New entrepreneurial technologies can enable safe face-to-face teaching at our universities, says **Gunther Friedl**

Fighting COVID-19 with technology

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In March 2020, like all German universities, the Technical University of Munich (TUM) shifted all teaching to online. Germany enforced a lockdown, and all universities were prohibited from face-to-face teaching. While online teaching worked surprisingly well, and students commended our activities at the TUM School of Management, nationwide surveys nonetheless showed that pure online teaching does not allow for the level of social interaction that is necessary for an enriching learning journey.

Around the same time, I met with Oliver Trinchera, the CEO of Kinexon. During his doctoral studies at TUM School of Management, Trinchera founded the technology company that enables communication between core elements in the Internet of Things (IoT). Oliver reported about a recently launched product, Kinexon SafeZone. This product includes a lightweight wearable device based on Ultrawideband technology that allows for contact warning and contact tracing. One of Kinexon's first customers was the National Football League (NFL) in the United States. The SafeZone made it possible to measure position and performance data to within centimetres. Therefore, performance and tactics as well as ball positions were able to be traced in real time. And the Kinexon technology also protects players from a COVID-19 infection.

In our conversation, it quickly became clear that this technology could very usefully be applied at universities as well. Face-to-face teaching under COVID-19 conditions requires exactly those two features that Kinexon SafeZone offers: contact warning and contact tracing. This technology is included in a small wearable device for distancing and tracing, the Kinexon SafeTag.

We decided to launch a pilot project at our new TUM School of Management Campus in Heilbronn. There were two reasons to pilot the device here: first, the Center of Digital Transformation is researching exactly the precise question of how new technology changes how we work and second, because of the relatively small size of the Campus. While there are over 5,000 students at TUM School of Management, our newly opened campus in Heilbronn currently has around 200 students with more than 50% international students. Moreover, as soon as they arrive, students at this campus get access to the latest technology such as teaching via virtual reality, so we knew that students would be open to technology-based solutions.

The purpose of our pilot project was to test whether we can have face-to-face teaching within a German environment, where the Infection Protection Act imposes severe requirements on higher education institutions. We wanted to create awareness of how to maintain the required distances of 1.5 metres between people. We also wanted to be able to trace infection chains in order to detect them early and interrupt them. Finally, and very importantly, we wanted to induce a positive marketing effect for Technical University of Munich as an innovative and university that acts responsibly.

50%

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Above:
Gunther Friedl with Oliver Trinchera, the CEO of Kinexon

We structured the project in two phases. Phase 1 included a first test case to assess the contact warning function of the SafeTags and a subsequent analysis of user acceptance. In Phase 2 we will evaluate the functionality of contact tracing and its acceptance with faculty, research assistance and staff members in a second test case.

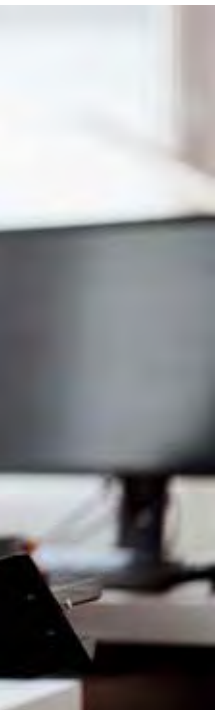
The objective of Phase 1 was to understand the logistical challenges, user acceptance, and the overall performance of the Kinexon solution. We decided to start with students in our Masters in Management and Innovation programme with a relatively small class size (25 students). During the four-day test phase, between 11 and 17 participants were present on-site. Students received their Kinexon SafeTags at the entrance of the lecture room and returned it as they left.

We wanted to understand how users perceive the experience, and whether they accept distance measurement and distance warning provided by the technology. We therefore collected field observations in the lecture room, outside the lecture room, and in breakout rooms. We also did focus group interviews on the basis of a set of open questions. Moreover, we did a survey on general user acceptance.

Our first results are very promising. First, and most importantly, SafeTags had a high rate of acceptance by participants. Users generally gave very positive feedback on the devices. Participants agreed that wearing the SafeTags improves their awareness of keeping distance and that this could potentially change behaviour. Feedback on enhancing participants' feeling of safety was also positive. Nearly 80% of the participants found wearing the SafeTag helpful and comfortable. They would recommend wearing the SafeTags to their fellow students.

Second, logistics of issuing and returning the devices worked well, but showed some room for improvement. While everybody received and returned the device safely, it turned out that it would have been better to distribute the devices at the entrance to the building instead of at the lecture hall. This would enable contact warning and tracing within the entire building even on the way to class, and when leaving the building.

In general, participants also gave the feedback that they would have been interested to have a better and more in-depth introduction to the purpose and functionality of Kinexon SafeZone. They are concerned about the contract tracing functionality due to privacy reasons and potential misuse of data. They questioned the benefit of using this additional device instead of using their own mobile phone with an app, such as the German Corona App.



> *One of the key take-aways of this project is that implementing technology solutions requires the careful involvement of all stakeholders. Communicating the advantages of a project is an important prerequisite for gaining the acceptance of all users. Our students value our innovative approach and simultaneously challenge us by forcing us to justify and rethink every step of our technology solution*

They also raised the concern that using the solution only for TUM lectures in the lecture building might reduce acceptance, as participants obey the distancing rules there, but often experience crowded situations outside, for instance when they use public transportation to commute to the campus. It seems useless to comply with the distancing rules in the lecture building if people outside the lecture building do not always follow the rules.

Some other concerns include questions about the benefits of using SafeTags in lecture rooms, when seating arrangements are already in compliance with distancing rules (1.5m). Participants wanted to switch off their device in such a situation, because sometimes warning lights and a warning noise occurred despite the fact that everybody was complying with distance rules. They agreed, however, on the overall benefits of using it when moving around the building.

Since we had positive feedback on the general acceptance of the SafeTags after phase 1, we will now proceed to evaluate acceptance of using the functionality of contact tracing to support the detection of possible infection chains by implementing test case 2.

In test case 2, one SafeTag will be assigned to each participant by scanning a personal QR code that will be linked to an anonymous identifier in order to be able to evaluate any personal contacts that come closer than the minimum distance of 1.5 m over time using software provided by Kinexon. Regarding compliance of contact tracing with the European and German privacy protection regulations, all participants have to sign a declaration of consent before the start of the testing phase.

The software stores all relevant contact events such as the SafeTag ID, time, duration and distance each day when the SafeTags are put back into the charging tray. The proximity and duration of each contact is recorded and can be quickly accessed to trace and evaluate chains of infection. However, the SafeTag does not record any movement, position or health data of the students and lecturers.

During the test period, participants' response to the SafeTags in different situations (office/meeting rooms/stay and movement on floors) will be checked by regularly asking for feedback. In addition, we will do another survey to check general acceptance of the SafeTags and its contact tracing function, supplemented by a qualitative feedback interview with a focus group.

The objective is to evaluate the acceptance of Kinexon SafeZone in the context of strong privacy protection regulations and to analyse the data collected for effective contact tracing on campus to create a safe campus environment and promote the feeling of safety of the overall campus community.

Once we have finished evaluating Phase 2, we plan to implement Kinexon SafeZone for the whole community on TUM Campus Heilbronn. By doing this, we are confident that we can enable a safe and enriching face-to-face campus experience for our students.

One of the key take-aways of this project is that implementing technology solutions requires the careful involvement of all stakeholders. Communicating the advantages of a project is an important prerequisite for gaining the acceptance of all users. Our students value our innovative approach and simultaneously challenge us by forcing us to justify and rethink every step of our technology solution. There is still huge uncertainty about the development of the COVID-19 pandemic. We now feel much better prepared for this uncertain future.

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About the Author

Gunther Friedl is Dean at TUM School of Management