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Generative Artificial Intelligence for the Tech Workforce

A resource guide for business owners

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In Partnership With:

AI SINGAPORE®

Foreword



Ms Yean Cheong
Executive Director, SGTech

We are in an era of technological evolution that is rapidly sharing the future of industries and workplaces. Living with tech as an enabler, the need for a skilled and adaptable workforce becomes increasingly pivotal.

As the appointed Skills Development Partner for the tech community by SkillsFuture Singapore (SSG), SGTech has embarked on a mission to champion skills development on a new frontier. As the trade association for the tech industry, we are constantly keeping abreast of changes, to advocate skills and training needs for the tech community, and drive skills adoption to uplift the quality of the tech workforce.

This publication marks a significant milestone in the industry-led effort towards fostering a workforce equipped with the essential skills to navigate and excel in the era of Generative Artificial Intelligence (GenAI).

The development of this publication marks the first tangible product of our collaboration with SSG, and is a groundbreaking endeavour driven by the collective wisdom of 30 forward-thinking companies dedicated to embracing the challenges of emerging tech and committed to uplifting the quality of their workforce through consultations of skills needs at the early stage in preparation for business needs.

The future of work hinges upon the readiness and adaptability of individuals and organisations to embrace technological advancements. With GenAI pushing new frontiers, we have also partnered with AI Singapore (AISG) to translate the requirements of technological advancements into jobs and skills needs. This publication emerges as a beacon, guiding professionals and enterprises toward a future where skills development converges seamlessly with technological innovation.

Within these pages, you will find a comprehensive resource that outlines the crucial skills demanded across various roles - from developers to end-users - to embrace and integrate GenAI technologies effectively within the workplace. There are also useful resources to support business owners who are keen to ride the GenAI wave.

I extend my deepest appreciation to SSG, AISG and the visionary companies who have lent their expertise and commitment to this initiative. May this publication serve as a compass, navigating the path towards a skilled workforce empowered to harness the full potential of GenAI, shaping a future that thrives on innovation, collaboration, and continuous learning.

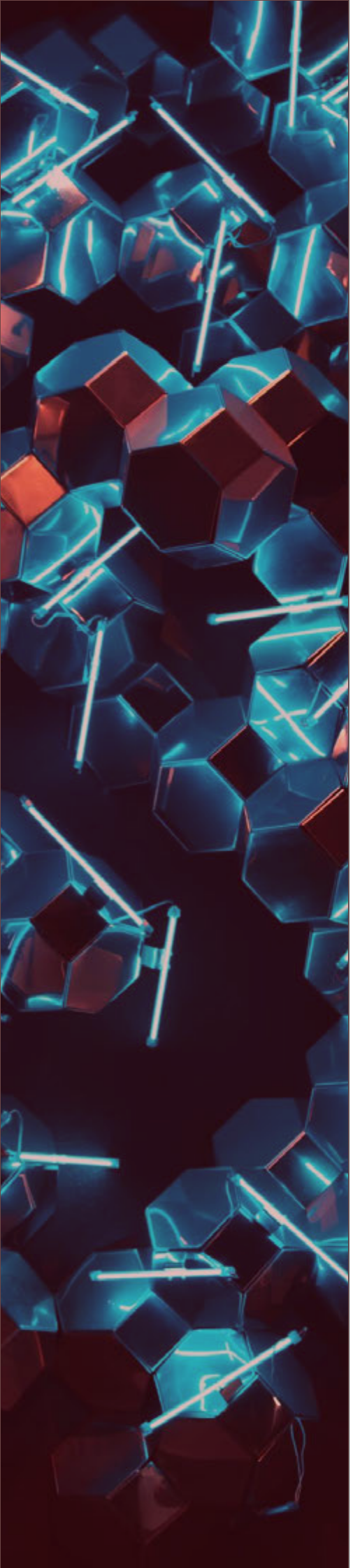
Acknowledgements

SGTech would like to thank the following companies who have participated in our industry consultations and validations of tech talent and skills profiles for GenAI.

In addition, we thank the following entities for their support:

- **SkillsFuture Singapore** - for the joint development effort in skills articulation
- **AI Singapore** - for the joint development of relevant skills training programmes for GenAI
- **TalentKraft** - for the joint development of this report

Pledging Companies		
Ailytics	Inspire-Tech	SAP
Aloniq	JJ Innovation Enterprise	Smart Tradzt
Athena Dynamics	JobKred	SoMin
Babbobox	Keppel Data Centres	TalentKraft
Dhata Tech	Microsoft	Tech JDI
DiMuto	NCS	Thoughtworks
Fidcorp	NEC	UnaBiz
Fidelium Group	Ngee Ann Polytechnic	Weytec
Google	Payboy Pte Ltd	Xcellink Pte Ltd
Gush	Rolling Arrays	Zscaler



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Executive Summary

The launch of ChatGPT was a global phenomenon that opened the eyes of the world to the possibilities of Generative Artificial Intelligence (GenAI). The exponential rate at which GenAI capabilities are developing are already reshaping how businesses operate. The impact will only increase as more powerful GenAI models are built into increasingly sophisticated solutions - no industry, no job function will remain untouched.

This prospect is as exciting as it is sobering, but many business leaders are struggling to separate hype from reality and to identify the concrete steps they need to take right now. This report aims to provide business owners and employees with an overview of GenAI and the expected impact on businesses, particularly on jobs and skills. More importantly, it is designed as a practical guide for business leaders who are looking to prepare their companies and employees for the GenAI world.

2

Introduction to Generative AI

How long does it take to reach 100 million users?



To put it into perspective, the World Wide Web as a whole took 80 months. Facebook took 54 months and even Tik Tok took 9 months.

ChatGPT, which introduced most people to Generative AI, reached the milestone in 2 months.

What exactly is Generative AI?

Generative AI (GenAI) is a subset of artificial intelligence that can create entirely new and unstructured content, be it text or visual imagery, from given inputs/prompts and the data it has been trained on.

While "regular" artificial intelligence only classifies/perceives/detects, GenAI can generate new content/output from given inputs/prompts and the data it has been trained on. From customer operations to drug design, GenAI is revolutionising industry after industry with its broad range of capabilities.

Human-In-The-Loop Intervention

GenAI requires a range of Human-In-The-Loop (HITL) intervention depending on the use cases

HITL Intervention

Low intervention → *High intervention*



Automation

Automates existing business processes with occasional checks and reviews from humans to ensure processes are running smoothly

Creation

Creates and takes on tasks that require expertise and have a larger impact with human intervention to ensure sound deployment

Advisory

Suggests potential outputs based on prompts but requires human intervention to decide whether to take on the advice provided

Business Value Derived From GenAI

A McKinsey study[2] found that three-quarters of business value derivable from GenAI is concentrated in just four business functions, namely Sales and Marketing, Customer Operations, Product Research & Development, and Software Engineering. Here are some examples of how GenAI can apply itself in core business operations:

	 **Automation**	 **Creation**	 **Advisory**
Product R&D	Automate testing of new products or materials via simulation of intended and unintended effects	Create new products or materials via inverse design, text /image prompts, etc.	Propose potential designs based on previous product lines, customer feedback and popularity of items
Sales and marketing	Automate sales and marketing processes such as CRM, SEO, A/B testing	Create personalised recommendations based on user behaviours to improve customer retention	Suggest new marketing material or product descriptions to improve customer engagement
Customer Ops	Automate customer responses or routing via GenAI chatbots to maintain service quality and personal touch	Create user support knowledge base via user guides, tutorials and FAQs	Improve customer experience by providing real-time feedback and suggestions to customer service team

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Impact of GenAI on Jobs and Skills

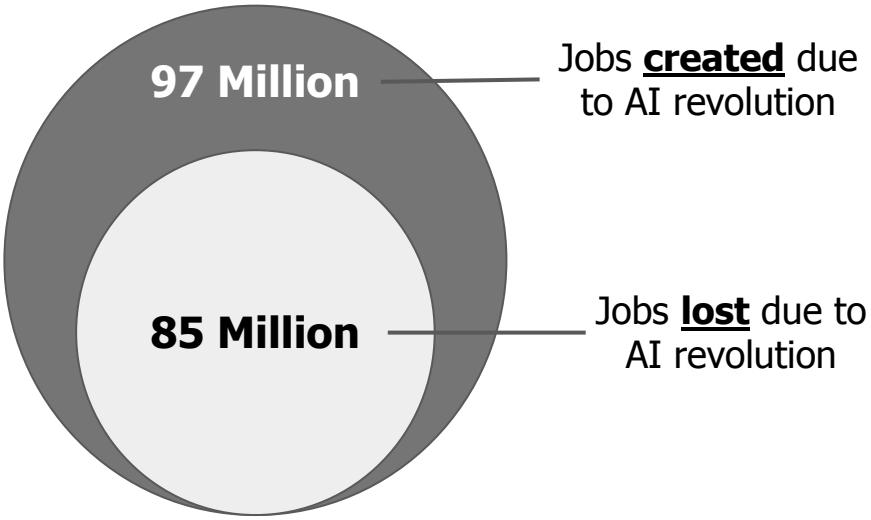
> *"AI will not replace people - but people who use AI will replace people who don't."*

The impact of GenAI is revolutionary and it is here to stay.

US$ 7 Trillion

Expected increase in global GDP due to GenAI in the next decade[3]

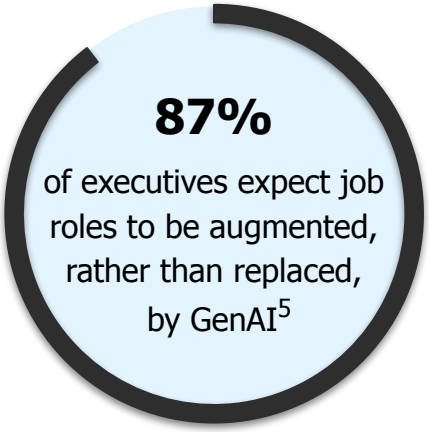
There will be **12 million more jobs created** than lost from AI revolution between 2020 and 2025[4]

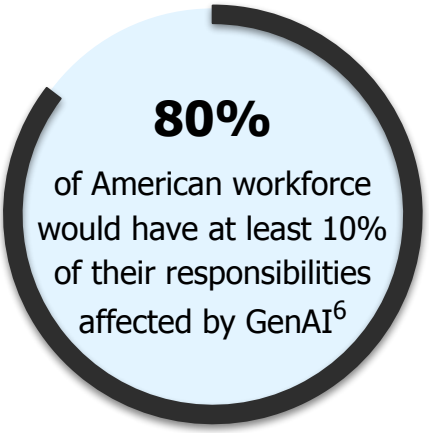


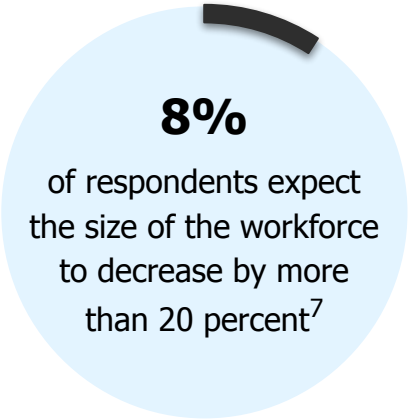
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GenAI will not replace jobs, but augment jobs to take on higher value activities

History gives us some reasons for optimism, as fears of widespread job displacement often do not materialise. McKinsey[2] found that GenAI could automate 60 - 70% of the average employee's day, but this does not mean that 60 - 70% of those employees will lose their jobs - rather, their job roles and responsibilities shift to newer things that are harder to automate.







As with previous waves of technological innovation, GenAI will get rid of some jobs, but also enable new jobs that previously could not have existed.

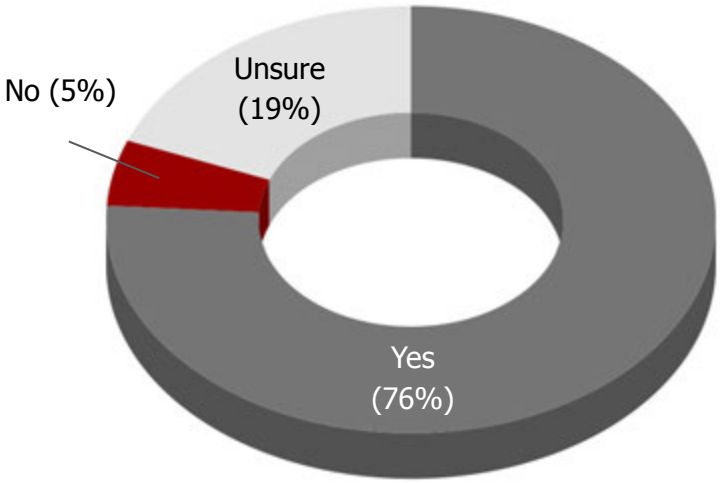
> Most jobs and industries are only partly exposed to automation and are **more likely to be complemented rather than substituted** by the latest wave of GenAI [...] the greatest impact of this technology is likely to not be job destruction but rather the **potential changes to the quality of jobs, notably work intensity and autonomy.**[8]

International Labour Organization

Employers are looking to reskill and upskill employees instead of replacing them

SGTech conducted a business capabilities and hiring sentiments poll among our members in October 2023 and found that 76% of the respondents in the tech sector indicated that they have intentions to build GenAI capabilities in the upcoming year.

Does your company intend to build GenAI capabilities in 2024?



Data derived from 42 respondents in the Tech Sector

Top 4 functions for GenAI innovation

1. Customer Service & Support
2. Marketing, PR & Communications
3. Operations & Administration
4. Information Technologies & Systems

This is in line with research conducted by the IBM Institute for Business Value between April and May 2023[9], where Singapore executives prefer to reskill their current team over hiring from external sources.



4

Use Cases of GenAI Applications

While the technology may be impressive, what impact is it actually making on business operations? In this section, we highlight a few examples of how GenAI solutions are already creating a step change in how things are done. These examples were chosen to cover a range of business operations, from recruiting to systems integration to code development and training.



Create customised tests and conduct life-like interviews to select the best talent



Ingest and analyse large data sets to power an advisory chatbot for rectification actions



Coach and train AI developers with GenAI through Socratic deep skills-thinking methodology

Create Customised Tests and Conduct Life-like Interviews to Select the Best Talent

mangtas

Using GenAI to revolutionise how companies find and assess remote talent in an effective and efficient manner

Their avatar, Arya, is able to conduct life-like interviews with candidates, generating questions and evaluating their answers in real time in order to formulate a deep understanding of a talent's real-world capabilities in an objective and unbiased manner.



Mangtas' Avatar, Arya

Besides that, Arya is also able to create open-ended questions that can test almost any skill, from coding to problem solving to customer service, and evaluate the quality of answers provided by candidates.

This means that companies can find the best talents for their jobs with almost no human effort or time wasted.

Outcomes

Reduce human biases

Save time and effort

Improve selection accuracy

Skills Impact

With tools like Mangtas in their toolkit, talent acquisition professionals can spend less time doing repetitive tasks and more time engaging candidates, enhancing the company's talent acquisition strategies, and employer branding.

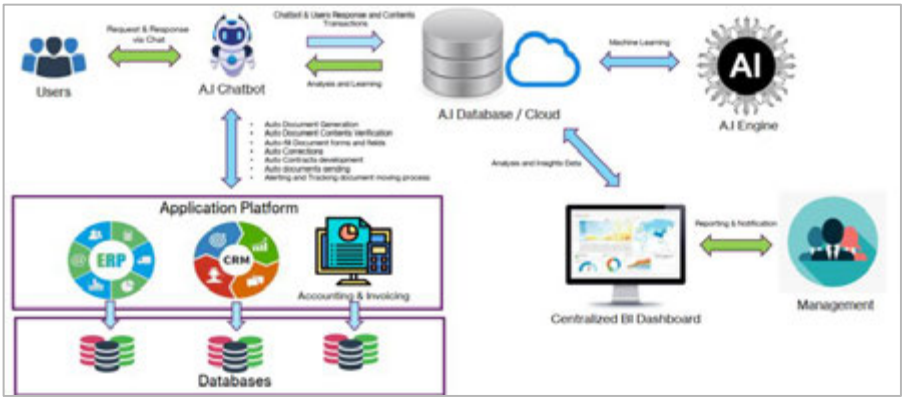
Ingest and analyse large data sets to power an advisory chatbot for rectification actions

JJ INNOVATION ENTERPRISE

Using GenAI to seamlessly integrate multiple solutions for more efficient business operations

A global player in the raw materials industry needed a way to integrate their various digital platforms to make these systems work seamlessly together to further increase productivity. JJ Innovation consulted with the business for 6 months and created a system to automatically ingest and classify documents across different departments.

This ability to incorporate information from all users meant that everybody in the company was involved in training the model, not just the tech team. This accelerated the rate at which the large language model could learn, hence delivering greater benefits to the company.



Process illustration of JJ Innovation's solutions

Outcomes

Faster information generation

Single chatbot interface for all users

Timely alerts for rectification actions

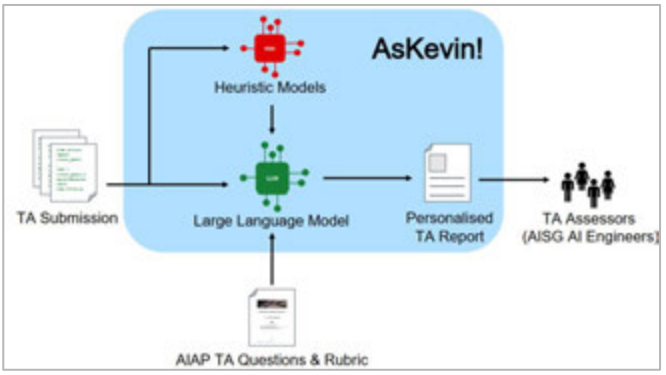
Skills Impact

GenAI capabilities in this field mean that far less time is spent on extraction and data, freeing up capacity to focus on higher value-adding activities, such as generating, and acting quickly, on data insights.

Coach and train AI developers with GenAI through Socratic deep skills-thinking methodology

Using GenAI to assess technical scripts, identify improvement areas and provide customised advice for AI engineers

AI Singapore (AISG) is the national programme to anchor deep national capabilities in Artificial Intelligence. They recently showed that they can 'walk the walk' on AI when they created AsKevin! One unique thing about AsKevin! is that the asking goes both ways.



Process illustration of AsKevin!

Unlike ChatGPT, which is designed to answer your questions directly, AsKevin! does not give you the answers straight away, but instead leads you to the answer. This is part of its Socratic deep skills-thinking methodology, which focuses on building understanding through asking the right questions, rather than simply spoon-feeding the solution.

Such capabilities would not be possible without GenAI's ability to generate the right questions, understand the responses, and drive the conversation forward until the engineer has learnt the key points.

Outcomes

Free up trainers' time

Accelerate learning journey

Improve learning experience

Skills Impact

With AsKevin! handling the first level of issues with code and providing basic coaching, AISG's engineers can instead focus on tackling more fundamental challenges, as well as helping colleagues to bring their skill sets to an even higher level.

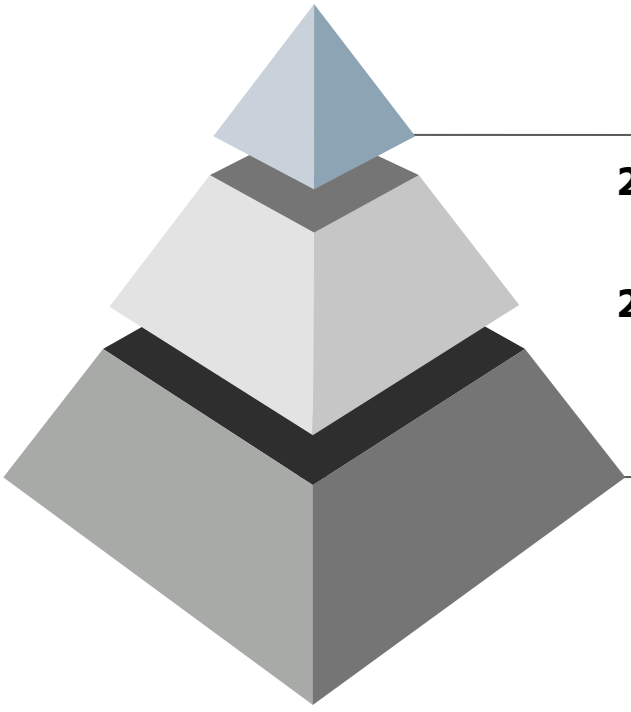
5

GenAI Talent Insights

GenAI is changing how we work, and companies and their workforce need to prepare to take advantage of this new world of opportunity. In this section, we look at the key workforce and skills profiles required to thrive in a GenAI world, and what companies and workers need to do to ensure they not just survive, but thrive.

Three levels of GenAI tech talent profiles were identified based on how much technical expertise is required.

GenAI Talent Profiles



1. GenAI Developers

Develop large language models (LLMs), train and finetune the machine learning algorithm to improve its performance

2a. GenAI Solution Providers

Leverage LLMs to fit specific use cases

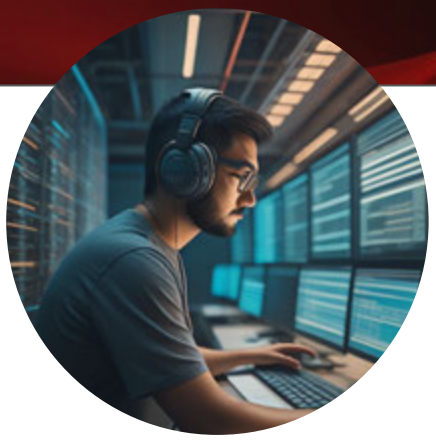
2b. Power Users

Use GenAI for specialised work tasks that require a greater understanding of prompt design and domain-specific knowledge

3. General Users

Use GenAI as a tool for solutioning work tasks. Understand how to use GenAI ethically and responsibly

1. GenAI Developers



Tech workforce in GenAI companies or leading development of Large Language Models (LLMs).

GenAI Developers require the highest level of skills and proficiency in technical expertise. As GenAI technologies are still developing, the skills required will also continue to evolve.

Examples of Job Roles

- Software Engineer
- AI/ML Engineer
- Full Stack Developer
- AI Applied Researcher

Examples of Skills Required

1. Programming and Coding
2. Application Development
3. AI Application
4. Big Data Analysis
5. AI Ethics and Governance
6. Data Engineering
7. Data Management
8. Data Ethics
9. Data Governance
10. Data Design

Relevant Training Courses

SGTech Talent Programmes

1. CCP for AI Application Developer

Courses Funded by SkillsFuture

1. Specialist Diploma in Applied Generative AI by Ngee Ann Polytechnic
2. Generative AI Intelligence by National University of Singapore
3. Executive Certificate in Enterprise Data Management by Singapore Management University

Pro tip: For relevant courses, click here and search by skill name or prompts such as "Generative AI" or "Gen AI"

2. GenAI Solution Providers & Power Users



Tech workforce of GenAI companies or corporates leveraging LLMs to fit specific use cases for solutioning of specialised tasks

GenAI Solution Providers will need to leverage the full software development toolkit of skills to build software solutions for different use cases.

Power Users are the talents within companies who work to integrate and customise off-the-shelf software solutions into what their companies need. They combine domain-specific knowledge relevant to their roles with an understanding of GenAI in order to get maximum benefit from the new technology.

Examples of Job Roles

Solution Providers		Power Users *(e.g.,marketing function)*	
Software Engineer	AI/ML Engineer	Marketing Manager	Content Writer

Examples of Skills Required

1. Programming and Coding
2. Application Development
3. AI Application
4. Cloud Computing
5. AI Ethics and Governance
6. Data Management and Design
7. Data Ethics and Governance
8. Website Design
9. Social Media Marketing
10. Search Engine Optimisation (SEO)

Pro tip: For relevant courses, click here and search by skill name or prompts such as "Generative AI" or "Gen AI"

Relevant Training Courses

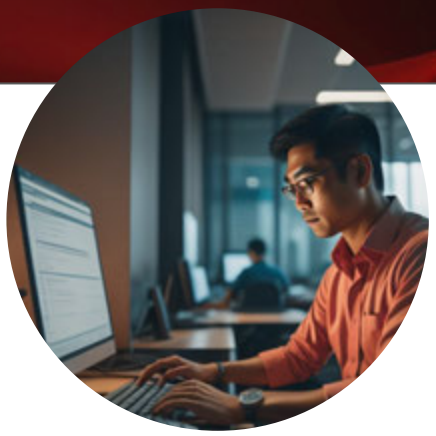
SGTech Talent Programmes

1. CCP for AI Application Developer

Courses Funded by SkillsFuture

1. Certified Artificial Intelligence Governance Professional (AIGP) by Singapore Management University
2. Leveraging Generative AI for Digital Marketing by Orita Sinclair School of Design & Music
3. Apply Generative Artificial Intelligence for your industry by Nanyang Polytechnic

3. General Users



Users of GenAI tools for solutioning work tasks

General Users are the majority of people in the company who will use the GenAI capabilities embodied in their company's tools and systems.

They will also need to learn the principles of ethical and responsible use of GenAI to avoid some of the potential downsides of GenAI.

Tips on Responsible Use of GenAI

General Users will need to learn how to utilise GenAI effectively and responsibly. As we tap on GenAI tools such as ChatGPT, Bard, Midjourney, some tips for responsible use include:

- **Understand the basis** behind the data which the output was generated, i.e. whether the data used had some biases in data sets
- **Always verify and fact-check** the content generated, especially if the output is intended for critical decision making or sensitive topics
- **Consider the context** in which the output will be used, to avoid infringement on data privacy issues

Relevant Training Courses

AI Singapore Courses

1. LearnAI | AI4I

Courses Funded by SkillsFuture

1. Introduction to Gen AI by Singapore University of Social Sciences
2. Generative AI for Business Professionals: ChatGPT, Media Synthesis, and Beyond by NTUC LearningHub
3. Generative Artificial Intelligence (AI) and Chat Generative Pre-training Transformer (ChatGPT) for Business by Singapore Polytechnic

Pro tip: For relevant courses, click here and search by skill name or prompts such as "Generative AI" or "Gen AI"

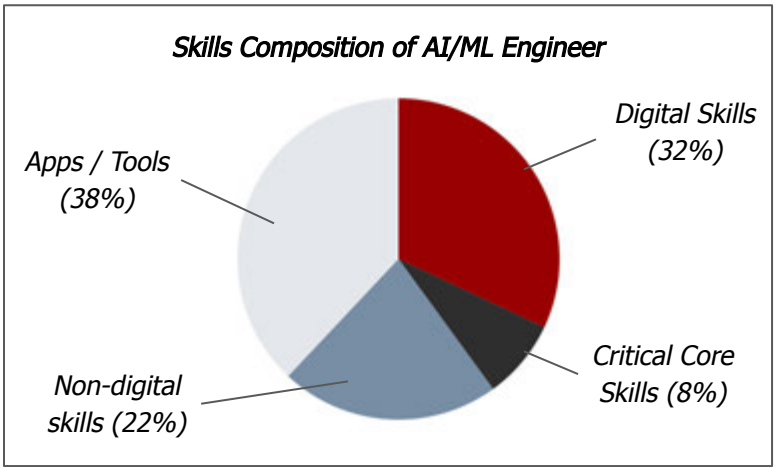
Key Insights for GenAI Talents

1 Existing AI/ML skills remain relevant for Developers and *Solution Providers* to upskill for GenAI

Although GenAI technologies are constantly evolving and being developed, Artificial Intelligence (AI)/Machine Learning (ML) skills would be foundational for Developers and Solution Providers, coupled with knowledge of Large Language Models.

There is also a rising demand for applied AI skills (e.g., Data analysis, Data visualisation, etc). This is currently a bottleneck as there are insufficient junior professionals with strong data validation skills who can discern correct syntax and codes. At the same time, industry insiders point out that general purpose programming models like Codex are transforming how people code, implement, and validate their code.

An analysis of GenAI startups and companies reveals that the most common skills reported by their professionals are in the general bucket of digital skills. These include skills such as Programming and Coding, Applications Development, and Artificial Intelligence Application.



SSG analysis of job posting data from 2020 – 2023. Source: JobTech

2 *Power Users* and *Solution Providers* need to be well-versed with data protection management skills

There is an urgent need to increase talent with data protection management and AI ethics and governance skills.

SGTech's interviews with industry players highlighted that organisations have a responsibility to ensure ethical and governance practices are in place to manage and oversee the use of GenAI technology.

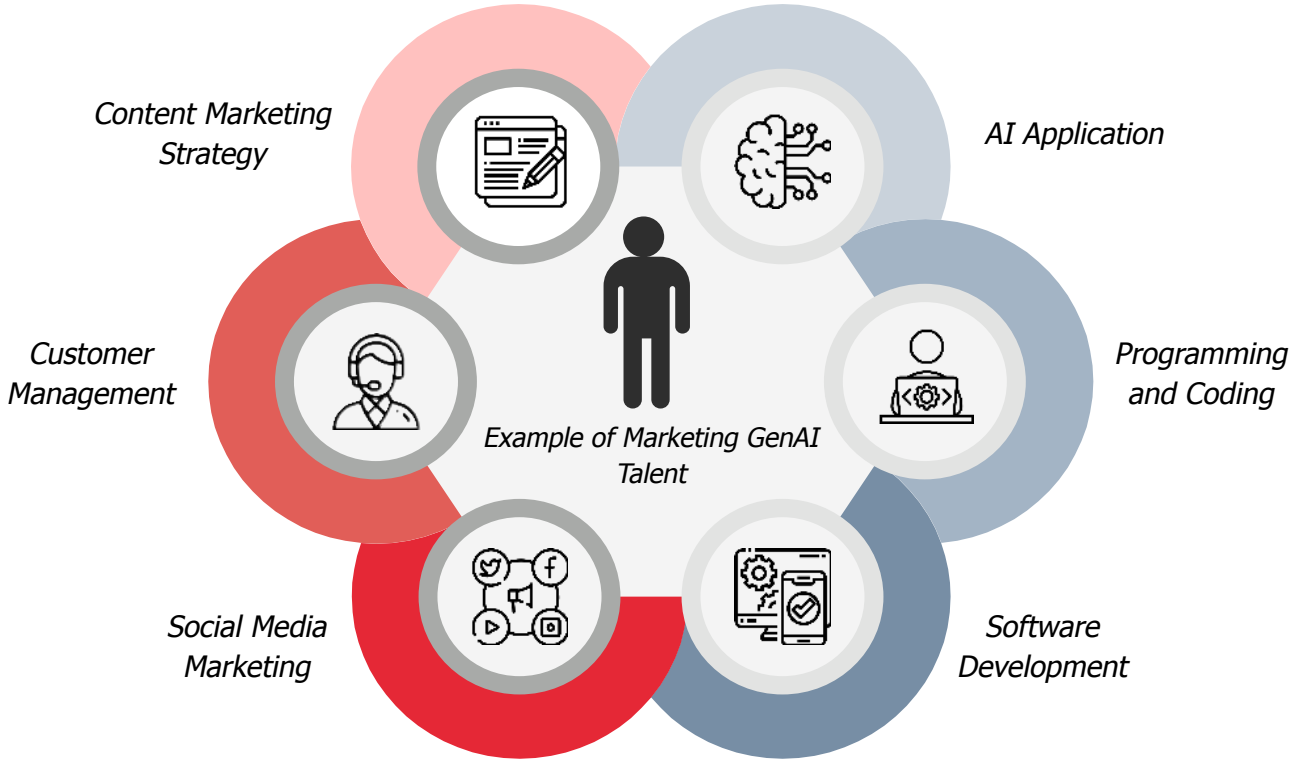
Strong cybersecurity measures are also important when developing or implementing GenAI solutions, given the large amounts of data that are contained within them. The industry will need to uphold data governance especially in the context of cybersecurity, and this requires that tech professionals understand the technological frameworks behind products and LLM services before using GenAI in their solutions

Key Insights for GenAI Talents

3 Domain-specific skills and knowledge are essential for Power Users and Solution Providers

Domain-specific skills and knowledge are essential to define use cases and the avenues to deploy GenAI solutions to support businesses.

For example, an analysis of Marketing GenAI companies shows that the most common skills listed by their talents comprise both digital skills (Software Development, Programming and Coding, Artificial Intelligence Application) and marketing skills (Digital Marketing, Social Media Marketing). This is applicable for both solution providers and power users, as both groups will require a mix of digital and domain skills.



This analysis is aligned with SGTech's industry consultations. While GenAI solutions uplift productivity in content creation, it is domain knowledge that sharpens clarity in use cases and eventually supports interpretation and contextualisation of the output for meaningful business applications.

Strong domain skills provide an anchor to ensure GenAI solutions can be applied appropriately, integrating smoothly with the workflows and processes for the respective business functions.

6

3 Steps to Ride the Wave of GenAI

1	2	3
Identify areas that could benefit from GenAI solutions and develop transformation plans	Identify team members who will be impacted by the GenAI solutions and how their jobs could be redesigned	Map training needs based on their augmented roles once the GenAI solutions are implemented

Examples of actions you can take

- *Define key GenAI use cases through Microsoft's workshops*
- *Embark on your digitalisation journey via the DT-SME programme*

- *Review support for job redesign and training needs via the Enterprise Jobs and Skills Portal*
- *Connect with GenAI mentors and mentees through the B2B Mentoring Programme*

- *Explore CCP for AI Application Developer Programme*
- *Enroll in LearnAI courses by AISG for General Users*
- *Review MySkillsFuture for a broader selection of courses for reskilling/ upskilling needs*

Click/scan the QR code to sign up for relevant Microsoft workshops!

Click/scan the QR code to check out training courses available on the Enterprise Jobs and Skills Portal (EPJS)

Pro tip: For relevant courses, click here and search by skill name or prompts such as "Generative AI" or "Gen AI"

For more information, contact SGTech at skills@sgtech.org.sg

[1]https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/

[2]https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#key-insights

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