FINAL REPORT

Visibility in the Supply Chain – Smart Glasses

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1.0

EXECUTIVE SUMMARY

Creating visibility across all stages of the food supply chain is vital to ensure organisations can demonstrate they are conforming to the compliance requirements of the relevant domestic and international regulatory authorities. There is also a need to deliver significant value to the end customer. The strict import and product quality requirements demanded by both Chinese authorities and the Chinese consumer make these compliance measures even more imperative considering the value of the Chinese food export market to Australia. There has been significant discussion and effort made to improve supply chain transparency and traceability. Some argue there is still considerable room for improvement. This project aims to design, develop, integrate, trial relatively low-cost digital solutions that can address some of these compliance pain points.

This solution leverages wearable Smart Glasses devices and cloud-based software to deliver a video call collaboration platform for remote observation/auditing. This service can support other compliance tools such as traceability systems to help validate data and create more visibility into the supply chain. The project involved multiple stakeholders from Software development (Bondi Labs Australia), Industry (AMPC and members), International Government Agencies (CAIQ).

This project was part one of a two-parts. The objectives part one was to demonstrate how smart glasses are used to conduct remote inspections between meat processing facilities and overseas government agencies.

- Explore the business and user needs
- Design strategies to use and system changes
- Implement and develop recommended changes
- Trial the use of smart glasses for identified red meat industry needs

Part two focused on researching the use of traceability platforms to collect data and share it with government agencies in China. This report will be focusing on describing part one of this two-part project.

The approach used was to split the project into four distinct phases of research, design, development and testing. Multiple activities were completed in these phases such as research field trips, interviews, surveys, software development, testing, evaluation and communication.

Research phase project outcomes included understanding of the food safety, quality control inspection process occurring in meat processing, understanding the challenges and needs for assistive tools, and matching that against existing wearable smart glasses devices. From this phase, it was found that inspections that do occur are critical to meat production. Conducting inspections is resource-intensive, and that there are in-efficiencies capturing food safety data. These insights helped to justify exploring the use of smart glasses in meat production environments.

Design phase project outcomes focused on consolidating many of the learnings from the research phase and designing a plan to rollout/use the technology, implement new software features and undertake testing of proposed hardware devices and software solutions.

The development phase focused on implementing the software changes, field testing the proposed hardware and software solution more controlled environments, e.g. local (office), on-site (meat processing plant) and international (Beijing) tests. This phase included many rounds of testing; thus many insights were learned. These ranged from technology limitations, e.g. WiFi bandwidth, environment considerations that may impact on remote inspection quality (noise, temperature change).

The testing phase planned to put all the pieces together and running live trials of the technology on-site with the intended target user groups, i.e. meat processing QA staff and CAIQ inspection officers. Activities in this phase un-able to be conducted during the COVID-19 pandemic, i.e. visitor and travel bans. Other tests were completed, including trialing the solution with the Department of Agriculture, Water, and Environment at freight forwarding sites. This helped to demonstrate the value this solution can bring to the red meat industry and beyond.

Ensuring food safety standards are not only being upheld but continually improved is an important factor in keeping Australian meat exporters competitive with global markets. The emergence of global health pandemics has only heightened this need to remain vigilant and on the front foot with solutions. Smart glasses being used to perform remote inspections is a prime example of how emerging technology can create a value multiplier effect on a food export business. Not only can it save costs in travel, improve international and customer relationships, but also de-risk supply chains by removing the riskiest element “Humans” from being present.

To date, the wearable hardware and software service is ready to use by industry. Now will be the true test of the solution as the industry starts to adopt this solution to see the value it brings. Future recommendations are to see the solutions use to be applied broadly in the industry in all kinds of conditions and scenarios. Even pushing beyond its use in meat processing plants to parts of the supply chain such as on-farm, logistics handlers and distributors. Also, applying the technology to other business challenges such as on the job training and asset maintenance.

2.0 INTRODUCTION

Australian red meat exporters need to remain competitive, compliant with Chinese government regulatory agencies and deliver premium products to Chinese consumers. Compliance processes and data exchange do exist to support current trade. However, increasing scrutiny of import compliance and food standards has made it more challenging for Australian companies using existing tools and methods. The Chinese consumer is becoming ever more demanding regarding product information that validates and demonstrates food quality, safety, and source of origin. There is also the complication of ensuring both exporters and those using compliance tools and technology have trust in the system they are using.

The scope of the research was split into four phases (Research, Design, Development, Testing).

- Research: Needs Analysis
- Design: Design of system improvements
- Development: Development of system improvements
- Testing: Domestic and International tests

The use of innovative technologies that meet these new and growing market access needs for the Australian red meat exporting industry was explored during the project. Emerging technologies such as AI-powered smartphones, smart glasses, cloud services, and online traceability platforms are proven tools to help significantly address many of the issues faced by the Australian red meat export industry. However, the complexity of existing IT systems, costs, and trust in choosing the right technology have led to relatively slow uptake. It is imperative that Australian food producers and processors proactively take steps to protect their market access. Global markets for Red Meat are becoming more competitive for Australian food exporters as the Chinese government and consumer require evidence that their food is clean, safe and from a trusted source. This project aimed to further develop and test the use of smart glasses technologies which address the main challenge of,
"Can I visually observe/audit in real-time any step in the processing of the product?"

- This question will be initially explored with the following outputs:

There have been challenges faced during the project, leading to certain limitations of outcomes such as industry participation, international communication, un-foreseen circumstances (COVID-19). Industry participation challenges and barriers were highlighted early on in the project when initially reaching out for recruitment. The initial expression of interest and survey sent out did receive a lower level of industry response than expected. This did not significantly impact the outcome of the early phases of research as the research team focused on some of the challenges and needs of key industry participants who had shown interest. There are now tangible outcomes that can be used by industry; therefore, we expect this solution to see much larger participation outside the initial project.

The project was to focus on making connections between Australian exporters and Chinese government agencies more seamless and transparent. Language, time delay and other barriers related to international business communication have all been challenges to address during this project. The project has overcome many of these challenges, demonstrated by the activities that have occurred, e.g. Realtime video sessions between meat processors and Chinese agencies.

COVID-19 has impacted the entire world in many different ways. In particular, travel and access to facilities during the final phase of this project have been significantly impacted. The flip side to this situation is the solution is a clear way to address many of the challenges global biosecurity threats bring, i.e. reducing the need to travel or have high-risk vectors such as humans on-site. COVID-19 outbreak has impacted the ability to conduct a final round of testing on-site. This testing is now planned to commence directly after the project ends via remote means, i.e. posting the hardware device and allowing individuals permitted to be on-site within a processing facility to conduct on-site trials on behalf of the research team.

3.0 PROJECT OBJECTIVES

This project was aimed to design, develop, test and trial a relatively low-cost technology solution that can address these compliance pain points. Bondi Labs' proposed solution to these challenges is the adoption of a vital Smart Glasses technology platform. This innovative technology allows remote observation/auditing that feeds real-time information to the government and inspection compliance agencies. Bondi Labs has partnered with the Australian red meat processing industry to develop this technology further to meet the market access needs. Outcomes from this project will be a commercially viable 'fit for purpose' MVP product. Further development will stem from this MVP to scale up adoption for the whole Australian red meat processing industry. The objectives for each completed phase are listed below.

Research:

- User needs analysis: Understanding who will come to use the technology and their tasks
- Smart glasses and platform matrix: Evaluative tool that can identify current smart glasses and platform offerings dependent on work tasks and user needs

Design:

- Smart Glasses Software Feature Design: Understanding the features that will assist individuals who come to use the technology to improve their work

Development:

- Smart Glasses Software Feature Development: Develop the features that will assist individuals who come to use the technology to improve their work

Testing:

- Demonstrate the use of a smart glass solution in a processing plant that meets the needs of compliance

4.0 METHODOLOGY

The project followed a methodology most familiar to a software development process. This involves splitting the project into Research, Design, Development and Testing phases.

The following outlines the activities that were conducted as a part of this methodology.

Research:

Survey: The survey structure is designed to explore and map the necessary demographic and job role information of users who may come to use the smart glasses technology. Questions focus on themes such as general demographics, job tasks, tools used during job, challenges faced during job tasks and a focus on visual inspection. The result of this is valuable data and insights that can be used to identify individuals for a follow-up phone interview as well as help guide the design and adoption of technology.

Semi-Structured Interviews: The interview structure is designed to explore and map an example of who may come to use the technology. Questions focus on themes such as job motivations, job role, job tasks, work environment, culture and experience to help paint this picture. The result of this is valuable data and insights that can be used to guide the design and use of the technology while remaining authentic to the needs of the Red Meat Industry.

Un-Obtrusive/Obtrusive observations: Unobtrusive observations involve members of the research team silently and unobtrusively observe individuals performing work tasks. This observation occurs in the natural work environment (i.e. we will have no contact with the observed participant while they perform their job other than being in the same room). These natural observations will occur at critical points during a typical working shift for approximately 1-2 hours.

Design:

We followed a software design methodology that aims to outline the design requirements from a user needs perspective. These requirements are then used to guide the improvement of existing software features or to develop new features. This method was also applied to the design of technology rollout and industry adoption. Customer Journey mapping was also utilised to help communicate this strategy.

Development:

The research team conducted on-site technology testing with project stakeholders. This testing allowed the research team to understand if the existing network infrastructure in a processing plant is appropriate for the use of smart glasses devices. Actioning designs and strategies for industry adoption and rollout was also conducted during this time. Development work was guided and monitored using Agile methodology whereby user stories were broken into tasks and completed in weekly sprints. Internal sprint reviews and milestone updates to stakeholders helped to gain industry feedback and remain accountable for deliverables.

The research team also worked with the Chinese project stakeholders CAIQ, ZJ Bondi Labs, and ZJ Meiya to prepare for testing and evaluation activities in early 2020. This work has involved identifying key Food Safety subject matter experts within CAIQ and establishing a working protocol that will enable more explicit visual communication methods between Australian food processors and CAIQ. As a part of this work, individuals from the research team travelled to China to attend the food safety conferences, workshops and direct meetings with key CAIQ, SAMAR, ZJ Meiya representatives.

Testing:
The planned testing aimed to follow a standard usability study structure where software and hardware would be tested by target end-users in a workplace environment. The research team would be on-site to monitor, observe and evaluate the solutions use against a number of metrics such as task efficiency, solution usability, reliability and subjective thoughts of value to the business. Testing was impacted by unforeseen circumstances, i.e. COVID-19 travel and visitation bans. To adapt, a series of remove call sessions were conducted between relevant project stakeholders to stress-test the software and put it to some use. It is intended that a follow-up study after the completion of this research project is conducted to help better evaluate the outcomes of this solution.

5.0 PROJECT OUTCOMES

The project outcomes can be best described as they were delivered in each research phase.

Research:

During the research phase, project outcomes focused on developing a user needs brief, and smart glasses selection matrix.

User Needs Brief:

The user needs brief communicated many of the findings from the surveys, interviews and on sight observations conducted. These outcomes were communicated under the themes of

- User personas
- Working conditions
- Tools used
- Working Environments
- Food safety tasks being performed
- Challenges faced during food safety tasks
- Industry insights and thoughts about technology solutions
- Jobs, pains, Gains
- Expected user journey using the solution

During this research it was found that individuals performing Verification and Auditing would benefit most from using smart glasses to conduct remote inspections. However other job tasks could also benefit from this solution.

Smart Glasses Selection Matrix:

The smart glasses selection matrix was designed to help inform both the research team and others adopting this technology which hardware device would suit their needs. Nine smart glasses devices were reviewed across the following themes

- Affordability
- Battery Life
- High Fidelity Footage
- Ability to Stream Footage
- Ease of Use
- Suitability

It was found that two suitable candidate devices RealWear HMT-1 and Vuzix m400 device should be evaluated during the remainder of the project to determine which device should be recommended to industry. During ongoing evaluations of the devices, it was found the RealWear HMT-1 is the most appropriate device to be used when conducting real-time remote inspections in meat processing facilities.

Design:

The design phase focused on taking the research findings and translating them to actionable planning documentation. This included Feature Design, Rollout Design and Testing protocol documentation.

Feature Design Documentation included information about

- User flow: Actors, roles and the flow of interaction and information
- User journey's: Narrative stories that help paint the picture of how the technology will be used and why.
- Feature requirements based on industry needs: These dictate to the development teams what needs to be built and help to validate the project is heading in the correct direction.

Rollout design documentation was also developed to include:

- Customer journey mapping: Outlining roles, stages of industry onboarding and use of the solution
- Solution and customer constraints: Outlining the limitations and restrictions that need to be accounted for when the solution is being used
- Technology cost: Outlining the costs associated with using the technology solution.

Development:

Development phase focused on implementing additional features into the technology solution. These tests included local and field-testing features as well as preparing information relevant to the use of the technology for industry, i.e. Website and product info.

Site testing was conducted at the meat processing facilities and aimed to test network and environmental limitations, remote inspection call quality between local and international users (China). The testing was able to successfully meet its objectives and had already demonstrated that the technology solution was capable of providing a real-time video stream to users viewing it in China.

Testing:

COVID-19 restrictions had affected the ability to conduct on-site tests at meat processing facilities. Countering this impact, more remote call tests were conducted as well as broadening the application of the solution to other areas.

An industry ready version of the solution was tested with different participants/locations in China. In addition, the technology was tested in the field with the Department of Agriculture, Water, and Environment in outdoor situations for remote Biosecurity inspections. The results of all these separate tests were successful in demonstrating the technology can work in the field.

Additional documentation was also developed during this phase, including a Business Case, and Technology support documentation specific to use in the Red Meat Industry. The Business case outlined:

- Description of the problems faced by industry
- Potential solutions
- Smart glasses solution
- Value drivers
- Return of investment
- Example user cases
- Implementation plan

6.0 DISCUSSION

Each phase had its own challenges, limitations and outcomes. The outcomes for all activities the phases completed, however, were deemed successful by the research team and industry stakeholders.

The user needs brief proved to be a valuable tool in communicating the intentions of the project and designing additional features and strategies for technology adoption. New insights were gained, which may not be actioned within the scope of this project. But provide a good opportunity for future research and development activities.

The smart glasses selection matrix also proved to be an invaluable communication and design tool. It has become a part of the product information and has also be re-used by other stakeholders to communicate/justify selection and purchasing of equipment.

The design documentation of features became an invaluable tool during further phases, such as software development. Additionally, the rollout design and testing protocols were put to the test during later phases. This documentation and strategy did require further refining once they were put into practice. However, minimal changes were required demonstrating the original plan was thorough.

Development of system changes and the continual cycle of testing not only help to ensure a robust solution could be provided to the industry but also generated new knowledge along the way. The tests conducted, in fact, were smaller-scale versions of the final evaluations planned. Their success partially fulfilled many of the requirements for the testing phase of these projects. In addition, the use of the solution at meat processing facilities and calls made to China helped to validate to industry participants the value and usefulness of the solution.

The testing phase was hampered by visitor access and travel restrictions. Therefore, the strength of evidence for this project was impacted. However, prior testing conducting in other phases helped to mitigate any loss invalidation. There is still the full intention and support by project participants to continue this testing after the project has officially wrapped. The additional business case information provided will help to communicate to industry the value this solution can bring for now.

7.0 CONCLUSIONS/RECOMMENDATIONS

Visibility in the supply chain is vital to ensure organisations can demonstrate they are conforming to the compliance requirements of the relevant domestic and international regulatory authorities. The end customer is also a beneficiary of this via high-quality food and trust in its source, resulting in an appreciation of the premium charged. China is one of Australia's largest export markets for food products; therefore, the strict import and product quality requirements they require demand attention. Adhering to these requirements can often be problematic and costly for Australian food producers and processors. As a result, the project aimed to explore some new technologies that will help reduce costs and improve compliance.

The research team has proposed a solution to these challenges via the adoption of a Smart Glasses technology platform application for remote observation/auditing that feeds real-time information to the government, and inspection compliance agencies. This project conducted four main phases of work Research, Design, Development and Testing. Each phase was designed to be integrative (testing and refining scope), build on knowledge from the last phase and culminate in a practical demonstration of the technology. There was a large range of research, development activities, as well as documentation/communication produced during this project.

The outcomes from this project are the knowledge that can be shared with the industry to better understand how smart glasses can be applied to a business to create value. In addition, access to a proven solution is being offered to industry members under licence agreement via AMPC. Given current world events, it is recommended that this solution is given an opportunity to see if it can help. The value and opportunity to conduct critical business activities such as on-site inspection whilst reducing the need to travel clearly shows this solution has value. The outcomes and solution developed will also help drive innovation and further research into the adoption of innovative technologies.

8.0 BIBLIOGRAPHY

N/A

9.0 APPENDICES

N/A