Smart Qabin – Royal Ahrend

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Impact on society

What impact is expected from your technology?

What is exactly the problem? Is it really a problem? Are you sure?

The problem is not that the Qabin lacks smart technology. The problem addressed by QVision is that users can remain seated for long periods and may not notice poor posture during focused work. QVision focuses on posture awareness and encouraging a micro-break. It does not claim to solve workplace health as a whole.

Are you sure that this technology is solving the RIGHT problem?

Partly. QVision addresses posture awareness and prolonged sitting, which were identified during stakeholder research. However, poor posture can also be influenced by the chair, desk setup, individual physical conditions, and work habits. QVision therefore supports one part of the problem and should not be treated as a complete solution.

How is this technology going to solve the problem?

QVision monitors posture using computer vision and provides a posture alert after 30 continuous seconds of poor posture. The break reminder also encourages the user to take a micro-break after prolonged sitting. RC2 showed that all eight participants reduced their poor-posture time when posture feedback was visible, with a median reduction of 63.3%. This shows an immediate effect on posture behavior, but not a long-term health improvement.

What negative effects do you expect from this technology?

The camera may make some users feel monitored even though images and video are not stored. Incorrect detections can also occur when body keypoints are blocked or the camera position changes. Repeated alerts may become distracting, and user autonomy could be reduced if the features cannot be paused or disabled.

In what way is this technology contributing to a world you want to live in?

QVision supports a workplace where technology can help users become more aware of their posture and sitting behavior while keeping them in control. This is acceptable when the system protects privacy, explains its purpose clearly, and remains a support tool. It should not develop into employee surveillance or performance monitoring.

Now that you have thought hard about the impact of this technology on society (by filling out the questions above), what improvements would you like to make to the technology? List them below.

Keep posture monitoring and the break reminder under user control. Maintain local processing and no image/video storage. Improve detection when keypoints are blocked, keep the camera position stable, and explore better calibration. Clearly explain known limitations and prevent posture information from being used for employee performance monitoring.

Hateful and criminal actors

What can bad actors do with your technology?

In which way can the technology be used to break the law or avoid the consequences of breaking the law?

QVision has limited direct potential for criminal use in its current form. The main risk appears if someone gains unauthorized access to the device and uses the camera or software for a purpose that was not intended. Unauthorized device access and misuse of camera data were also identified as remaining security concerns during the technical expert interview (Interview GK, April 27, 2026).

Can fakers, thieves or scammers abuse the technology?

There is little direct value for fraud or scams because QVision does not manage money, user identity, or communication between people. However, unauthorized technical access could allow someone to interfere with the software or attempt to access the camera while the system is operating.

Can the technology be used against certain (ethnic) groups or (social) classes?

The current prototype does not identify ethnicity, social class, or individual identity. It is also not used to make employment decisions. A more serious risk could appear if future versions connect posture information to employee profiles or performance assessment. This would be outside the intended purpose of QVision.

In which way can bad actors use this technology to pit certain groups against each other? These groups can be, but are not constrained to, ethnic, social, political or religious groups.

No clear direct use was identified within the current scope. QVision operates locally with one user and does not publish content or communicate information between groups. This risk is therefore low for the current design.

How could bad actors use this technology to subvert or attack the truth?

Someone with unauthorized access could change the posture rules or system feedback so that incorrect information is shown to the user. The current impact would be limited because QVision is a supportive system and its results are not used for medical diagnosis or employee performance decisions.

Now that you have thought hard about how bad actors can impact this technology, what improvements would you like to make? List them below.

Protect access to the Raspberry Pi and camera, control who can change the software, and use secure update procedures. The system should continue to avoid image and video storage. Future versions should also avoid connecting posture information to employee monitoring or performance scoring.

Privacy

Are you considering the privacy & personal data of the users of your technology?

Does the technology register personal data? If yes, what personal data?

The camera processes visual information in real time and converts the detected posture into body keypoints. QVision does not identify the user and does not store images or video. Because the system still observes a person through a camera, it is safer not to claim that no personal data are processed at all.

Do you think the technology invades the privacy of the stakeholders? If yes, in what way?

The privacy risk is reduced by the system design, but it is not completely removed. A camera inside an enclosed work pod can still make some users uncomfortable. This was also found during the interviews, where the option to switch camera sensing off was considered important during private calls or sensitive work (Interview JA, March 31, 2026).

Is the technology is compliant with prevailing privacy and data protection law? Can you indicate why?

QVision is designed in line with key GDPR principles, especially data minimization and storage limitation, because processing stays local and no images or video are stored. However, full legal compliance was not formally assessed during this graduation project. Therefore, the system should not yet be described as fully GDPR-compliant

Does the technology mitigate privacy and data protection risks/ concerns (privacy by design)? Please indicate how.

Yes. Camera processing takes place locally on the Raspberry Pi, the system does not need an internet connection during operation, and images or video are not stored. These choices reduce data exposure and follow the principle of privacy by design (Cavoukian et al., 2010). However, technical architecture alone does not remove risks related to device security and user awareness.

In which way can you imagine a future impact of the collection of personal data?

The current risk is limited because QVision does not store images, video, or personal profiles. In the future, this could change if the system adds user accounts, cloud storage, long-term posture histories, or other forms of personal logging. These additions could create risks such as user profiling,

data misuse, or use of posture data for purposes beyond health support. Any future increase in personal data collection should therefore be assessed again before implementation.

Now that you have thought hard about privacy and data protection, what improvements would you like to make? List them below.

Keep local processing and the no-image/video-storage rule as fixed design requirements. Add a clear indicator when the camera is active and explain its purpose before use. Users should also be able to pause or disable sensing when needed. If future versions introduce accounts, cloud services, or long-term posture histories, the privacy impact should be reassessed before those features are implemented.

Human values

How does the technology affect your human values?

How is the identity of the (intended) users affected by the technology?

The direct effect on user identity is limited because QVision does not recognize individuals or create personal profiles. However, the presence of a camera may still affect how some users feel inside a space that is normally used for private and focused work. The system should therefore remain clearly positioned as a posture-support tool rather than an employee-monitoring tool.

How does the technology influence the users' autonomy?

Automation can support users, but it should not remove their control. Stakeholder research showed that manual control remained important even when automated functions were available (Interview DY, March 9, 2026). A future product should therefore allow posture monitoring and break reminders to be paused or disabled.

What is the effect of the technology on the health and/or well-being of users?

The prototype showed a positive immediate effect on posture behavior. During RC2, all eight participants reduced their poor-posture time when feedback was visible, with a median reduction of 63.3%. This does not prove a long-term health improvement. It only shows that the feedback changed posture behavior during the validation sessions. Research also shows that prolonged sitting during office computer work can contribute to short-term musculoskeletal discomfort (Baker et al., 2018).

Now that you have thought hard about the impact of your technology on human values, what improvements would you like to make to the technology? List them below.

Keep the system supportive and under user control. Allow users to pause or disable posture monitoring and break reminders when needed. Keep alerts brief and non-intrusive, and explain clearly why an alert was triggered. Future versions should also avoid using posture data for employee monitoring or performance evaluation.

Stakeholders

Have you considered all stakeholders?

This category is only partial filled.

Who are the main users/targetgroups/stakeholders for this technology? Think about the intended context by answering these questions.

Name of the stakeholder
End users

How is this stakeholder affected?
End users are directly affected because QVision monitors posture during a work session and provides a posture alert and a break reminder. The system can influence their comfort, privacy, sense of control, trust, and behavior during focused work.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Innovation Unit at Ahrend

How is this stakeholder affected?
The Innovation Unit owns the project direction before a possible product-development stage. It needs to decide whether QVision provides enough user, technical, and business value to continue toward a larger pilot or product roadmap.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
APAC team

How is this stakeholder affected?
The APAC engineering team becomes important if QVision moves toward

product development. The team would need to work on hardware integration, production design, camera placement, software support, testing, and technical maintenance.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Technical experts

How is this stakeholder affected?
Some of Technical experts are not direct users of QVision, but their input affects the technical quality of the system. They contributed to decisions concerning system architecture, edge processing, camera placement, privacy and security risks, feedback design, scalability, and future technical development.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Health and ergonomics expert

How is this stakeholder affected?
The health and ergonomics expert supports the quality of the health-related design choices in QVision. Expert input was used to review the posture classification, the 30-second threshold for the posture alert, the micro-break reminder interval, and limitations of the front-camera setup.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Product Development and service teams

How is this stakeholder affected?

These teams would become responsible for integrating QVision into the Qabin product, supporting production, maintaining the system, handling repairs, and managing future updates.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Customer IT, security, and facility management teams

How is this stakeholder affected?
These teams may need to manage QVision after installation at a customer location. Their responsibilities could include device access, network policy, physical installation, privacy communication, maintenance, and handling technical problems.

Did you consult the stakeholder?
No

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Royal Ahrend senior management

How is this stakeholder affected?
Senior management would decide whether further investment in QVision fits Royal Ahrend's product strategy and whether the technology should enter the product roadmap.

Did you consult the stakeholder?
No

Are you going to take this stakeholder into account?
Yes

Did you consider all stakeholders, even the ones that might not be a user or target group, but still might be of interest?
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Now that you have thought hard about all stakeholders, what

improvements would you like to make? List them below.
Involve customer IT and security teams, facility management, service teams, and privacy/legal specialists earlier in the next pilot. Continue expert review, test QVision with a broader user group, and define clear ownership for security, maintenance, updates, and future validation.

Data

Is data in your technology properly used?

Are you familiar with the fundamental shortcomings and pitfalls of data and do you take this sufficiently into account in the technology?

Yes. RC2 showed that the quality of the camera input directly affects the result. in some cases hand or paper blocking important body keypoints caused two false posture alerts for P3 and P4. Camera movement also caused incorrect standing detections for P6, P7, and P8. These findings show that the system can produce incorrect results when the camera view or position changes.

How does the technology organize continuous improvement when it comes to the use of data?

The current prototype does not learn automatically from users. The pose model is pretrained, while the posture decision uses fixed comparison rules. Improvements therefore require further testing and software changes instead of automatic learning from previous sessions.

How will the technology keep the insights that it identifies with data sustainable over time?

QVision currently works session by session and does not create a long-term personal posture history. This limits personalization and long-term trend analysis, but it also avoids building detailed behavior profiles about individual users.

In what way do you consider the fact that data is collected from the users?

Only the information required for posture analysis is processed during normal operation. The system does not create an identity profile and does not store images or video. The research logs collected during RC2 were used for prototype validation and should be separated from the intended data behavior of a future product.

Now that you have thought hard about the impact of data on this technology, what improvements would you like to make? List them below.

Improve the handling of blocked body keypoints and use a fixed camera position that cannot easily move during operation. Per-user calibration should also be explored because the current prototype uses the same fixed reference posture for all users. Any future data collection should have a clear purpose before it is introduced.

Inclusivity

Is your technology fair for everyone?

Will everyone have access to the technology?

Access depends on whether QVision is installed in the Qabin. The system does not require users to create an account, own a smartphone, or have an internet connection. However, the accessibility of the interaction itself was not specifically tested during this project.

Does this technology have a built-in bias?

This cannot yet be ruled out. The current prototype uses one fixed reference posture for all users, while the validation included only eight participants. The study was not designed to compare performance across different body types, mobility conditions, ages, or demographic groups. Equal performance across all future users can therefore not be claimed.

Does this technology make automatic decisions and how do you account for them?

Yes. QVision automatically classifies posture by comparing detected body keypoints with the fixed reference posture. A posture alert is shown after poor posture continues for 30 seconds. The system does not force the user to respond, but RC2 showed that incorrect detections are possible. These errors need to be considered in future development.

Is everyone benefitting from the technology or only a a small group? Do you see this as a problem? Why/why not?

The intended users are people doing seated work inside a Qabin. The validation included only eight participants and was not designed to show that every type of future user would benefit equally. This is a limitation because Qabins can be used by people with different physical characteristics, work styles, and needs.

Does the team that creates the technology represent the diversity of our society?

This was not formally assessed. The prototype was mainly developed within one graduation project with input from Royal Ahrend stakeholders, users, and technical experts. A wider deployment would require testing and design input from a more varied group of users.

Now that you have thought hard about the inclusivity of the technology, what improvements would you like to make? List them

below.
Test QVision with a broader range of users and physical characteristics. A stronger calibration approach should also be considered instead of relying on one fixed reference posture. Feedback should not depend only on color, so text or different blinking patterns could make alerts easier to understand for more users.

Transparency

Are you transparent about how your technology works?

Is it explained to the users/stakeholders how the technology works and how the business model works?

Partly. Users can see when QVision gives a posture alert, but the current prototype does not explain how that result was produced. The process of detecting body keypoints and comparing them with the reference posture remains mostly hidden from the user.

If the technology makes an (algorithmic) decision, is it explained to the users/stakeholders how the decision was reached?

Not fully. YOLO11n-pose extracts the body keypoints, while QVision uses rule-based comparisons with a fixed reference posture to decide whether the posture differs enough to be classified as poor. The user receives the result but not the reasoning behind it. Stakeholder input suggests that this explanation can remain simple, while more detail can be available when needed (Interview JE, March 4, 2026).

Is it possible to file a complaint or ask questions/get answers about this technology?

Not in the current prototype. There is no built-in function for reporting an incorrect alert, questioning a detection, or providing feedback about a specific system decision.

Is the technology (company) clear about possible negative consequences or shortcomings of the technology?

Not yet. RC2 identified incorrect detections caused by blocked body keypoints and movement of the camera, but these limitations are not communicated to the user during normal operation.

Now that you have thought hard about the transparency of this technology, what improvements would you like to make? List them below.

Give a short reason when an alert appears, for example, that poor posture was detected for a sustained period. Add a simple way to report an incorrect detection. Known limitations should also be explained before the system is used.

Sustainability

Is your technology environmentally sustainable?

In what way is the direct and indirect energy use of this technology taken into account?

QVision uses a Raspberry Pi 5 and camera for continuous local processing during operation. The actual energy use was not measured in this project. Local processing avoids continuous data transfer to cloud services, but the project did not compare its total energy impact with cloud processing. A future version should measure power use and reduce processing when the Qabin is not in use.

Do you think alternative materials could have been considered in the technology?

Yes. The prototype uses standard electronic modules, PCBs, wiring, and plastic parts selected mainly for technical feasibility and compatibility. Environmental material choices were not assessed. A production version should review the number of components, housing materials, recyclability, and ease of replacement.

Do you think the lifespan of the technology is realistic?

The production lifespan has not been tested. The prototype uses separate modules, such as the Raspberry Pi and camera, which can be replaced individually if they fail. A future product should keep this modular approach and allow repair or replacement without replacing the full Qabin system.

What is the hidden impact of the technology in the whole chain?

The main hidden impacts come from manufacturing electronic components, transport, replacement parts, and electronic waste at end of life. These impacts were not measured in this project. Future development should reduce unnecessary hardware, use replaceable components, and define how electronics are repaired, reused, or recycled.

Now that you have thought hard about the sustainability of this technology, what improvements would you like to make? List them below.

Measure the power use of QVision, reduce processing when the Qabin is not in use, keep the hardware modular and repairable, and consider recyclable or replaceable components for a production version. End-of-life handling of the electronics should also be included in future implementation planning.

Future

Did you consider future impact?

What could possibly happen with this technology in the future?

QVision could become a more adaptive postureQVision could become a more adaptive posture-support system with better calibration and reliability. Wider use may support posture awareness and micro-breaks, but it could also increase concerns about privacy and workplace monitoring.

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one utopian scenario.

In a positive future, QVision becomes an optional workplace feature. It gives accurate posture alerts and uses the break reminder to encourage a micro-break. Processing stays local, no images or video are stored, and users remain in control.

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one dystopian scenario.

In a negative future, posture data becomes linked to employee profiles and performance monitoring. Users lose control over the camera and how their data are used, turning a supportive system into workplace surveillance.

Would you like to live in one of this scenario's? Why? Why not?

I would support the positive scenario if QVision remains optional, private, and under user control. I would not support its use for employee monitoring or performance evaluation.

What happens if the technology (which you have thought of as ethically well-considered) is bought or taken over by another party?

A new owner could add cloud storage, user identification, or employee monitoring. The intended purpose, privacy requirements, and limits of QVision should therefore be clearly documented.

Impact Improvement: Now that you have thought hard about the future impact of the technology, what improvements would you like to make? List them below.

Keep local processing and no image/video storage. Maintain user control over posture monitoring and the break reminder. Improve calibration and reliability, and prevent posture data from being used for employee

performance monitoring.