WIRELESS RESEARCH @UKM

Aerial Wireless
- Radiation monioriing
- Aerial navigation and Geo-fencing
- FANET
- Low altitude platform for rural
- LoRa for livestock
- Mobile network on UAV

IoT
- Performance and characterization
- Factory of Future
- Internet of Vehicle
- Energy efficient wireless transmission
- Smart City
- Internet of Mangrove

5G & Beyond
- Massive MIMO
- NOMA
- HetNet
- mmWave propagation
- Dual connectivity

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Human-machine frontier

Future of Jobs

Proportion of tasks completed by humans vs machines

WORLD ECONOMIC FORUM

2022

| 34% | 66% |

2027

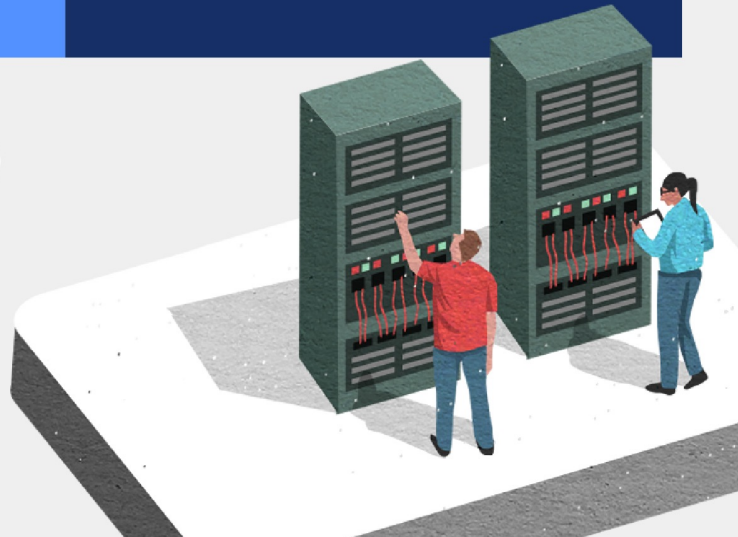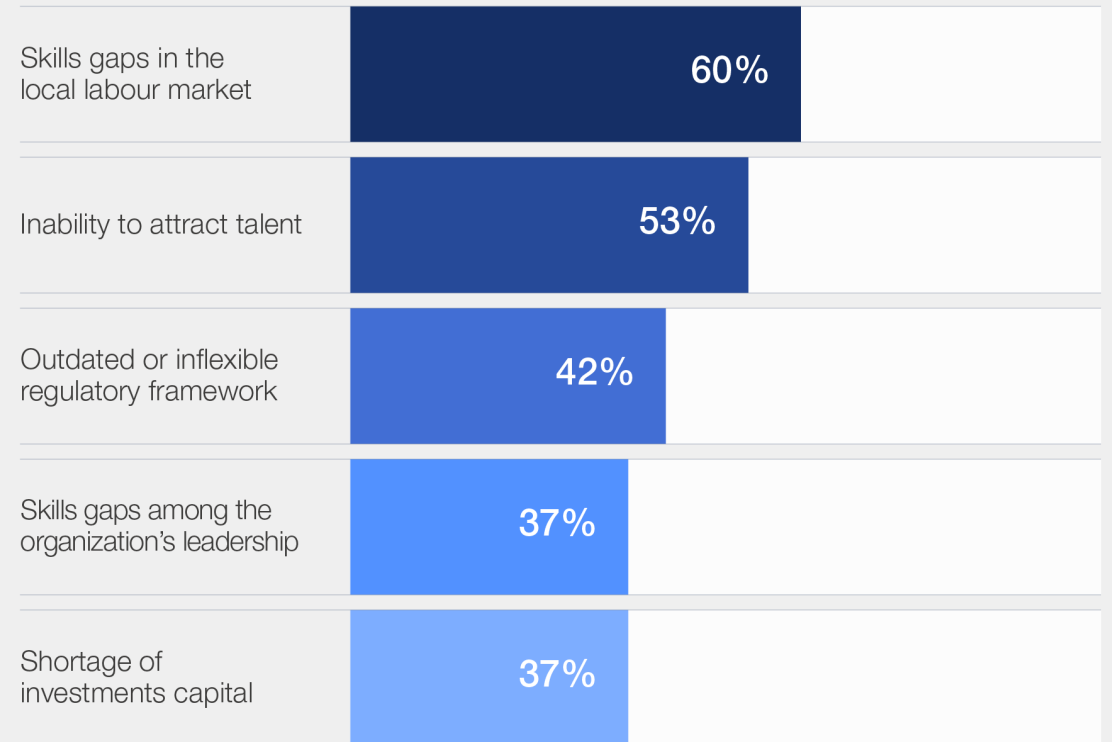| 43% | 57% |

● Machine ● Human

Source: World Economic Forum, *Future of Jobs Report 2023.*

Skills and talent gaps block industry transformation

Future of Jobs

Percent of respondents rating this as a main barrier

WORLD ECONOMIC FORUM

Skills gaps in the local labour market	60%
Inability to attract talent	53%
Outdated or inflexible regulatory framework	42%
Skills gaps among the organization's leadership	37%
Shortage of investments capital	37%

Source: World Economic Forum, *Future of Jobs Report 2023.*

Fastest growing vs. fastest declining jobs

WORLD ECONOMIC FORUM

Top 10 fastest growing jobs

1. AI and Machine Learning Specialists
2. Sustainability Specialists
3. Business Intelligence Analysts
4. Information Security Analysts
5. Fintech Engineers
6. Data Analysts and Scientists
7. Robotics Engineers
8. Big Data Specialists
9. Agricultural Equipment Operators
10. Digital Transformation Specialists

Top 10 fastest declining jobs

1. Bank Tellers and Related Clerks
2. Postal Service Clerks
3. Cashiers and ticket Clerks
4. Data Entry Clerks
5. Administrative and Executive Secretaries
6. Material-Recording and Stock-Keeping Clerks
7. Accounting, Bookkeeping and Payroll Clerks
8. Legislators and Officials
9. Statistical, Finance and Insurance Clerks
10. Door-To-Door Sales Workers, News and Street Vendors, and Related Workers

Source
World Economic Forum, Future of Jobs Report 2023.

Note
The jobs which survey respondents expect to grow most quickly from 2023 to 2027 as a fraction of present employment figures

Businesses' top 10 skill priorities for 2027

1. Analytical thinking
2. Creative thinking
3. AI and big data
4. Leadership and social influence
5. Resilience, flexibility and agility
6. Curiosity and lifelong learning
7. Technological literacy
8. Design and user experience
9. Motivation and self-awareness
10. Empathy and active listening

Type of skill

- Cognitive skills
- Self-efficacy
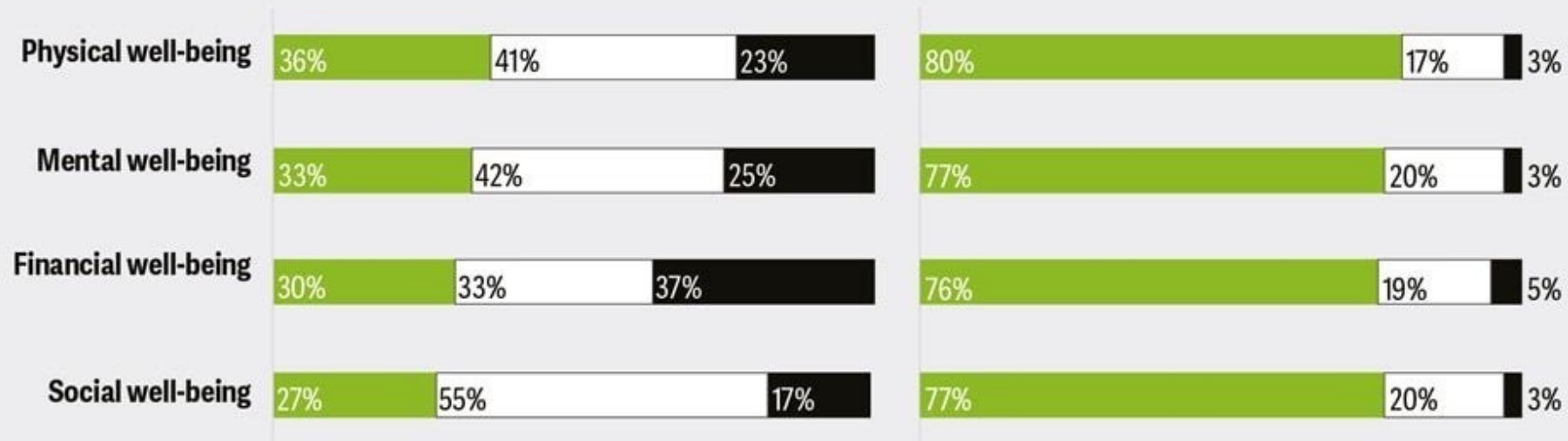- Technology skills
- Working with others

Figure 1

Most employees say their health worsened or stayed the same last year, but more than 3 out of 4 executives believe their workforce's health improved

● Improved   ○ No change   ● Worsened

Employee perspective on how their well-being changed

	Improved	No change	Worsened
Physical well-being	36%	41%	23%
Mental well-being	33%	42%	25%
Financial well-being	30%	33%	37%
Social well-being	27%	55%	17%

C-suite perspective on how employee well-being changed

	Improved	No change	Worsened
Physical well-being	80%	17%	3%
Mental well-being	77%	20%	3%
Financial well-being	76%	19%	5%
Social well-being	77%	20%	3%

Source: Deloitte 2023 Well-being at work survey.

Deloitte. Insights | deloitte.com/insights.com

Challenges - Summary

- Rate of automation in industry is growing rapidly, while future engineers across the globe encounter mental health issues; raise potential risks towards engineering safety practices

- 12% of workers in Malaysia experienced serious mental health in the past 2 years.

- To increase safety of engineers and reliability of engineering system designs based on the needs and principles of the Industrial Revolution 4.0.

Boosting Engineering SafeTy And Reliability for IR 4.0: Integrated Approach of Soft and Hard Skills (BESTARI4.0)

Boosting Engineering Safety and Reliability for IR 4.0:
Integrated Approach of Soft and Hard Skills

Project Brief

There are two critical challenges in enhancing the safety of engineers and engineering systems in the IR 4.0 era. The first challenge is the lack of new technical skills for designing, operating and maintaining future intelligent engineering systems. The second challenge is the engineering community's lack of familiarity with soft skills. To address the challenges, we aim to develop both soft and hard skills of engineers in a single multi-disciplinary module.

Objectives

1. To develop a hybrid module to enhance the safety of engineers, by integrating soft and hard skills, based on the need and direction of IR 4.0.
2. To deliver modules by holding a series of national-level workshops for the final year students, fresh graduates, and early career engineers
3. To develop a micro-credential course based on the developed module.

Expected Outcomes

Two micro-credential modules for both soft and hard skills. The modules should demonstrate suitable assessment methods and reporting in a user-friendly manner. The micro-credential should be shareable across multiple platforms including social media, email, blogs, and resumes.

Current Status

40% progress (developing hard skills materials)

Core Team

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Project Leader (UKM)

Ts. Noor Mohd Helmi Bin Nong Hadzmi
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Dr. Nasrudin Subhi
Social Scientist

Dr. Mehran Behjati
Machine Learning

Ili Hazwani binti Zakaria
Research Officer

Project Plan

Phase 1	Phase 2	Phase 3
Module Development (10/22 – 3/23)	**First trial/test module delivery** (4/23 – 6/23)	**Module improvement and module delivery preparation** (7/23 – 9/23)
• **Deliverable:** Module materials • **Milestone:** Development of hard, soft, and integrated skills teaching materials	• **Deliverable:** Alpha version of the module • **Milestone:** Delivering test module and identifying downsides of the developed module	• **Deliverable:** Beta version of the module and teaching platforms and facilities • **Milestone:** Improving module and preparing online and physical teaching materials

Phase 4	Phase 5	Phase 6
Module Delivery (10/23 – 3/24)	**Micro credential development** (4/24 – 8/24)	**Project closure** (9/24)
• **Deliverable:** 6 workshops in hybrid mode • **Milestone:** IP and Delivering one-year workshop	• **Deliverable:** Micro-credential module • **Milestone:** Development of micro-credential module	• **Deliverable:** Technical report • **Milestone:** Providing progress evaluation and technical report

Hard Skill Module Layout Planning

	MODULES	DAY	DURATION
1	**Introduction to Machine Learning** What is machine learning Machine Learning Ethics ML Systems Learning Style and Algorithms Types of ML Outputs Machine Learning Microcontroller Deep Learning	1	3 hours
2	**Embedded Devices** Embedded System Design Real Time Operating System Arduino as Microcontroller Benefits of Combining ML and Embedded Systems	1	3 hours
3	**TinyML with Edge Impulse** Edge Impluse with the Nano 33 BLE Sense Setting Up Edge Impulse Creating Datasets and Program Train the ML Model	2	3 hours
4	**Examples for IoT** Building machine learning model Security of ML Deploy ML on cloud, edge and devices	2	3 hours
5	**Assignment & Evaluation**	3	Independent + Presentation

Relevant Tools for TinyML Micro-credential Course

The MC will leverage a combinations of SW & HW tools.

Participants will gain proficiency in using Edge Impulse, Google Colab, and Arduino IDE to develop and deploy ML models on microcontrollers

By utilizing basic sensors and the Arduino Nano, learners will acquire practical skills in implementing TinyML applications

Additional tools like Raspberry Pi and TensorFlow Lite expand the possibilities for advanced projects
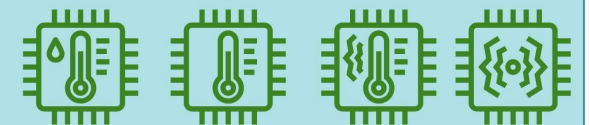
Software Tools

EDGE IMPULSE

TensorFlow Lite

colab

Arduino IDE

Hardware Tools

Sensors

Comparison BESTARI4.0 with Coursera & EDX

Modules	BESTARI4.0	Coursera (Edge Impulse)	EDX (Harvard)
Mode of Delivery	Online (early development phase with physical workshop)	online	online
Duration	Max. 40 hours (to fulfil notional hours)	Est. 4 hours videos, 4 hours self reading	Not more than 40 hours (overview for the duration of every videos and reading materials are not shown before launching the lesson)
Each Video Duration	Under development	Minimum - 2 mins, Maximum - 15 mins	Average 5 mins
Overview of each subtopics	Depends on the selected microcredential platform to launch the course	Available. Duration for every video, slides and assessment can be viewed before learning time	Not available. Have to launch and join in every modules to view the layout of every subtopic.
Assessment	at the end of every modules	at the end of every modules	at the end of every modules
Participant/Instructor Interaction	Both cohort and independent learning	Independent learning	Independent learning
Pace of Learning	Hybrid (fixed for physical course or self paced for online course)	Self paced	Self paced
Total modules	3	3	2
Indicator of achievement	Handout Project on the last day of the course	Project to be submitted at every module	Project to be submitted at every module

Recruitment of Research Assistant for the soft-skills development

Finalizing hard-skill materials (Machine Learning) for trial/pilot workshop

Identifying a suitable micro-credentials platform for the final deliverable

Construction on hard skills module layout (learning objectives, outcomes and quizzes)

Developing website for visibility

FGD with industry partners (IX Telekom and Aerodyne) and final year students

Focus Group Discussion (FGD)

- To gather data and information on investigating the caused of mental health among engineers in workplace. The survey only done among selected young engineers from IX Telekom on 3rd February 2023.
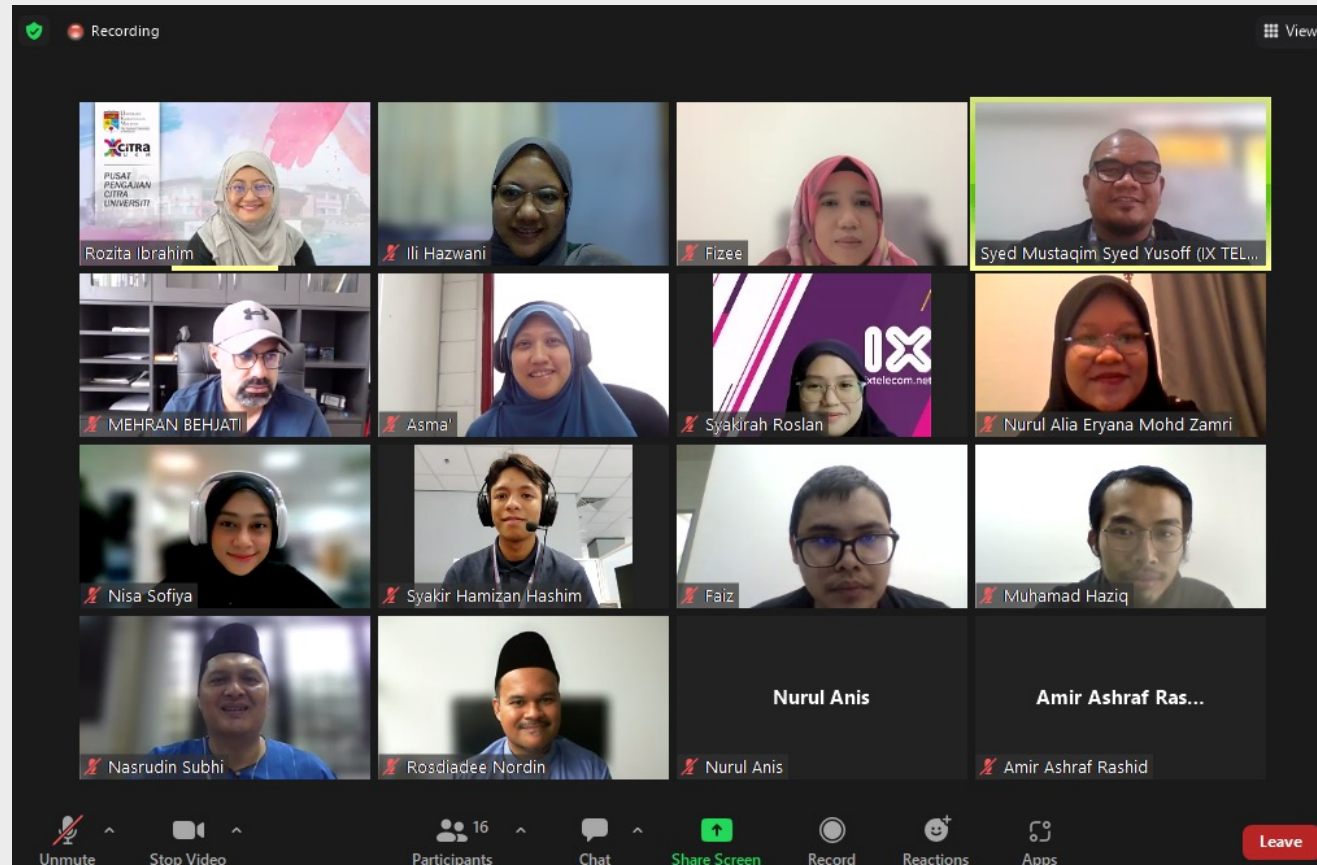
Challenges

- So many micro credentials platform to choose!
- Creating a unique content that can differentiate our micro credential course with existing ML courses
- Ensure the learner consistency while pursuing micro-credential – add active learnings?
- Sustainability of the platform; to engage with wider/specific audience

Opportunities

- Integrate into existing degree course on Machine Learning (tech) and social science (soft-skills)
- Recognition & certification of the short course
- Collaboration with a production team to create interesting contents for the short course
- Provide a flexible form of learning

Thank You!

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