital citizenship called to question

To adapt to the situation created by the Covid-19 pandemic, UTC organised its “Interactions-Press” event in early November in the form of a “Live LinkedIn”. On the programme: an online conference by Clément Mabi, UTC a research scientist, who explained how digital tools are overturning participatory democracy. Some excerpts.

**Digital tools for citizen participation**

“Civi-tech” refers to all the applications and platforms that make it possible to use our collective intelligence and to strengthen the democratic link between citizens, communities and the State. No wonder that civic engagement, commitment and citizen participation offer one of the favourite playgrounds for digital entrepreneurs today. But digital tools are not for everyone. “About twelve million French people are far from it. Public meetings still have a bright future ahead of them. There is a kind of Internet democracy with a form of regulation. Even if it is the strength of popularity and emotions that circulates content, for example YouTubers. There is an emotional mobilisation behind this mechanism of the Internet and social networks where, in order to optimise visibility, you can stand behind key words such as #I am Charlie or #MeToo.” Then there is the legitimate question of the democratic regulation of these social networks.

**An e-democracy specialist, Clément Mabi questions the state of public debate today and takes a critical look at the tools proposed by the industrial sector, particularly the GAFA, and their uses.** Digital technology is gradually becoming a culture that is transforming our relationship with democracy and citizenship. “Technologies don’t create fake news per se but make it more visible. Depending on the digital tool used, we create a relationship in a different sense. The important thing is the space in which we express ourselves. When we do it with people who look like us, speech is freer. But can digital technology bring democracy up to date? The more we use digital technology, the more we need to put people behind it”, says Clément Mabi, who has taken a strong interest in these “citizen-oriented technologies” better known as “civi-tech”.

**THIS YOU SHOULD KNOW...**


**Clément Mabi, Citizen-cum-Research Scientist**

Clément Mabi is a research scientist in information and communication sciences at UTC (University of Technology, Compiègne), specialising in digital technology at the service of democracy. He is particularly interested in digitally-assisted consultation and public debate. Within the UTC-Costech laboratory (Knowledge Organisation and Technological Systems), he leads the Epin team (Digital Writing, Practices and Interactions) and is Costech’s deputy Lab Head. His work and publications have refocused on public debate: participatory democracy, online participation, concertation engineering. His reflections have led him to explore many other themes: Internet governance, open data, open government. Clément Mabi is currently directing a special issue of the magazine Réseaix on the theme of “Digital government and public action”, to be published in January 2021.
The Saint-Côme Polyclinic, Compiègne, like many other French hospital sites, has had to deal with the first wave of the coronavirus. The establishment was, with those of Compiègne and Creil, among the first in the country to be affected by this new disease at the end of February 2020 with the Oise cluster. Its teams had to mobilise and reorganise themselves to deal with the then epidemic in order to ensure, in collaboration with the public hospital, the care of Covid-19 patients.

Close to Crépy-en-Valois, France’s first noted Covid cluster, the hospitals of Creil, Compiègne and the Saint-Côme polyclinic were the first to enter crisis mode. Three weeks before the rest of the country, they were already heavily impacted by the coronavirus SARS-CoV-2. Crépy-en-Valois was one of the first epidemic foci. Then we were heavily impacted, because of the government’s hesitation about what to do at first. It’s true that at that time we didn’t know much about the virus and its extent. We quickly had to organise ourselves to deal with this epidemic with Covid patients and staff quarantined,” says Vincent Vesselle, director of the Saint-Côme polyclinic, the largest private clinic in the Picardy region. It has nearly 800 workers, including 550 salaried staff, the city’s second largest employer. Apart from Covid-19, the establishment treats 15 000 other patients every year, 25 000 in A&E visits, 1 300 maternity deliveries, 5,000 chemotherapy treatments, i.e., one in three cancers in the Oise region, and 15 000 dialysis treatments. The integration of new practitioners and new activities have moreover called for the completion of a building extension in 2019 (cost €10m) for this establishment, which was only recently opened in 2009.

Public and private hospital hand in hand

Between the GHPSO (Groupe Hospitalier Publicier Sud Oise), the Beauvais hospital, the Compiègne hospital and the Saint-Côme clinic, a territorial coordination unit has been organised to exchange and offer mutual assistance. This includes a daily telephone conference with the Samu’s regulating doctor. “At the beginning of the Covid-19 health crisis, it was very complicated to deal with all the actions that needed to be taken. Especially in regard to masks. One day, they were recommended; the next, they were not recommended; the problems with the supply of medicines and materials. We are lucky in this area to live in very good harmony with the public hospitals. So we worked together,” says the director, who very quickly decided to suspend all non-urgent interventions in order to admit Covid-19 patients in support of the hospital. In May, the activity resumed almost normally with the care programme of patients who had not been able to be taken care of before. The clinic has a total of 270 beds, places and posts. “The second wave has been easier to manage because we are less unprepared and better prepared. There is even a lull at the end of the year.” Picardy was very affected for the first wave; however, for the second wave, it was more preserved than the Hauts de France (Nord) and Ile-de-France. Nevertheless, it was necessary to increase the capacity of intensive care units (ICUs) to meet the needs of Covid-19 patients, knowing that other pathologies continued to be treated to avoid loss of opportunity for patients. □ KD
Among the twelve 2020 winners chosen by the Fondation “La France s’engage”, among the social entrepreneurs who innovate to build a fairer and more socially responsible society, we find the Compiègne-based Bip Pop Cooperative designed within the UTC Costech laboratory. It has been noted at the national level for its application of mutual aid among citizens, associations and communities aimed at alleviating isolation.

The health crisis we are going through has unfortunately accentuated inequalities in our society. The mission of Bip Pop takes on an even stronger meaning in this period. The co-operative offers a platform of local self-help services for communities that wish to broaden their social offer in order to fight against people's isolation. Bip Pop is a social and solidarity economy enterprise (société coopérative d'intérêt collectif). Its partnerships with local authorities, MDS, RPA, EHPAD, CAS, CCAS, CSR aim to provide a service to as many isolated people as possible. "The situation in France is worrying. Two million senior citizens are in a situation of isolation and this figure is constantly increasing. By putting people in need of a service in touch with other people or entities offering their services, Bip Pop is making it easier for them to stay at home by providing access to the last mile and local services," explains Mathieu Ribeil, Bip Pop's development director.

A recognised social innovation
Conviviality visits, reading aloud, computer assistance, help with administrative formalities, accompaniment on walks, races, events and even senior-junior advice, I need help, I “beep” Bi, and Pop answers me, referring to the immediacy of Internet and mobile uses. But here it is transposed to pure social contact. The idea is to popularise these local self-help services. Here again the pop popularises. Anne Guénand, lecturer-research scientist at UTC designed this social and solidarity innovation at the UTC-Costech laboratory. "Bip Pop is indeed the fruit of several years of development and research work in partnership with UTC and the Godin Institute. Winner 2016 of the Impact Ashoka programme, winner 2016 of the Inclusive Mobility Laboratory, winner 2017 and 2018 of the Oise Financeers' Conference, as well as of the Hauts-de-France region, the Bip Pop platform was deployed in 2020 in the Hauts-de-France and beyond."

The citizen commitment is affirmed at this particular time
This tool for coordinating local solidarity makes it possible to respond easily to the specific and sometimes very simple needs of isolated people through a voluntary and local response. The network thus formed promotes home care for the elderly and brings more life into their homes. As former President of the Republic, François Hollande, Chairman of the Foundation La France s’engage, points out: "Bip Pop is a real bulwark against exclusion and will aim to break the isolation of more than 30,000 elderly people living in rural areas within three years. Our project is to contribute to building a fairer and more supportive society, based on the fulfilment of each individual. "The Fondation La France s’engage is part of the extension of the programme of support for social and solidarity innovation initiated by the State in 2014. Each year, it identifies and rewards the most innovative projects. Once approved, the projects are accelerated by the Foundation, which provides them with support for three years in addition to funding. The aim is to help them spread throughout the country. ■ KD
Ubikey reinvents itself with **Ubikey Office**


Ubikey announce its innovative visual management solution: Ubikey Office. This collaborative software allows any employee to follow the real time evolution of a project on a tablet, smartphone, computer, at the same time as it is displayed on the company’s interactive screen. Each employee can thus view and interact on the digital Post-it board, wherever he or she is, on his or her own missions as well as those of the whole team for greater efficiency. This tool has already been adopted by companies such as Sanofi, Thales, Bouygues, Michelin and Ariane Group. “I am responsible for continuous improvement within Ariane Group and, in this capacity, I lead workshops where many exercises are the subject of Post-it workshops. With the health crisis, a protocol has been put in place within Ariane Group limiting contact and handling of objects such as the famous paper Post-it notes. Ubikey offers a lasting solution beyond the crisis, since this environment allows me to run the workshops both face-to-face and remotely, with participants sharing the handling of Ubikey at the beginning of each workshop”, says Jean-Marc Goyon, Improvement & Change manager with the Ariane Group, who has successfully experimented with various concrete uses such as visual performance management, World Café workshops or an interactive game board based on lean management.

A response to the needs of companies during the crisis

“With Ubikey Office, we want to be part of the current evolution of work, i.e., the presence for each company of employees present on site and others working remotely at home. The ambition is to keep all its teams involved and informed, in real time, as to the evolution of a project in a context where the health crisis is forcing companies to manage their teams distributed both on site and remotely”, assures Atman Kendira, CEO of Ubikey. Created in 2015 following research work carried out at UTC, this start-up now has nine employees and a number of prestigious customers, including Sanofi, Plastic Omnium and Sorbonne University. Ubikey also benefits from strong support from its institutional partners BPI-France, the Hauts-de-France region, Paris & Co, UTC, French Tech and the Cap Digital competitiveness cluster. “Visual management, in these troubled times, appears to be the solution to better manage these teams,” concludes Julien Bellenger, Director of Development at Ubikey. “Never before has the need for meaning and a global and rapid understanding of the project one is involved in been so important for employees around the world. Ubikey is a long-term tool for a new way of working that will be both face-to-face and remote and which we describe as a hybrid.”

**KD**

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**Ubikey offers a long-lasting solution beyond the crisis, since this environment allows us to ensure both face-to-face and remote workshops.**

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**START-UP**

**Havr adopts home on line working from home**

The start-up created by UTC students has presented its employees with a new business model and working arrangements that combine productivity and well-being. “We have had an extremely positive experience, which can serve as a basis for a new social model that will have to be improved, optimised and refined over time. Our employees are more gratified and have found a perfect balance between their professional and personal lives. The company, for its part, is more efficient. The situation has led to a culture of “don’t work harder, work smarter”, says Simon Laurent, CEO of Havr. Since its creation in 2017, the start-up has continued to grow and establish itself in the corporate access control market.
Surviving as a start-up in 2020

The year 2020, marked by the Covid-19 pandemic, has proved difficult for many French companies, especially start-ups. How did they experience the lockdown, how did they adapt and do they envisage the future? A status review, with 4 UTC graduates.

What did the confinement bring about for the development of your start-up?
LG: At the beginning of the lock-down, we made much more use of the written word to communicate. Decisions were also made in writing, which created misunderstandings and may have led to certain tensions within the team.

CB: We have generalised teleworking for all our employees by providing everyone, in an emergency, with the necessary equipment for decent working conditions. Unfortunately, given the deadlines, it was not optimal for everyone.

PH: With my partner, we decided to mobilise our team and focus on our internal Medicamentum project, the 1st INCI beauty* drug, because Beyowi’s consulting and mobile and web application development activity was very affected by the containment.

How did you adapt? Have you made any long-term changes to the way you work?
SC: We stopped assembling our 3rd prototype and started designing the 4th in order to propose a more successful system once the health crisis was over. Within the team, we had already been working remotely for two years between Germany and France, so it was more the relations with the outside world that were impacted, because it is simpler to propose a videoconference.

CB: We organised regular meetings and contacted each person individually to update our status knowledge. We were careful not to organise too many meetings, so as not to weigh too much on the schedules and avoid the feeling of being “spied on”. A project was born out of the confinement: the opening of a Coddity site in the Limousin countryside, a spacious and quiet working environment. In the long term, we plan to develop an activity in this little-known and often neglected region.

What is this year's outcome? How do you plan for 2021?
SC: As our initial event-related activity was impossible under the current conditions, we decided to put it on hold and embark on a new adventure by seeking to respond to the problem of access to energy on the African continent. Several field studies in Africa are planned, as well as the meeting of a large number of actors and the production of the first prototypes.

LG: Our communication has evolved over time, we know how to differentiate between exchanges that can or cannot be done in writing, which saves time and limits frustration between team members.

PH: Our incubation at H7 (a living space dedicated to entrepreneurs in Lyon) and our 4th place out of 50 projects in the Digital InPulse #App4Good competition in October made Medicamentum visible. We also recruited 3 additional people to accelerate development.

AtmosGear, Soft mobility in an urban settings

Christine Kerdellant, Editorial Director of Infopro Digital and Manuel Moragues, Editor-in-Chief of Industrie & Technologies, together with partners, unveiled the four 2020 winners of the 17th edition of the Trophies for Engineers of the Future. After having been "a favourite" at the 2019 edition, Mohamed Soliman, 23 years old, won this year’s prize in the "Innovation" category with his electrically assisted rollerblade project: AtmosGear.

AtmosGear was chosen in the Innovation category of the Engineers of the Future 2020 Awards. It is the world’s first electrically assisted, self-contained and connected rollerblade model. A highlight at the 17th edition of the Engineers of the Future Trophies held on December 1st in a 100% digital format. Organised by the editorial staff of the review Usine Nouvelle, they reward engineering students in four categories: Innovation, Research, Tech For Good and Digital. Mohamed Soliman, a 23 year old engineer, is a UTC student. In 2019, this entrepreneur created a startup in the field of electric urban mobility. Its flagship product, AtmosGear, aims to be the first ecological mobility...
alternative that is at the same time intelligent (no need for a joystick), practical (no need to take off your shoes) and fun (challenges and community social network).

Mobility, an everyday issue

'Our ambition is to change the travel habits of the French by democratising soft mobility. Whether it's to go to work, to class, or on a walk, AtmosGear provides the benefits of a sporting activity while reducing your efforts to help you find pleasure in your daily journeys,' emphasises the young company director for whom mobility means being able to move where you want to, when you want to and how you want to. "And what we want above all is to link our users to each other so that they can exchange and even challenge each other via our connected application," he continues. "This community of enthusiasts is called AtmosRiders".

Future-oriented remote on-line learning

The NQCE specialised Master’s degree (post-master 2) accredited by the Conférence des grandes écoles (CGE), entitled "Management through Quality", has been able to evolve by anticipating the constraints due to the health crisis. Focus on this course, which after 15 years in e-learning, can be followed entirely on-line and while maintaining a full-time professional activity.

As early as 1972, UTC considered “quality” to be a major challenge, creating a course of study in Industrial Reliability and Quality. Opened in 1992, the NQCE specialised Master's degree was accredited by the Conférence des grandes écoles (CGE) in 2002 and offered an on-line option as of 2005. In 2019, Nicolas-Louis Duclos, lecturer-cum-research scientist in charge of the MS-NQCE and his predecessor, emeritus professor Jean-Pierre Caliste, had the idea of strengthening international teaching and developing partnerships with foreign universities.

Managing, improving, anticipating

This specialised Master's degree provides a high level of management skills and uses methods and know-how from the quality professions. It is based on the technological culture of the UTC to take into account the impact of the digital transformation of the economy and business practices. "The coronavirus crisis has shown the need to strengthen the capacity to be reactive and innovative in order to remain effective in crisis situations. The growing uncertainty and complexity of today’s world is forcing us to change the way we look at things and to change our ways of thinking and working methods. Agile know-how helps us to move forward despite complexity, for example by generalising the project culture, by better taking into account the transversal and intangible aspects of activities," explains Nicolas-Louis Duclos, specialised research scientist at the UTC-Costech-CRI (Complexities, Networks and Innovation research unit).

The new formula integrates innovative teaching methods such as self-assessment quizzes, team marks and peer assessments (students marking students): "Our teaching method and individualised support allow both the acquisition of theoretical knowledge and its concrete appropriation, thus developing operational skills." Considering that over the last thirty years, many managers have gradually been put on the defensive, giving priority to reporting and justification logics rather than to the added value of the job, Nicolas-Louis Duclos is convinced of the need to offer high-level international training to enhance management and quality know-how: "Using the Internet to adapt this diploma to everyday life is a step in the right direction." KD

A PROJECT SUPPORTED BY THE TERRITORIAL DEVELOPMENT DEPARTMENT

Mohamed Soliman imagined these skates of the future, which are very real today, at the UTC Daniel Thomas Innovation Centre. This highly skilled engineer did not wait until the end of his studies to become an entrepreneur. It is thanks to the DIDT’s Innovative Project and Entrepreneurship Scheme, and then the Iterra incubator that he overcame various technological pitfalls, one by one: sensor agility, miniaturisation of the power unit... "The engineers of tomorrow will also be the citizens of the future. It is important for us that our students are able to envisage and adapt to this changing world. This is something Mohamed Soliman has already understood for a long time," says Pascal Alberti, the school’s Director of Innovation and Territorial Development.

CONTINUING EDUCATION

“Management through Quality”

The NQCE specialised Master’s degree (post-master 2) accredited by the Conférence des grandes écoles (CGE), entitled “Managing through quality: from strategy to operations”, has been able to evolve by anticipating the constraints due to the health crisis. Focus on this course, which after 15 years in e-learning, can be followed entirely on-line and while maintaining a full-time professional activity.

Image 1

Mohamed Soliman imagined these skates of the future, which are very real today, at the UTC Daniel Thomas Innovation Centre. This highly skilled engineer did not wait until the end of his studies to become an entrepreneur. It is thanks to the DIDT’s Innovative Project and Entrepreneurship Scheme, and then the Iterra incubator that he overcame various technological pitfalls, one by one: sensor agility, miniaturisation of the power unit... "The engineers of tomorrow will also be the citizens of the future. It is important for us that our students are able to envisage and adapt to this changing world. This is something Mohamed Soliman has already understood for a long time," says Pascal Alberti, the school’s Director of Innovation and Territorial Development.

Image 2

As early as 1972, UTC considered “quality” to be a major challenge, creating a course of study in Industrial Reliability and Quality. Opened in 1992, the NQCE specialised Master's degree was accredited by the Conférence des grandes écoles (CGE) in 2002 and offered an on-line option as of 2005. In 2019, Nicolas-Louis Duclos, lecturer-cum-research scientist in charge of the MS-NQCE and his predecessor, emeritus professor Jean-Pierre Caliste, had the idea of strengthening international teaching and developing partnerships with foreign universities.

Managing, improving, anticipating

This specialised Master's degree provides a high level of management skills and uses methods and know-how from the quality professions. It is based on the technological culture of the UTC to take into account the impact of the digital transformation of the economy and business practices. "The coronavirus crisis has shown the need to strengthen the capacity to be reactive and innovative in order to remain effective in crisis situations. The growing uncertainty and complexity of today’s world is forcing us to change the way we look at things and to change our ways of thinking and working methods. Agile know-how helps us to move forward despite complexity, for example by generalising the project culture, by better taking into account the transversal and intangible aspects of activities," explains Nicolas-Louis Duclos, specialised research scientist at the UTC-Costech-CRI (Complexities, Networks and Innovation research unit).

Future-oriented remote on-line learning

The new formula integrates innovative teaching methods such as self-assessment quizzes, team marks and peer assessments (students marking students): "Our teaching method and individualised support allow both the acquisition of theoretical knowledge and its concrete appropriation, thus developing operational skills." Considering that over the last thirty years, many managers have gradually been put on the defensive, giving priority to reporting and justification logics rather than to the added value of the job, Nicolas-Louis Duclos is convinced of the need to offer high-level international training to enhance management and quality know-how: "Using the Internet to adapt this diploma to everyday life is a step in the right direction." KD
Sabine Allouchery graduated from UTC majoring in computer engineering (with elective specialist option robotics) in 1988. Since 2005, after a career in the computer industry, Sabine Allouchery has been a coach and therapist. Portrait of a woman with boundless curiosity.

Curious? Did you say curious? Sabine Allouchery demonstrated this in her years in “preparatory classes”. While the grandes écoles [French engineering schools] opened their arms to her, but she chose UTC. Why so? “I saw UTC as modern. It worked with a UV system, which was innovative for an engineering school. The other schools seemed more classical to me. UTC was also more human in the sense that, alongside technological knowledge, it also included a management dimension. It required a one-year internship in a company, 6 months in the second year and 6 months at the end of the cycle, and offered many partnerships abroad. I absolutely wanted to have an experience outside our borders,” she says. After a first internship at Poclain on real-time computing, she joined Philips Kommunikation A.G. in Nuremberg for her final year internship. “During the first internship, it was the separation between the blue-collar workers who had lunch at noon and the white-collar workers at 1 p.m. that struck me. I’m also delighted to experience the programme I developed by driving a hydraulic excavator myself. At Philips, I came to love the international atmosphere, and taking part in the development of the first mobile phone compiler,” she explains. Still curious? “My colleagues were motorcyclists and I started accompanying them on their motorbike rides. I caught the virus and as soon as I got back to France, I passed my Big Bike* licence”, she jokes. [special “A” licence required for bikes over 35 kW (47/6 HP)]

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Still curious? “You are a sales director, you talk more about people than numbers”, says a headhunter. “I reply that numbers are a consequence of good management. The job of manager fascinated me, much more complex than a robot, much richer than millions of euros,” she adds. New curiosity and a change of direction? A trip to the desert with a Tibetan lama creates a new inner lane ‘fast-track’ route. Sabine wants to deepen her understanding of humans. She leaves BMC to set up her own consulting business and continues her training. First in Sophrology, then at the Gregory-Bateson Institute (IGB) where she trains in short-term and strategic therapy, which comes from the work of the Palo Alto school. “After 11 years as a therapist in my practice and as a consultant in companies, I am passionate about people and nature. I am looking forward to continuing to discover and learn through life experiences,” says Sabine. Ultimate curiosity and new orientation? “Yes as a novelist. Seeking a publisher for my new novel is my goal today,” she concludes. MSD
www.senseways.fr

* NdT - borrowed from Lewis Carol's Alice, another intrepidly curious lady.