Liberating IT Graduates in the AI Era: Moving Beyond Graduate Attributes

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Abstract

Artificial intelligence is reshaping information technology (IT) practice, shifting professional capability from technical execution to judgement through socio-technical understanding. This has significant implications for the curricula of university IT degrees. In a highly competitive higher-education landscape getting and keeping students is paramount to institutional survival. A major driver for attracting students to IT is the promise of abundant, well-paid IT careers. Subsequently, universities are scrambling to re-align their IT curricula with the rapidly changing needs of industry – amid this is increased emphasis on graduate attributes. The reliance by many universities on "graduate attributes" as defining the quality of programs is at odds with the realities of AI-mediated work especially in the IT industry. Additionally, for too long IT education has prioritised technical knowledge over human-centred capabilities such as adaptability, development of judgement and social-technical awareness. IT systems are embedded within complex human contexts hence socio-technical capabilities are foundational rather than supplementary to professional practice in IT. AI technologies exacerbate the need for human-centred capabilities in professional practice and displace technical knowledge as the most fundamental layer in IT curricula. A case is made for a critical reframing of quality markers for IT program curricular: from a compliance-driven paradigm of discrete graduate attributes that are fragmented, to a liberal paradigm providing for educating IT graduates as adaptive, socio-technical thinkers who engage critically with AI-mediated environments. The argument is not for abandoning graduate attributes, but for reinterpreting and enacting them through a liberal education framework at the level of IT program design.

Keywords: AI in higher education; IT curriculum reform; socio-technical competencies; graduate attributes; liberal education; workforce readiness; critical digital literacy

Introduction

> "The skills that [IT] industry is looking for is changing. It's not that we don't need people anymore…it's that people don't have the right skills that we're after…
> You know, normally, you're a junior, you would come into somewhere, you would gain experience and then you would move up the ladder…we [industry] have almost got rid of that [junior] rung on the ladder. But universities, they're still pushing, you know, graduates who come out at that lower rung level, they [graduates] are not going to necessarily get roles or have the skills that we're looking for now on entry to jobs. And we've talked a little bit about what some of those skills are, those higher order skills." – *Discussion with a panel of IT leaders in industry at the author's institution with March 2026.*

The landscape for recent college graduates entering the workforce is undergoing profound change as AI technologies proliferate across industries. Studies and surveys throughout 2024–2025 report sharp declines in traditional entry-level job opportunities ((IntuitionLabs, 2025, p. para 1).

The message from industry is abundantly clear: AI is redefining the nature of work across all sectors and that has vast implications for programs curricula in universities. Industry is concerned about whether university graduates will have the skills they need. Graduates are concerned about what AI might do to their job opportunities (Cash, 2026). Declining student numbers in IT related degrees is being seen across the globe. In Australia, most recent data on student numbers in IT related programs of study are showing a decline (Braue , 2026). According to data from the Australasian Conference of Tertiary Admissions Centres (ACTAC), enrolments are down by around 2.2% with just 2.9% of incoming university students choosing IT-related degree programs (Braue , 2026). While the reasons for this are not fully clear, the potential role of AI must be considered whether it is because of the hype around obsolete coding roles, degree scepticism or market saturation fears for entry level roles (Ramirez, 2026). The latter, corroborated by industry views about predicted decline in *traditional* entry-level jobs due to AI. Declining student numbers and the challenge of transforming curricula and teaching is a major 'headache' for institutions, particularly against the backdrop of several decades of increasing global competitiveness, economic uncertainties and long-standing operational pressures.

Beyond the institutional challenges of attracting students into IT programs there's other important considerations. AI is demonstrating to be a transformative force in industry and broader society at an unanticipated pace. The rate of change of AI and digital technologies in general, is accelerating. In fact, the entire technological landscape is subject to a rate of change exceeding anything that has been experienced before. The acceleration in technology development and sophistication is matched by phenomenal increases in both the depth and breadth of integration of technologies into human endeavours. Such rapid and widespread melding of technologies with human activity, means that the impact of technologies is felt globally, by nearly every single individual on the planet - *this* means that those who design, develop and work with technologies bear a great responsibility to ensure that the technologies are designed and used responsibly and ethically, for the good of humanity

For universities, there is therefore a 'social responsibility' to design and deliver IT curricula in ways that nurture necessary capabilities for working with technologies in ways that serve the good of humanity. Graduates play a prominent role in using and shaping technologies of the future. While the discourse about IT graduates needing to be socially responsible and ethical has presence for many decades, it has never really gained prominence in university IT program curricula with emphasis remaining on teaching coding and other essential technical knowledge and ethics, communication and critical thinking either relegated to a separate course or present haphazardly in the curriculum usually as an additional module or through activities which require, for example group work. Rarely are these human-centred skills explicitly taught or prominently highlighted to students as necessary, beyond reasons of them being employability skills or required to be in the curriculum by some accrediting body.

The rationale for the transformation of University programs in IT must be founded in more than the institutional need to attract students, on more than reform of the technical knowledge that is taught. It must also be founded in the need bring to the fore curricula design and

delivery which facilitates the development of socially responsible, ethical and critical thinking graduates, who will use and shape technologies in socially responsible ways.

Thus, the proposition in the present article is that graduate attributes serve institutional level functions but poorly serve needs at program level. At program design level, the 'checklist' form of the graduate attributes does little to shift human capabilities from supplementing the technical curriculum to a holistic socio-technical curriculum. The graduate attributes model usually translates to a requirement to 'map' graduate attributes that are present in program, typically resulting in a loose coupling at best of the curriculum to graduate attributes. The graduates attribute model does little to facilitate proper systematic integration of social responsibility, critical thinking and other human-centred capabilities into program curriculum. At the level of program design, realisation of graduate attributes requires their full and systematic integration into the program curriculum - and this requires a reframing of the graduate attributes model.

In broader discourse around university learning, especially internationally, there is engagement with liberal education as an integrative educational philosophy, particularly through organisations such as the American Association of Colleges and Universities. The argument at the centre of the present article is that there is value in raising awareness and use of 'liberal education' in the Australian context as a framing philosophy for design of IT programs. This allows for a critical reframing of quality markers for IT program curricular in higher education from a compliance-driven paradigm of discrete graduate attributes that are fragmented and to a liberal paradigm providing for educating IT graduates as whole, to be adaptive, socio-technical thinkers capable of engaging critically with AI-mediated environments.

Graduate Attributes

Across higher education, and particularly in countries such as Australia, New Zealand and the UK the language of "graduate attributes" has become the dominant mechanism for expressing the broader aims of a university education. Graduate attributes can be defined as 'the qualities, skills and understandings a university community agrees its students would desirably develop during their time at the institution '(Boweden et a. 2000, p3 cited in Wong, Chiu, Copsey-Blake, & Nikolopoulou, 2022, p. 1341). Institutions articulate capabilities such as critical thinking, communication, teamwork, and ethical practice, mapping them to courses and assessments to demonstrate alignment with regulatory expectations set by national quality frameworks and enforced through quality assurance processes internal and external to the institution.

Each university defines and articulates its own graduate attributes given that these attributes have an element of contextual sensitivity. There is some variation of the term used across universities which include terms such as graduate outcomes, graduate skills, graduate qualities or graduate capabilities (Barrie et al., 2009; Wong et al., 2022 cited in (Turner, Gunaesekara, Yuan, & Stough, 2025)). Themes within the graduate attribute statements of Australian Universities include:

1. Global citizenship and cultural competence (36 universities)
2. Critical and creative thinking and problem-solving (34 universities)
3. Communication (31 universities)
4. Ethical practice (23 universities)

5. Collaboration, teamwork and leadership (20 universities)
6. Lifelong learning (17 universities)
7. Digital literacy and information literacy (16 universities)
8. Self-directed learning including self-management and self-awareness (11 universities)

(Turner, Gunaesekara, Yuan, & Stough, 2025, p. 241).

Graduate attributes serve an important institutional function. Besides being used as marketing tools to show distinction from other institutions, graduate attributes provide a shared articulation of expected graduate capabilities and enable alignment with regulatory frameworks such as the AQF. The Graduate Attributes model delivers consistency and auditability with universities diligently tracking and requiring mapping of courses and programs to those graduate outcomes. However, when applied to programs of study, graduate attributes also produce a reductionist interpretation of capability development. The limitation lies not in the existence of graduate attributes, but in how they are operationalised within programs. The dominant mechanism—curriculum mapping—treats attributes as items to be distributed and evidenced, rather than capabilities to be developed. This results in coverage without coherence, and exposure without progression.

In graduate attributes, capabilities are frequently expressed as lists, weakly integrated into curricula, and primarily justified through employability narratives. In IT degrees which have almost exclusive emphasis on teaching of technical knowledge, these graduate attributes are generally poorly operationalised in the curriculum. In IT, the nature of professional practice has shifted from purely technical execution to deeply socio-technical engagement, but the programs of study are persistently ensuring technical knowledge is systematically developed while outside of discipline capabilities are included but in a much less deliberate, weakly taught (if at all) and fragmented throughout the curriculum.

The attribute model is compliance driven. Capabilities exist primarily to demonstrate alignment with external requirements, which in Australia, include Australian Quality Framework (AQF) descriptors and accreditation standards such as those established by the Australian Computer Society. This shifts attention away from how capabilities are developed and toward whether they can be evidenced. In addition, the framing in graduate attributes is strongly instrumental. Capabilities are justified in terms of employability, which narrows their meaning. In IT, this often results in a focus on tool proficiency and workplace readiness, rather than deeper forms of reasoning, judgement, and responsibility. In fact, the emergence of graduate attributes in higher education is rooted in the marketisation of the sector, although universities serve a greater purpose in society than merely employability (Wong, Chiu, Copsey-Blake, & Nikolopoulou, 2022).

Graduate attributes are expressed as discrete items, at the broad university level and merely mapped to specific programs through alignment exercises. While this creates visibility and makes it easy to ‘tick off’ as requirements, it does not guarantee development within the programs of study. Capabilities may appear across multiple courses, but without clear progression or increasing complexity. What is needed is a binding layer between institutionally defined graduate attributes and the program curriculum; a platform for reframing graduate attributes at program level in a way that facilitates the integration of these particular human capabilities in deliberate structured ways rather than merely mapping for compliance purposes.

IT Practice

At a technological level, what IT practitioners need to know or be able to do is changing. 'Lower order' or routine training of technical skills found in basic coding for instance, are being rapidly automated by AI. What matters know in technical knowledge is having fundamental understandings, the kind of conceptual or immutable knowledge that is required to even 'drive' AI to a solution for an application. What also matters a great deal is the capability of the human to problem solve, to be able to architect a solution to complex computing and system development problems using an array of tools including AI. As the human does this, they will also need to be able to analyse increasingly complex problems that require a technical solution, they will need to understand the many layers of context in which the system will exist, and they will need to be able to critically evaluate the AI output for correctness, bias and reliability.

Facilitated by communications technologies and by the advent of cloud computing (the last 'big revolution' in IT before AI took the centre stage), IT is more distributed and connected to other systems than every before. This means, working with technologies is about working with whole technological systems, making for higher technical complexity and exacerbating the need for strong problem-solving skills and systems thinking, but not only in the technical domain – in the human domain as well.

Technology isn't just embedded or integrated into human activity, it is fusing to the extent that the technology now doesn't just support human activity, in many cases and particularly in organisation, the technology has made possible the human activity. Hence, technology is now inextricable from the social context in which it exists. IT has always had a social side to it simply because it is a tool used by people to meet specific purposes. AI has served to increase fusion of digital technologies with human activity and hence IT practitioners need to be able to work effectively within the socio-technical context.

AI provides new natural ways for humans to interact with technology, enabling more widespread interaction with technology and interaction with a tool that is seemingly human but also more authoritative or capable than humans. The biases in algorithms and biases in other technological systems are often invisible unless humans have heightened analytical and critical thinking capabilities.

As AI systems become more capable, there is a tendency to accept outputs without sufficient interrogation. In ICT, this can lead to flawed systems, ethical breaches, and unintended consequences at scale. The practitioner's role becomes one of critical engagement with technology, not passive utilisation. The ability to evaluate AI outputs, understand their limitations, and situate them within broader socio-technical systems requires integrated forms of reasoning with emphasis on critical inquiry, ethical reasoning, and contextual understanding.

AI is powerful and subsequent technologies will likely become more powerful and widespread. The more powerful and widespread the technology, the more responsibility those designing and using the technology have. Who is benefitting from the technology? Who does this technology help, who does it harm? What harm can this technology do? What are the intended and unintended consequences of this technology? These are all ethical questions and require awareness and knowledge of what systems are actually doing and importantly require ethical and responsible use. And finally, there is the pace of change. The rapidity with

which tools such as generative AI are evolving is unforeseen. It is reasonable to expect that high velocity change is the future. This will require adaptive capabilities for technology practitioners.

AI systems now perform tasks that were previously central to ICT practice, including code generation, debugging, data analysis, and system design suggestions. This shifts the role of the practitioner from execution to oversight. The value of human capability lies increasingly in the ability to frame problems, evaluate outputs, interpret context, and make decisions under uncertainty.

The emergence of AI and the associated technologies, now and emerging fundamentally alters the nature of work in ICT. It is no longer sufficient to conceptualise IT practitioner capability in terms of discrete technical or cognitive skills. The broad implication of this for IT programs of study is that we can ill-afford to weakly integrate those human-centred capabilities. Human-centred capabilities must now take a more leading role in university IT education and must be deliberately and properly integrated with technical knowledge.

Liberal Education as an integrative approach

Liberal education is best understood as an integrative approach that brings together disciplinary knowledge, intellectual skills, ethical reasoning, and social awareness into a coherent whole. Contemporary scholarship emphasises that liberal education is not a collection of skills, but a model of intellectual development in which knowledge and capability are mutually constitutive (Rothblatt, 2003). The term ‘Liberal education’ is not frequently used in Australia and particularly in technical domains such as IT, it is apparent that the term and the philosophy it represents is unfamiliar

The defining feature of the concept of liberal education is integration of capabilities (Boyle, 2019). Critical thinking is not taught as an abstract skill but developed through engagement with disciplinary problems. Ethical reasoning is not appended to technical work but embedded within it. Communication is shaped by the epistemologies and practices of specific fields. Liberal education therefore operates not at the level of discrete outcomes, but at the level of curriculum architecture.

Central to liberal education is the development of judgement. Liberal education cultivates the capacity to interpret, evaluate, and act under conditions of uncertainty. This capacity is increasingly central in ICT, where practitioners are required to navigate ambiguous requirements, incomplete data, ethical dilemmas, and rapidly evolving technological landscapes, and is particularly critical in the age of AI with all the algorithmic biases and appearances of ‘human intelligence’ that seem to imbue some kind of unwarranted trust or authority to the technology. As stated by Jones (2005, p. 35), “In the future, the inherent constructs of liberal education will be more applicable and in higher demand than they are today”.

Liberal Education and University IT programs

In IT, liberal education is not an enhancement to technical training; it is foundational to competent practice. This can be understood through the inherently socio-technical nature of IT systems. Graduate attributes present capabilities as a checklist of discrete items that somehow define quality in IT program. However, IT systems are not isolated technical

artefacts. They are embedded within organisational processes, social contexts, and regulatory environments. A software system shapes and is shaped by the activities it supports. A cybersecurity breach is as much about human behaviour as it is about technical vulnerabilities. AI systems encode assumptions and biases that have real-world consequences. Developing systems in this context requires more than technical proficiency. It requires the ability to understand stakeholders, interpret context, evaluate trade-offs, and anticipate consequences. These are not discrete "soft skills" that merely enhance employability - they are an integrated core of human capabilities essential to IT as a socio-technical discipline.

Liberal education, a holistic philosophy and view of human capability in the broader social context provides the framework for developing these capabilities in an integrated manner. Wrapping IT programs in Liberal education enables students to engage with IT as a socio-technical field, where technical decisions are inseparable from human, organisational, and ethical considerations. The principles of liberal education support the development of professionals who can not only build systems but understand their implications and responsibilities. Without this integration, IT education risks producing graduates who are technically capable but contextually naive. In an AI-mediated environment, this is not a marginal limitation; it is a systemic risk to discipline and society. Addressing this challenge requires a shift from treating capabilities discrete compliance items to treating them as integrated elements of program architecture.

Capabilities should be conceptualised as a foundational layer of IT programs. They underpin disciplinary knowledge and interact with emerging technologies and practices. This aligns with a layered model of program design in which foundational capabilities, disciplinary concepts, and responsive skills are understood as interdependent. This requires intentional design. Capabilities must be scaffolded across the program, with clear expectations for development at different stages. Students should encounter increasingly complex socio-technical problems that require the integration of knowledge, skills, and judgement. Assessment must also evolve. Rather than assessing capabilities in isolation, assessment should capture their integration within authentic tasks. For example, evaluating a system design should include not only technical correctness, but also ethical considerations, stakeholder impact, and contextual appropriateness.

Liberal education provides a 'binding layer' between graduate attributes and program curriculum for addressing integration. It enables IT education to move beyond narrow specialisation and focus on technical knowledge and toward a model that prepares graduates for complexity. It also supports adaptability, which is critical in fields where knowledge and technologies evolve rapidly. Importantly, liberal education repositions capabilities often labelled as "soft skills" as central to disciplinary competence. This reframing is essential for aligning IT education with the realities of contemporary practice and is visually represented in Figure 1.0.

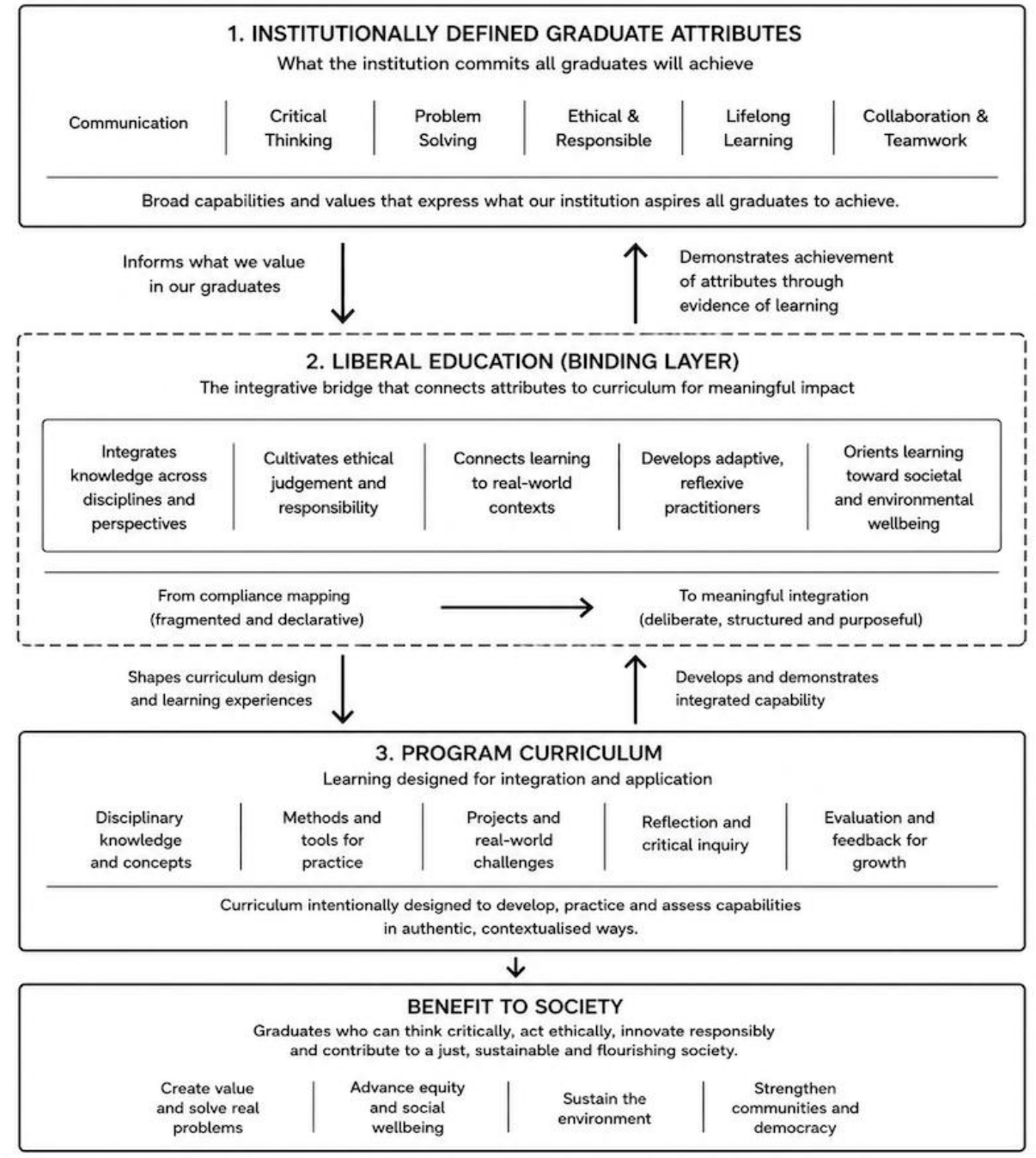

Figure 1 Liberal education binds graduate attributes to program curriculum

Against this background, liberal education can be seen as a binding layer between institutionally defined graduate attributes and the program curriculum in a way that facilitates the integration of capability in deliberate structured ways for the purpose of benefit to society, rather than merely mapping for compliance purposes.

As an example of how a liberal education framing changes positions curriculum design (for simplicity, a course level example) to illustrate. Consider this student assignment: *Design and implement a web-based system for managing client requests* and how it plays out from the technical perspective and from a socio-technical perspective supported by Liberal education principles (Table 1):

Comparison of Assignment Approaches

Dimension	Liberal Education–Bound Assignment (Socio-technical project)	Programming-Focused Assignment (Technical implementation)
Framing	Design a system for a real community/client context	Build a system from a predefined specification
Requirements	Elicited, negotiated, evolving with stakeholders	Fixed, given upfront
Core Activity	Analyse context → design → justify decisions → implement selectively	Implement features according to spec
Role of Context	Central (organisational, social, ethical factors shape design)	Minimal/abstracted to technical specifications
Graduate Attributes	Embedded and enacted through tasks	Peripheral or incidental (if present at all)
Communication	Stakeholder engagement, presentations, justification of decisions	Technical documentation only
Critical Thinking	Evaluating trade-offs, ambiguity, competing needs	Localised to technical choices
Ethics	Integrated (privacy, bias, access considered in design decisions)	Rare or treated as add-on reflection
Collaboration	Situated, consequential (team + client accountability)	Procedural (team coordination)
Assessment Focus	Quality of judgement, appropriateness of solution, integration of perspectives	Functional correctness, code quality, completeness
Outcome	Adaptive practitioner able to apply IT in context	Competent programmer working to specification

Table 1 Design and implement a web-based system for managing client requests Socio-technical (liberal education) vs classical technical perspective

What stands out between the technical perspective of the student assignment and the socio-technical perspective guided by liberal education is not about content but how professional capability is conceptualised and developed. In the programming-focused model, the organising principle is technical execution against predefined requirements, and requirements are just that, a set of isolated parameters that the student knows they must make sure that the system function does. Within this frame students are likely to be optimising for correctness, efficiency, and completeness. The decision space is intentionally constrained: requirements are stable, context is largely abstracted, and judgement is exercised primarily within technical parameters (Did the code work, which code worked better etc).

In contrast, the liberal education–bound model repositions the same disciplinary content within a socio-technical frame. Requirements are not fixed but negotiated, and context is integral to the task rather than incidental. This shifts the locus of capability from execution of code and technical requirements to judgement. Students are required to interpret stakeholder needs, navigate competing constraints, and justify decisions in conditions of ambiguity. Graduate attributes are not mapped retrospectively but enacted through structured engagement with practice. Communication becomes stakeholder engagement, ethics becomes a design constraint, and critical thinking is realised through the evaluation of trade-offs.

The programming model privileges the correct application of knowledge, whereas the socio-technical model privileges its appropriate application in context. This more closely reflects contemporary IT practice, where the central challenge lies not in building systems alone, but in determining what should be built, for whom, and with what consequences.

Concluding thoughts

Graduate attributes are typically articulated at the institutional level as abstract capability statements, and programs are expected to demonstrate their inclusion through curriculum mapping. While this approach provides visibility, it does not ensure coherence or development of capabilities throughout programs of study. The issue, therefore, is not the presence of graduate attributes, but the absence of an organising framework or binding layer through which they can be meaningfully enacted within disciplines.

The argument presented is that liberal education provides such a framework. The framing of Liberal education enables graduate attributes to be reinterpreted not as discrete items to be mapped, but as integrated dimensions of socio-technical practice, developed through scaffolded engagement with disciplinary problems. In this sense, liberal education operates not as a replacement for graduate attributes, but as the mechanism through which they acquire disciplinary meaning and educational depth within ICT programs.

Liberal education connects knowledge, skills, and dispositions, and foregrounds the development of judgement, adaptability, and socio-technical understanding, and fosters a human-centred narrative in the design and delivery of IT program curricula. A liberal education framing in IT becomes most defensible when it is anchored directly in the realities of what graduates design, build, and are accountable for. Rather than positioning liberal education as an abstract or parallel layer, it can be understood as the intellectual and ethical infrastructure required to engage responsibly with socio-technical systems.

At the core of the argument for bringing liberal education to bear on IT programs is responsibility for socio-technical systems. IT artefacts are not neutral technical constructs;

they are value-laden systems that shape and are shaped by human activity. Design decisions—whether in data models, interfaces, or algorithms—have consequences that extend beyond functionality to affect individuals, communities, and institutions. In AI-mediated environments, where decision-making is increasingly automated, the locus of responsibility becomes more diffuse but no less critical. Graduates must be able to recognise that accountability does not disappear with automation; it is reconfigured. Liberal education supports this by developing the capacity to interrogate assumptions, anticipate consequences, and take responsibility for outcomes in complex, uncertain contexts. This extends into questions of power, governance, and regulation.

Digital systems distribute benefits and harms unevenly. Decisions about system design, data access, and platform architecture embed particular interests and priorities. Understanding who benefits, who is disadvantaged, and how these dynamics are shaped by policy, standards, and law is central to contemporary ICT practice. Issues of public trust, transparency, and legitimacy are no longer external considerations; they are integral to the success and acceptance of digital infrastructure. A liberal education perspective brings these considerations into the core of the discipline, reinforcing that ICT professionals operate within, and contribute to, broader systems of governance.

Liberal education in IT programs is closely related is the development of critical digital literacy. ICT graduates are not only producers of digital systems but also participants in digital environments characterised by misinformation, algorithmic influence, and concentrated platform power. They must understand how data is generated, interpreted, and potentially misused, and how systems can amplify or mitigate these effects. This requires more than technical competence; it requires the ability to critically evaluate digital information ecosystems and to act responsibly within them. Liberal education connects this directly to citizenship, situating ICT practice within the broader context of participation in digital society.

Finally, liberal education contributes to the formation of professional identity and character. The question is not simply whether graduates can perform technical tasks, but what it means to be a “good” IT professional. This involves navigating tensions between commercial imperatives and the public good, recognising when to challenge organisational decisions, and exercising ethical courage in situations where the consequences of technology are significant. Issues such as whistleblowing, dissent, and professional responsibility cannot be reduced to compliance with codes of conduct; they require judgement, reflection, and a developed sense of purpose.

Liberal education is not an adjunct to IT curricula but a necessary condition for meaningful practice. It provides the conceptual and developmental basis for engaging with the socio-technical, ethical, and civic complexities that define contemporary IT work. Graduate attributes, so extensively used in universities, are merely a convenient checklist of capabilities useful mostly for compliance purposes and marketing. Integration of graduate attributes at program level is notoriously challenging (Wong, Chiu, Copsey-Blake, & Nikolopoulou, 2022). Attempts to integrate graduate attributes into programs, is more about mapping for compliance rather than designing for truly integrated and structured, holistic development of capabilities throughout the program. Liberal education provides the mechanism for understanding graduate attributes as integral to IT practice.

Liberal education must be the interface between institutionally defined graduate attributes and curriculum design. In this way universities are better meeting the social responsibility of producing graduates who are critical thinkers, adaptable in the face of rapid change, who understand their responsibilities acutely aware of the human impact of the powerful technologies they wield and create.

Statement on the use of AI: AI has been used to assist with image creation and example generation images. The topic, argument, thesis, structure and logical development of the paper is fully author developed and written (minor use of AI for occasionally enhancing sentence clarity)

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