



DigiEduHack Solution

Dublin - TCD DigitalEduHack

Challenge: DIGITAL LEARNING

SOLUTIONS PROMOTING ZERO-HARM

Canary AI

Create a Zero Harm Workplace for Miners using AI & Data Analytics

Helping to reduce accidents on mining sites by:

- using computer vision to capture incidents & hazards
- a chatbot to guide miners through reporting & dealing with it
- real-time data analytics to drive focused training & supervision
- incentivising/rewarding staff at 'team' level

Team: Canary AI

Team members

Miriam O'Flynn, David Azcona, Enric Moreu, Michelle Ang

Members roles and background

Two of the team have extensive AI and Data Analytics expertise; David is completing his Post-Doc at Dublin City University, while Enric is completing his Masters in the field. They built all the technical elements that you see in the demo, as presented in our pitch, in a matter of hours.

The other 2 team members - Miriam and Michelle - worked on the Solution Canvass, fleshing out the idea and it's impact, as well as tweeting under @CanaryAI1 (set up on the day) and the design of the home screen of the app for miners, which we presented as part of our pitch. Both have just completed a Post-Graduate in Innovation & Entrepreneurship at Trinity College Dublin. In addition, both have considerable management experience - Michelle in the Property sector, and Miriam as an IT Programme Manager.

Contact details

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Solution Details

Solution description

Canary AI is a **mobile & web app** comprising:

1. **Computer Vision** for anomaly detection
2. **Chatbot** captures information from staff via text or voice input
3. **Solution / fix suggested** by chatbot, and all data including images and risk category are captured
4. **Real-time Data Analytics & Reporting**, using this data captured at site level, will be available to all staff as required
5. **Insights** will be used by Management to develop bespoke training programs & to re-focus supervision and checks in appropriate areas
6. **Training** will be provided to staff within the app, via both bite-sized learning and longer modules that include 'Test Your Knowledge' questions/scenarios. Staff training will be recorded within the app.
7. Incentivise & **reward staff at a team level** to improve site-wide safety. Where no incidents have been reported in an area in a given time period, the team should also be rewarded. Supervisors will need to check regularly to avoid under-reporting, and if they find incidents, they can report them; the app will recognise them as Supervisors, and could record a 'negative' score or deduction of rewards for the relevant team. Team 'league tables' are an option also.
8. **Monitor the improvement** of safety / reduction of incidents & accidents over time.
9. For **emergencies**, a one-touch button on the app will connect staff with the emergency services.

Generic models will be trained prior to launch with 'safe' mining situations and 'unsafe' mining situations, and used in the Computer Vision and Chatbot elements. After launch, any incidents that are reported using the app will be held locally at the specific mining site i.e. the mining site's data will not be shared publicly. It will however be used to augment the generic models for that mining site.

See [Demo](#)

The app can be used both online, in quarries for example, or offline in underground mines. The chatbot will be available in multiple languages; each miner can set his/her preference at the outset.

Solution context

1. Reporting mining incidents is laborious & time consuming. Where forms are completed, it cannot be done instantly as forms are not carried by staff as they go about their work.
2. Also there is often a fear of reprisals. See [Mineworkers fear 'reprisals' for raising safety concerns amid spike in deaths](#).
3. These factors (#1 and #2 above) lead to under-reporting.

4. Language barriers are another issue. Miners move around frequently and often have limited or no language of the country they are working in.
5. Learning / training is not currently informed by actual incidents on each site.
6. WIIFM (What's In It For Me)? Individual motivation to adopt a Zero Harm mindset is not enough to prevent many near misses or more serious incidents.

Solution target group

All staff working on Mining Sites.

Incidents will be recorded by miners, and supervisors where needed. Information will be analysed by Management and will feed into Training requirements, which in turn will be rolled out to all staff.

Miners ---> Health & Safety Supervisors ---> Management ---> Training Department ---> Miners
(this form does not allow me to draw a circle!)

Benefits include:

1. Rapid and easy reporting of incidents, accidents **and** emergencies
2. Learnings from incidents drives Training programs
3. Continuous Improvement results in reduced incidents & accidents, and moves the mining site towards a Zero Harm workplace.
4. A safer workplace satisfies workers, key stakeholders & shareholders, and society in general. It make the mining industry a more attractive place to work (currently, it is not seen as attractive).

Solution impact

The impact of Canary AI is:

1. Improved site safety record
2. Better decision making on training (Training Needs Analysis is automated to a considerable extent)
3. Organisation-wide learning
4. Reduction in time lost and costs incurred as a result of workplace incidents and accidents
5. Staff learn to better understand and manage safety risks, for themselves and their team
6. Zero Harm workplace = happy staff, community and stakeholders

The following KPIs will be measured to determine effectiveness:

- No. Of Unsafe Acts / Near Misses / Minor Injuries / Major Injuries / Fatalities - these should reduce with use of the Canary AI app over time. The aim would ultimately be for these to reduce to Zero.
- Training hours recorded.
- Knowledge levels based on the 'Test Your Knowledge' or other assessment scores.
- Rewards at team and department levels

Solution tweet text

Canary AI uses Computer Vision, AI & Data Analytics to help create a Zero Harm Workplace through bespoke, informed Training based on actual mining incidents at a given mine site.

Solution innovativeness

The app helps training to be developed based on **actual** incidents at a given mining site.

It also **removes the laborious paper-filling** that is currently required by staff to report mining accidents, and allows them to report in a simple, quick and efficient manner. Data can be input via voice or if in a noisy area, via text. The chatbot will prompt them for the information needed and offer a solution where possible.

It helps identify and record unsafe acts and near misses to prevent future serious accidents by providing real-time Management Information. Training programs and supervision schedules can then be based on the highest risk / probability incidents.

It also rewards staff on a 'team' basis (or it could be department basis) providing extrinsic motivation, in addition to the intrinsic motivation of staff not wanting to injure themselves. This also helps remove the 'blame culture' that is prevalent on many sites, preventing staff from reporting real issues. See example from Australia where there have been 6 mining deaths this year:

[Mineworkers fear 'reprisals' for raising safety concerns amid spike in deaths](#)

The article quotes a leading Health & Safety expert saying: ***"The key to fixing things is to predict the precursor events or situations before they become an accident. We need to get a really good reporting culture with no fear of blame."***

As we are mindful of the older demographic of miners (50+ years), the layout of the app will be simple, as shown in this mock-up: [Layout of CanaryAI app homepage for Miners](#)

It consists of 4 elements:

1. Emergency situation (connects to Emergency Services/Team)
2. Incidents & Accidents (Non-emergency) Reporting
3. Team Performance
4. My Learning

The target audience, although not digital natives, are nevertheless competent mobile phone users, so training in the use of the app's functionality should be straightforward.

Solution transferability

The Canary AI system could be easily adapted for other high risk workplaces such as Construction, Manufacturing and Hospitals.

Solution sustainability

The Canary AI solution would be delivered in the form of a mobile app, supported by a web-based dashboard for Management. As such, it is a sustainable solution.

In addition, the system would be designed and built for scale, as data requirements will increase over time with the capture and recording of new incidents on each site.

Solution team work

The Canary AI team worked extremely well together :)

Two of the team have extensive AI and Data Analytics expertise; David is completing his Post-Doc at Dublin City University, while Enric is completing his Masters in the field. They built all the technical elements that you see in the demo, as presented in our pitch, in a matter of hours.

The other 2 team members - Miriam and Michelle - worked on the Solution Canvass, fleshing out the idea and it's impact, as well as tweeting under @CanaryAI1 (set up on the day) and the design of the home screen of the app for miners, which we presented as part of our pitch. Both have just completed a Post-Graduate in Innovation & Entrepreneurship at Trinity College Dublin. In addition, both have considerable management experience - Michelle in the Property sector, and Miriam as an IT Programme Manager.

David, Enric and Miriam have participated in a number of hackathons together, all with different themes, in the last year (we first met at a hackathon!).

We absolutely could continue working together into the future!

