Enhancing Generic Skills Development in Higher Education in the Era of Large Language Model Artificial Intelligence

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The recently developed large language model artificial intelligence (AI) systems, such as ChatGPT, are likely to become widely used over the next few years as core tools in many areas of business. Higher education graduates will need to be adequately prepared with the necessary generic skills to exploit this technology and a detailed understanding of the risks of using it and related ethical aspects to maximize their employability. Higher education institutions will need to develop training to support this and a conceptual multi-layer framework is proposed for generic skills development in higher education relevant to the emerging new era of large language model AI. This model encapsulates traditional generic skills training for employability, the extended skill sets needed for operating as independent knowledge-workers in increasingly fragmented working contexts, and the new sets of skills in areas such as prompt engineering, output verification and bias detection, which are needed specifically for operating as effective users of advanced AI systems in business.

Keywords: higher education, artificial intelligence, large language models, ChatGPT, generic skills development, graduate employability

INTRODUCTION

It has long been recognized that acquiring generic skills is an important aspect of higher education to make graduates more employable. Consequently, most higher education institutions now explicitly foster generic skills acquisition through their academic curricula, dedicated skills training programs, and work-based learning opportunities. However, given the recent advent of large language model artificial intelligence (AI) systems, such as ChatGPT, which are likely to transform significantly the future of work in many business sectors, it is now necessary to review and augment the kinds of generic skills training that students need for their future employment. The focus of this paper is on the implications of ChatGPT and similar systems for higher education generic skills training. The aim, in particular, is to identify new kinds of training that students will require in order to become more employable in a world where artificial intelligence systems are likely to become embedded in many business processes across a wide range of industries and professions, and moreover to draw on best practice in generic skills acquisition known to date to inform the approaches to the new kinds of training required.

BACKGROUND: GENERIC SKILLS TRAINING IN HIGHER EDUCATION

The need for generic skills training in higher education has been evident for around thirty years, with much research taking place on generic skills development over that period to ensure graduates are well-equipped to contribute to knowledge-based economies (Cornalli, 2018). To clarify nomenclature, in this paper the term "generic skills" will be used to refer to skills that are not explicitly related to a specific subject of academic study at university but are of a general nature related to increasing the employability of graduates in professional roles. These types of skills are also variously referred to as "basic skills", "transferable skills" and "soft skills" in the literature. However, "soft skills" may sometimes be used more narrowly for skills related to human interaction such as teamworking or communication skills. In contrast, generic skills may embrace a broader set of skills such as proficiency with office information technology. The concept of employability often means that a graduate not only has relevant specialist knowledge and expertise for a particular employment sector or job type but also possesses the necessary generic skills to be a competent employee who fits in and contributes effectively in a corporate environment. The concept of employability also embraces the idea that graduates are "attractive" to a wide range of employers. However, it has been argued that focusing higher education on this is a consequence of the massification of higher education and may not be entirely compatible with the broader aim of higher education supporting civil society and social justice (Boden & Nedeva, 2010).

There have been several reviews and studies of generic skills needed by employers and of "skills gaps" where there is a perception by employers of a lack of relevant generic skills among graduates (e.g. Andrews & Higson, 2008; Jackson, 2010; Robles, 2012; Tuononen et al., 2022), although interestingly some studies have pointed to skills mismatches rather than skills gaps (e.g. Cappelli, 2015). Most studies on generic skills requirements and gaps reported in the literature have taken place in the pre-ChatGPT era. Generic skills typically identified pre-ChatGPT include communication, teamwork, critical thinking, problem-solving, work ethic and integrity, leadership capability, basic competence with office information technology, effective time management, good work attitude and courtesy. Some of these skills can be broken down into more detailed capabilities such as visual presentation skills, verbal communication skills, written communication skills etc., and some can also be described as personal attributes rather than skills such as work ethic. The lack of generic skills among higher education graduates and the limitations of higher education to provide them has been a continuing concern globally both of employers and graduates as studies in countries in different parts of the world over the last ten years have shown (e.g. Asonitou, 2015; Boahin, 2018; Pereira, 2013; Pitan, 2017; Singh et al., 2014; Tran, 2013; Zuber Abd Majid et al., 2020).

PERCEPTIONS OF GENERIC SKILLS NEEDS

Studies of the perceptions of generic skills needs for employability among various stakeholder groups such as employers, students, graduates, and higher education academic teaching staff have revealed significant differences (Emin Bakay, 2022; Jackson, 2012; Rosenberg et al., 2012). Interesting findings have emerged from individual studies, such as that female graduates have more confidence about their ability to acquire generic skills than males (Wickramasinghe & Perera, 2010); that the perceived importance of generic skills acquisition by students varies according to the subject of the degree they are studying (e.g. Aranda et al., 2022); that academics consider problem-solving most important whereas corporate human resources managers value teamwork and collaboration skills more highly (Emin Bakay, 2022); that business students tend to over-estimate their own employability skills (Jackson, 2012); and that human resources recruiters believe leadership skills generally are below the expectations of industry (e.g. Rosenberg et al., 2012). It is difficult to generalize globally from such findings but it is clear that perceptions continue to differ and that skills acquisition is still a contentious issue worldwide among the stakeholder groups. The advent of ChatGPT and similar AI systems is likely to accentuate differences of perceptions about skills training needs in the short term as employers, students, and academics grapple independently with trying to understand the importance and impact of the technology on jobs and careers.

THE ACQUISITION OF TRADITIONAL GENERIC SKILLS

Besides understanding what generic skills are needed by graduates, the means of acquisition of such skills by students has also received much attention in higher education institutions and the effectiveness of generic skill development is considered to be important in quality audits of higher education provision (Clanchy & Ballard, 1995). Efforts are generally made to incorporate skills acquisition in academic curricula and special purpose learning experiences, but many factors influence the effectiveness of these. Conventional lecture-based teaching has been well-recognized as not conducive to acquiring business-relevant generic skills. Instead, more active forms of learning applying knowledge in real world contexts with students collaborating across disciplines have been proposed (Nelson, 2021). Other studies have shown that the lack of academic staff with industry experience and over-dependence on teaching theoretical content have created problems in teaching generic skills and that students need interactive class-based activities, self-directed learning and problem-solving to improve their generic skills acquisition (Okolie et al., 2019). The use of interdisciplinary teamwork to augment project-based learning has also been found to be effective for generic skills acquisition (Vogler et al., 2018). Work-integrated learning experiences such as internships or work placements are seen as highly valuable in generic skills acquisition, but there is a need for good placement design and appropriate preparation of students for such experiences to get the optimum outcomes (Jackson, 2015). Dual study programs involving split periods between academia and industry have also been recommended (Tastanbekova et al., 2021). Students and graduates have been found to regard industrial placements and post-graduation employment as more effective than university studies to acquire generic skills and regard the opportunity to have collaborative learning experiences and be given responsibility as particularly helpful (Crebert et al., 2004). Efforts have also been made to incentivize students to improve their generic skills acquisition during their higher education studies by developing schemes to assess, grade, and accredit their generic skills learning culminating in recognition through digital badges (O'Connor et al., 2016). Regardless of the types of generic skills learning experiences on offer and their general effectiveness, it still remains evident that success in student acquisition of such skills can depend on several other independent socio-academic factors such as student gender, performance in academic studies, or whether their geographic origin is urban or rural (Chamorro-Premuzic et al., 2010; De Prada et al., 2022; Zuber Abd Majid et al., 2020).

THE EVOLUTION OF GENERIC SKILLS NEEDS

Even prior to the advent of large language model AI systems, there has been a growing recognition in recent years of the need for generic skills acquired by students to evolve to equip them more effectively for the changing global business environment. The recent introduction of large language model AI systems has only made such an evolution even more necessary. Traditionally, generic skills training has focused on employers' needs and ensuring that higher education graduates can fit in and be valuable contributors in knowledge-based roles in companies. However, the so-called mega-trends in higher education and the labor market, such as the marketization of higher education with students expecting rapid "pay back" for their investment in their studies, the growth of erratic, fragmented or portfolio careers, and the increasing digitalization of business with the trend towards online "gig" economies, are all having an impact on generic skills needs for graduates (Kornelakis & Petrakaki, 2020). Increasing use of AI and the potential displacement of workers will also accentuate these trends. Several new generic skills requirements have been identified to enable graduates to survive and thrive in career terms in the shifting work context that has been emerging globally over the past decade. These skills include entrepreneurial and risk-taking skills, self-promotion skills (especially online), networking skills (especially the ability to build both professional/technical and social support networks), bidding and strategizing skills, self-management skills, remote-team working skills, resilience and capability to face frequent rejections, and the ability to cope with highly fragmented working patterns (Wilkinson, 2017). To date it is apparent that many, if not most, higher education institutions have not yet fully embraced the majority of these new skills requirements, although, an unexpected positive outcome from the COVID-19 pandemic was to make many students more

adaptable to working flexibly and under more self-management in a remote context. Another notable trend is the growing awareness that graduates need a good understanding of sustainability issues and that not only do students studying sustainability programs need to acquire generic skills but also generic skills focused on understanding sustainability and acting professionally in ways to enhance personal and corporate sustainability are becoming more important for all students (Brundiers & Wiek, 2017). At the present juncture, it is clear that skills training in higher education now needs to evolve not just to embrace the latest business and societal mega-trends before ChatGPT but must now also evolve to cover the likely enormous impacts of AI on business globally which are likely to become evident quite rapidly within the next few years.

LARGE LANGUAGE MODEL AI SYSTEMS

After more than half a century of research on the theoretical understanding and practical implementation of AI systems across the globe, the introduction of ChatGPT as a publicly available AI chat system in late 2022 was a landmark in the history of computer science and its application. Whilst it is still too early to comprehend the full impact of this development, it is likely to stand alongside the introduction of the internet, the development of the personal computer, and the roll-out of mobile telephony as one of the key technological developments to significantly change business and society. Developed by the OpenAI organization, ChatGPT is a large language model system, a type of generative AI. ChatGPT can generate long text responses to questions, queries, or prompts input to it by human users. ChatGPT uses deep learning neural networks trained with a large body of data drawn from open internet sources to generate suitable text responses to users. GPT refers to generative pre-trained transformer, a type of learning architecture initially developed for machine translation (Vaswani et al., 2017). The power of such large language model AI systems derives from the massive volume of training data used, the sophistication of the neural network algorithms, and the enormous computing power used to process the training data and generate the output. When writing this article, the most up-to-date version of ChatGPT uses the software version GPT-4. Its input is limited to 2048 "tokens, " the separate digital elements into which a body of text is deconstructed for analysis; these are broadly equivalent to words or punctuation marks. Outputs can be hundreds of words in length; there is no theoretical limit, only a limit posed by the computational practicality of systems serving millions of users concurrently. In order to get the most sophisticated responses to complex inputs, it is possible to break input information into multiple inputs each of which remains within the token limit but collectively can well exceed it. ChatGPT is also limited by having training data that contains information up to September 2021 so it does not know events or new information beyond that date, though it is highly probable that more up-to-date information will be used to train such systems in the future. Even though ChatGPT is impressive in its ability to generate text, which is almost indistinguishable from what can be produced by a highly knowledgeable and well-informed human, some deficiencies exist besides the date limit on its knowledge. ChatGPT can occasionally produce incorrect or false information, sometimes referred to as hallucinations. Also, its responses can be biased because it uses information drawn from public sources on the internet, which might be biased, which is a general problem for all AI systems (Nowotny, 2021). There is also the potential for it to plagiarize given that it draws information from its vast bank of training data to construct responses and might take existing phrases from within such data. ChatGPT does not *understand* what it produces (Floridi, 2023); it uses publicly available information and user input to construct a meaningful response to an input matching text patterns and predicting text. This distinction between cognitive ability and pattern-based text prediction is important because it means the outputs of large language model AI systems need human verification. It should be noted, however, that some evidence has recently been found that large language models can perform certain types of reasoning (Webb et al., 2023) therefore they should not be viewed solely as dumb pattern prediction machines.

BUSINESS IMPACT OF LARGE LANGUAGE MODEL AI SYSTEMS

It is becoming widely recognized that large language model AI systems such as ChatGPT will have profound disruptive impacts on business and society (Mondal et al., 2023; Shaji George et al., 2023) and that there will be a "gold rush" with companies seeking to develop software applications making use of the technology to generate new areas of business (Rotman, 2023). But even without new software apps based on it, what is becoming very clear is that given the ability of the existing interactive ChatGPT system to generate credible high-quality text in response to user inputs, any jobs that involve the creation of reports or documents will be significantly affected by the use of this technology as anyone, anywhere can use it. This could include jobs that involve writing consultancy reports, marketing strategies, audit reports, business plans, advertising copy, media articles, legal briefs, software code etc. It has also been recognized that ChatGPT could assist in management decision-making and in corporate knowledge management (Korzynski et al., 2023). Hardly any professional job would not be impacted by this and there is growing concern that many white-collar jobs will disappear (DePillis & Lohr, 2023). But the impact of large language model AI will not just be restricted to business processes in companies. These systems will also be valuable in science (Stokel-Walker & Van Noorden, 2023), data science (Hassani & Silva, 2023), education (AlAfnan et al., 2023; Cooper, 2023; Lim et al., 2023), and medicine and healthcare (Cascella et al., 2023; Chow et al., 2023). It is also notable that ChatGPT has much potential in translation (which is the field for which generative AI was first developed), in research (Burger et al., 2023; Dwivedi et al., 2023) and will be useful for academic libraries (Lund & Wang, 2023), though concerns remain about its use in scholarly publishing (Liebrenz et al., 2023; Lund et al., 2023; Thorp, 2023) because of the above-mentioned issues of potential bias, hallucination and plagiarism. It should be noted that besides systems such as ChatGPT which focus on text generation, alternative AI systems such as DALL-E and Stable Diffusion, which can generate graphical images and designs from text prompts, are also likely to impact significantly on certain aspects of business in the creative industries in particular.

Even though it is likely that large language model AI systems will provide many benefits to businesses and society as they become widely used, for completeness, it should be noted that there is also growing concern that as these systems further evolve there could be significant risks to humanity and that regulation will be required to ensure that they do not endanger human existence (Russell, 2023). There is a growing awareness of the need for governance of AI systems and adopting measures to minimize their risks. Some AI governance and risk management frameworks have begun to be developed (National Institute of Standards and Technology, 2023; PDPC, 2020) with more under-development such as the proposed European Union regulation on harmonized rules on AI which in particular focuses on high-risk uses of AI that might pose potential risk to the health, safety or fundamental rights of individuals (European Commission, 2021). Business users of AI will need to follow good AI governance procedures and comply with any related regulations or legal requirements in their relevant jurisdiction. Graduates will need to be aware of such matters as they become business users of AI systems.

GENERIC SKILLS NEEDS IN RELATION TO LARGE LANGUAGE MODEL AI SYSTEMS

Given the major impact that large language model AI systems will have on many aspects of work, it is imperative that students are adequately prepared for employment in which the use of AI will become essential. Employers across the globe will likely see AI systems such as ChatGPT as a means to improve productivity and reduce labor costs at professional and semi-professional levels, thereby almost certainly resulting in fewer jobs for higher education graduates. To obtain or retain jobs, graduates will need to master the use of AI so they can individually become more productive and valuable to employers. The outlook seems bleak for those who cannot not adapt to this likely change. Apart from students aiming to enter corporate employment upon graduation, some may expect to become entrepreneurs or freelance gig workers. In this latter context, the ability to use AI systems effectively will become essential as the individuals concerned will need to use every tool at their disposal to become highly efficient and globally competitive. Given this emerging situation, it is now necessary for higher education institutions to view

training on the use of large language model AI as a vital and obligatory new element of generic skills training for all students.

REQUIREMENTS FOR GENERIC SKILLS TRAINING FOR THE USE OF AI

The implementation of generic skills training for the use of AI needs to embrace several aspects of these systems as follows:

Knowledge and Understanding of AI System Competence and Incompetence

Students and graduates need to understand the basic principles of systems such as ChatGPT and be very aware of their capabilities, technical limitations and restrictions, and potential for error. In particular the technical limits on the date limits of training data, the restrictions on input and output length and the reliability, potential for bias, hallucination and plagiarism all need to be understood. It is only by having a full understanding of the limitations, competence and incompetence of AI systems can a user make professional use of them. The priority is always to avoid having an AI system generate inaccurate, biased, misleading or plagiarized content that then goes into official business documents of any kind as the business consequences, or even the potential for litigation, may be significant depending on the nature of the generated content and its intended audience.

Practical Skills in Designing and Packaging AI Input

If a large language model AI system such as ChatGPT is to be used to generate complex and lengthy professional reports then it is necessary for it to be given the right input to enable it to do that. Given the limitations on input and output text stream length, it is necessary to break report creation tasks into meaningful sub-tasks and to design inputs to "tease out" the desired text responses for each sub-task. The term "tease out" here is used because essentially it is effectively impossible to determine in advance how accurate or relevant a text response from the system might be. It may be unfocused or off the point of the desired answer possibly because the system has misunderstood the user's input or has been led astray by particular training information. Learning how to nudge the system into refining its answers in order to home in on the desired output is a necessary skill to be developed.

Skills in Making Innovative Connections

One of the most powerful uses of large language model AI systems is to generate new ideas that could lead to business innovations. As described earlier, although large language model AI systems have no inherent cognitive ability, they can find patterns in their training data and make connections between ideas and concepts that have not been made by any humans before, simply because of their ability to process enormous volumes of data and information very quickly across a wide plethora of topics and subjects. There is potential for such systems to help create new business ideas and opportunities. Users need to be aware of this possibility and to have the skill needed to prompt AI systems to do this. Graduates who can create new business opportunities through probing large language model AI systems will be highly valued as employees and have the potential to become highly successful innovators and entrepreneurs.

Skills in Output Repackaging, Evaluation and Refinement

Ultimately output from large language model AI systems, if used professionally, will need to be repackaged, evaluated and refined. There must be close attention to verifying output for accuracy, ensuring it is not biased, and checking that none of the content produced has been plagiarized. In reality, the use of large language model AI systems is an exercise not in exploiting AI as a tool to do all of the work that a human would do. Instead, it is an exercise in human-machine collaboration whereby a powerful and productive tool becomes the assistant to a human, but with the human always being the supervisor and verifier who takes full responsibility for what is produced. The skill of output oversight, and if necessary refinement, is a necessary requirement for effective human-machine collaboration.

IMPLEMENTATION APPROACHES FOR AI GENERIC SKILLS TRAINING

The implementation of skills training for use of large language model AI systems should adopt the best practices in generic skills learning identified to date. This should include collaborative work, interdisciplinary activities, and ideally work integrated learning experiences given the conclusions of many studies on generic skills teaching and learning as reported earlier. It is likely that most students will now be familiar with using systems such as ChatGPT within the scope of their everyday academic studies. It has become clear that ChatGPT can improve student productivity (Fauzi et al., 2023) and can help them consolidate their learning and gain deeper understanding of topics through interactive dialogue (Rospigliosi, 2023). Most higher education institutions are devising guidelines and codes of practice on AI usage to ensure that students use systems such as ChatGPT to improve their learning experience and not cheat in assessments and reduce their learning. But while familiarity with ChatGPT may be becoming widespread at a superficial level to assist in learning, generic skills training on AI for employability purposes needs to be formalized and structured to cover deeper topics essential for business use of AI rather than academic use. A number of core learning activities can be identified as follows:
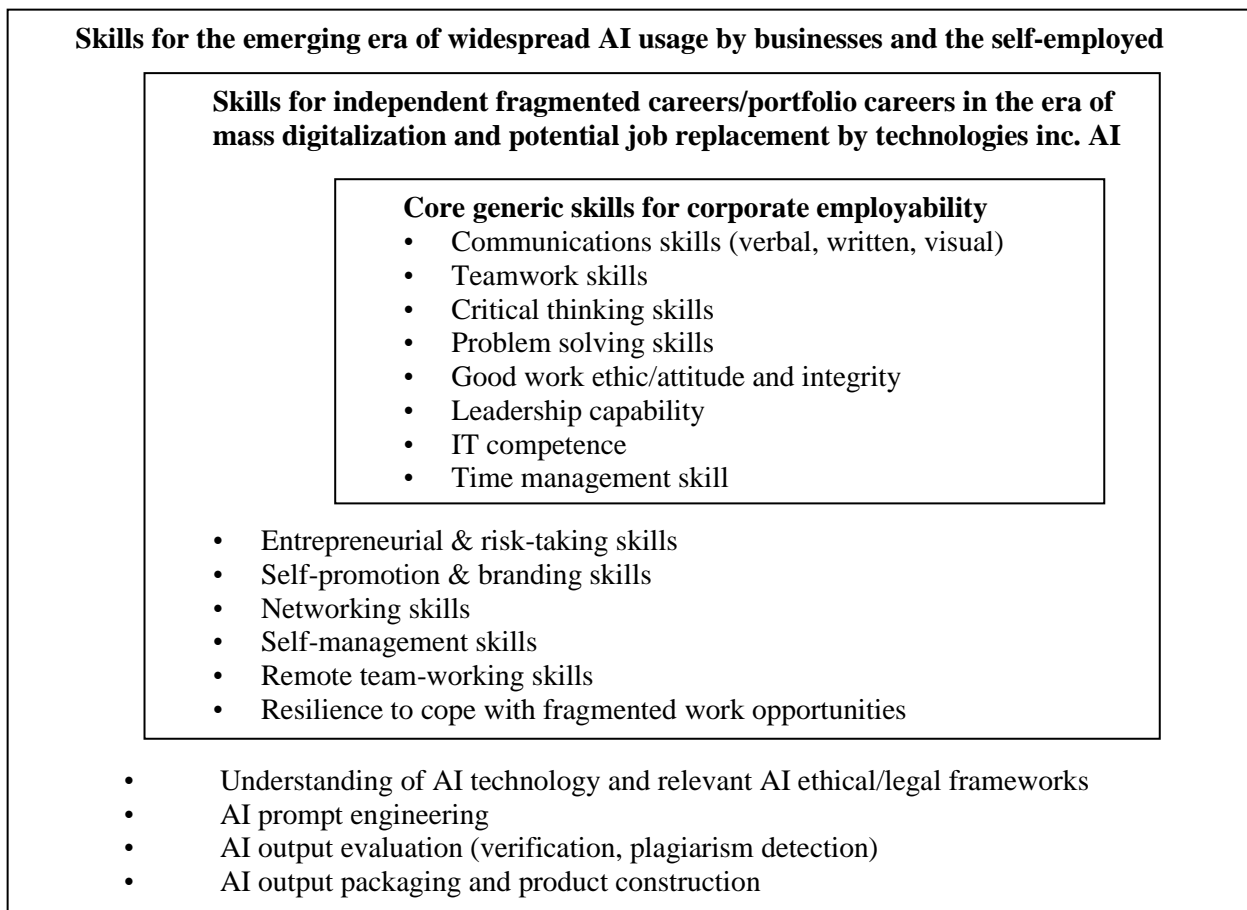
(a) **Theoretical instruction on AI systems and ethics.** The starting point for generic skills acquisition on using large language model AI systems ought to be to convey a basic understanding of the systems, their limitations, and ethical dimensions regarding their use. Class-based instruction of these aspects supplemented with interactive exercises may be effective. But this should ultimately only be the groundwork for more extensive practical exercises as below. The acquisition of theoretical knowledge mustn't become a burden that detracts from fully experiencing and working with AI systems on complex projects.

(b) **Prompt engineering exercises.** "Prompt engineering" is the term now used for designing the inputs to large language model AI systems to get optimal outputs for the objective required and students need to be trained on this. Publications have begun to appear on this topic (e.g. Roth, 2023; Tull, 2023) as well as some online video courses, though this is still a relatively undeveloped field at the present time. In particular there is a need for methodologies to be developed for designing sequences of prompts in order to produce a complex set of outputs that can be assembled into large documents that may be required in a business context. Techniques such as storyboarding which have been used in designing human-computer interactions in the past (e.g. Truong et al., 2006) as well as possibly some approaches used in software engineering may be useful in this context, though this needs further exploration and is for future consideration. At this point in time, it is recommended that students should get practical experiences of designing complex interactions with large language model AI systems, such as ChatGPT, using what is already known about effective prompt engineering. Ideally such practical exercises should focus on real world business problems and involve collaborative teams of students from different disciplines working together to create large documents using the AI system. The involvement of industrial partners in such exercises would be beneficial. At the present time where the use of large language model AI is still in its infancy there could be valuable learning experiences for employers in engaging with higher education institutions in such activities to create a two-way learning process for students and employers.

(c) **Practical output verification tasks.** Verifying outputs, eliminating bias and plagiarism should also be key objectives of skills training on AI. From a practical perspective this should include practice with using plagiarism detection tools, such as *TurnItIn*, which are now widely used in higher education institutions. Although such tools are widely used, their use is often restricted to academic staff who aim to detect cheating by their students. Ideally institutions should ensure that such tools are available not only to academic staff but also to students as the tools will become vital elements in evaluating the outputs of AI systems. Students should be trained to become proficient in the use of such tools and should regard them as essential in using large language model AI systems for business purposes. Such proficiency should be seen as an essential generic skill. Besides plagiarism avoidance, students need training on how to verify

AI outputs for accuracy and avoidance of bias. It is suggested that this is best done through collaborative exercises in which teams of students undertake practice exercises to verify and detect bias in specific examples of AI output. Detection of falsities and bias can be difficult to do, and is very much dependent on the nature of the output and its context. Ideally, higher education institutions should design practical exercises enabling students to collaboratively investigate how they can verify particular outputs by cross-referencing to alternative reliable sources, looking for inconsistencies in outputs, and engaging with experts if needed. Learning how to spot biases should ideally also be done collaboratively. Some aspects of corporate diversity training could potentially be adapted and used in this context and research is needed on this.

CONCEPTUAL FRAMEWORK OF THE EVOLUTION OF EMPLOYABILITY SKILLS

Through combining the traditional generic skills needed by graduates for employability, the skills needed for more flexible working, and the emerging needs of business with increasing AI utilization that have been discussed, we can conceive a potential over-arching framework that reflects what skills development should ideally be offered by higher education institutions going forward, as in Figure 1.

FIGURE 1
CONCEPTUAL FRAMWORK OF EVOLVING GENERIC SKILLS DEVELOPMENT

Skills for the emerging era of widespread AI usage by businesses and the self-employed

> **Skills for independent fragmented careers/portfolio careers in the era of mass digitalization and potential job replacement by technologies inc. AI**
>
>> **Core generic skills for corporate employability**
>> - Communications skills (verbal, written, visual)
>> - Teamwork skills
>> - Critical thinking skills
>> - Problem solving skills
>> - Good work ethic/attitude and integrity
>> - Leadership capability
>> - IT competence
>> - Time management skill
>
> - Entrepreneurial & risk-taking skills
> - Self-promotion & branding skills
> - Networking skills
> - Self-management skills
> - Remote team-working skills
> - Resilience to cope with fragmented work opportunities

- Understanding of AI technology and relevant AI ethical/legal frameworks
- AI prompt engineering
- AI output evaluation (verification, plagiarism detection)
- AI output packaging and product construction

At the heart of this model lies the set of traditional generic skills that are well-known as being essential for optimum graduate employability. But, in addition, this model incorporates as a novel element the skills

needed for graduates to operate independently, whether by choice because they choose to become self-employed or because they find themselves forced into self-employment because of job market changes which may or may not be driven by rapid growth in business use of advanced technologies including AI. These skills for independent working extend outwardly the generic skills needed by graduates to embrace the concept of the graduate as an independent knowledge-worker who may not be tied to one specific employer full-time or for a significant length of time. The model then embraces at a higher level the novel set of skills needed in the era of widespread AI adoption, essentially for a graduate to operate effectively either as an employee of a corporation that proactively embraces AI in its core business activities or for a graduate actively to exploit AI to maximize their own personal efficiency as an independent knowledge-worker operating in a highly competitive global environment. Overall, the conceptual model encapsulates in the three successive layers the optimum set of generic skills needed by new graduates from higher education in the new era in which AI is becoming increasingly embedded in business and likely to change employment patterns with significant consequences for their long-term careers. It is possible that this model could be structured in alternative ways. There is much scope for debate around this and how best to deliver the types of skills training identified. Still, regardless of how to construct such a framework it is almost inevitable that generic skills training in all higher education institutions will need to embrace the issues, competencies and themes identified here.

DISCUSSION

It is now widely recognized that the advent of large language model AI systems is going to create major changes in the way in which many employees carry out their work tasks across many private and public sector organizations. There is also likely to be significant down-sizing of teams in certain types of job roles with knock-on effects on society and graduate careers. Therefore, higher education institutions must make the necessary changes in generic skills training for students to ensure they are well-equipped with the maximum employability skills in this new and rapidly evolving context. This paper has attempted to outline the key issues involved and to suggest types of generic skills training required especially relating to topics such as prompt engineering and AI output evaluation as part of an extended conceptual framework for skills training in higher education. It should be noted, however, that large language model AI is still in the early stages of adoption worldwide. The full extent of how it will be used and its full impact on economies and societies is yet to be fully understood. Nevertheless, higher education institutions should recognize the urgency of giving their graduates the best employment opportunities by initiating generic skills training on using and applying AI systems. It is likely that such training will be relatively rudimentary at the beginning, but will develop as new methodologies emerge in areas such as prompt engineering. There also exists the possibility that AI systems could be used in the delivery of generic skills training and research is needed on this. Finally, while this paper has focused on training needs concerning generic skills associated with using large language model AI systems, it must be recognized that specialist training will also be needed for those graduates who are likely to become not just professional users of such systems but active developers. Any such training must embrace the growing concerns about AI safety and governance.

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