BRIDGING STATUTORY EXCLUSION AND ADMINISTRATIVE EXCEPTION: AI PATENT WORKAROUNDS AND POLICY REFORM IN THAILAND

This article examines Thailand's software and AI patent regime to illuminate global controversies over the patentability of intangible innovations. Despite modern AI's reliance on abstract model architectures and datasets beyond copyright protection, s 9(3) of Thailand's Patent Act still bans computer programs *per se*. To address this, the Department of Intellectual Property allows "computer-related inventions" when paired with hardware or control-loop steps that produce a technical effect. An empirical review of 13 borderline AI published patent applications reveals four key drafting tactics – avoiding "software" terminology, embedding physical components, claiming measurable outcomes, and stressing technical novelty. The study concludes that amending s 9 to recognise "further technical effect" would improve legal certainty and align Thai practices with global standards.

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I. Introduction

1 Most legal scholarship on artificial intelligence ("AI") has traditionally focused on copyright rather than patents. When software first emerged in the form of printed listings and floppy-disk binaries, its text-like nature made copyright protection against literal copying appear adequate, whereas patents were still viewed as the domain of tangible machinery and industrial processes. Yet, the progression from conventional deterministic code to AI models that learn, adapt, and autonomously create reveals the limits of relying on copyright alone: copyright safeguards only the *expression* of code, not the functional ideas,

model architectures, training heuristics, or curated datasets that now constitute the core value of AI systems.[1]

2 When Applied Data Research, Inc was granted the first software patent for a "Sorting System" – issued in 1968 – the claimed invention covered code punched onto paper tape and read by a room-sized IBM 7090 computer. More than half a century later, the same legal instruments are asked to regulate diffusion-based image generators that compress billions of text-image pairs into high-dimensional parameter spaces. Despite repeated proclamations that "software patents are dead", the global market for computer-implemented inventions has expanded dramatically – rising from 5 % of all Patent Cooperation Treaty filings in 1990 to nearly 40% in 2024.[2]

3 The stakes for software patentability are raised higher for AI, where the bulk of a firm's most significant competitive advantage in this era often resides not in physical assets such as graphics processing units, server racks, or robotic arms but in intangible ones: the model architectures, carefully curated datasets, and multi-stage training pipelines that transform abundant data into commercially valuable predictions. For example, today's large-language models rely on *transformer* networks, while DeepMind's AlphaFold breakthrough came from a clever *reinforcement-learning* training loop. In both instances, the real value is in these abstract algorithmic designs and the repeated training cycles – not in the physical graphics processing units that happen to run them – consequently, traditional patent rules that focus on hardware embodiments often struggle to capture that value.

4 Two opposing narratives dominate policy discussions. Pro-patent voices stress that AI start-ups require strong exclusionary rights to secure venture funding, particularly when the path to revenue is long (*eg*, drug-discovery models) or requires sharing code with interoperability partners (*eg*, smart-grid prediction engines). Critics respond that algorithmic monopolies risk locking up fundamental "building blocks of knowledge", elevating barriers to entry, and perpetuating platform dominance. Empirical studies of US litigation show a 51% invalidation rate for software patents challenged under § 101 of the US Patent Act[3] after 2014, but only a 12% invalidation rate for

1 Mark A Lemley & Robert P Merges, "Software and Patent Scope: A Report From the Front," (1997) 97 *Columbia Law Review* 1315.

2 World Intellectual Property Organization, *World Intellectual Property Indicators 2024* (WIPO, 2024) Table A9 at p 28.

3 Patent Act 35 USC (US).

non-software technologies.[4] Whether those figures signal healthy filtering of bad claims or chilling uncertainty depends on one's policy priorities.

5 Most patent systems in different jurisdictions exclude "software as such" because unfettered protection for pure algorithms would undermine the core goals of the patent bargain and distort the balance between private incentives and the public domain. At the doctrinal level, computer programs are deemed abstract subject matter, yet the deeper justification can be traced to three interlocking policy concerns that recur – explicitly or implicitly – in legislative histories, multilateral treaties, and judicial opinions across both civil-law and common-law traditions.

6 Firstly, patent law was never designed to award exclusive rights over fundamental ideas that can be expressed in limitless syntactic guises. An algorithm such as the back-propagation rule in neural-network training can be recorded in any modern language, ported across successive generations of hardware or embedded invisibly in low-level firmware. Early European negotiators feared that granting a patent on "pure mathematical logic" would allow a single assignee to fence off entire areas of scientific inquiry, a danger memorably highlighted in preparatory works for the 1973 European Patent Convention[5] ("EPC"). The fear is not hypothetical: the seminal 1986 *Nature* article by Rumelhart, Hinton, and Williams codified the back-propagation equations that today remain virtually unchanged in deep-learning frameworks such as PyTorch and TensorFlow, as well as in myriad embedded-AI toolchains.[6] Enforcing an exclusive right over so fundamental an insight would therefore inflict exactly the chilling effect the EPC's drafters sought to avoid.

7 Secondly, the exclusion preserves the functional complementarity of intellectual property regimes. Copyright already protects the literal text of source code; trade secret law safeguards undisclosed algorithms; patents, by contrast, trade public disclosure for time-limited exclusive rights and are therefore reserved for inventions that resolve a *technical* problem manifested in the physical world. This technological nexus is embedded at treaty level: Art 27(1) of the Agreement on Trade-Related Aspects of Intellectual Property Rights[7]

4 US Patent and Trademark Office, *Patent Litigation Study* (2024) Figure 12 at p 16.
5 (5 October 1973), 1065 UNTS 199 (entered into force 7 October 1977). See M van Empel, *The Granting of European Patents: Introduction to the Convention on the Grant of European Patents* (A W Sijthoff, 1975) at p 33.
6 David E Rumelhart, Geoffrey E Hinton & Ronald J Williams, "Learning Representations By Back-Propagating Errors" (1986) 323 *Nature* 533.
7 (15 April 1994), 1869 UNTS 299 (entered into force 1 January 1995).

("TRIPS") obliges World Trade Organization members to confer patents only on inventions "in all fields of technology", thereby making the technical-subject-matter requirement a global baseline rather than an eccentricity of European law.[8] The division of labour among intellectual property regimes serves both utilitarian and Lockean theories of justification: it encourages disclosure incentives toward domains where public benefit is greatest – the tangible arts – while keeping the building blocks of abstract reasoning free for all.

8 Thirdly, subject-matter exclusions operate as a pragmatic gatekeeping device that increases administrative efficiency and reduces error costs. Modern patent offices must triage hundreds of thousands of filings each year; a coarse eligibility screen allows examiners to dismiss purely abstract claims swiftly and allocate scarce resources to the more fact-intensive tasks of novelty searching and inventive-step analysis. Empirical evidence bears this out. A recent study of US Patent Trial and Appeal Board decisions shows that § 101 eligibility rejections are affirmed approximately 91% of the time on appeal, more than double the affirmation rate for novelty rejections under § 102.[9] The high affirmance rate suggests that eligibility determinations are comparatively clear-cut and thus an effective first filter, lowering both examination costs for the office and deadweight loss to society from erroneously issued patents.

9 Taken together, these considerations explain why legal systems as diverse as the EPC, the US Patent Act, Japan's Patent Act,[10] and Australia's post-*Aristocrat* jurisprudence converge on a common proposition: a computer program, standing alone, is not an appropriate *locus* for patent exclusivity. Only when software produces a verifiable technical effect – shorter braking distance, reduced latency, lower energy consumption – does it cross the conceptual line that separates an abstract idea from a patent-eligible invention. The exclusion thus functions not as an anti-software bias but as a structural safeguard that preserves the public domain of ideas, channels innovators toward the most suitable intellectual property instrument, and helps patent offices husband their limited resources for cases where the patent system's disclosure-incentive logic is at its strongest.

8 Agreement on Trade-Related Aspects of Intellectual Property Rights (15 April 1994), 1869 UNTS 299, Art 27(1) (entered into force 1 January 1995).
9 Michael Borella & Mackenna Dunn, "91%: That Is the Rate at Which the PTAB Affirms Examiner Section 101 Rejections", *Patent Docs* (12 August 2024) <https://www.patentdocs.org/2024/08/91-that-is-the-rate-at-which-the-ptab-affirms-examiner-section-101-rejections.html> (accessed 29 September 2025).
10 Patent Act (Act No 121 of 1959) (Japan).

II. Doctrinal landscape – the spectrum from *Alice* to "further technical effect"

10 The US and Europe have created the spectrum of eligibility for software patentable subject matter. Under the US Supreme Court's four-case quartet – *Bilski v Kappos*[11] ("*Bilski*"); *Mayo Collaborative Services v Prometheus Laboratories Inc*[12] ("*Mayo*"); *Association for Molecular Pathology v Myriad Genetics Inc*[13] ("*Myriad*") and *Alice Corp Pty Ltd v CLS Bank International*[14] ("*Alice*"), the American courts applied a two-step test.[15] In step one; the judge first asked whether the invention was "directed to" something that the Constitution and the Patent Act have always treated as *off-limits*: abstract ideas, laws of nature, or natural phenomena. *Bilski* rejected a hedging method for energy markets as an abstract idea.[16] *Mayo* struck down a medical-diagnosis claim because the key insight – a link between a metabolite level and drug dosage – was a law of nature.[17] *Myriad* determined that a naturally occurring gene sequence is a natural phenomenon, so isolating it in a lab does not make it patentable.[18] *Alice* found that performing the centuries-old practice of "intermediated settlement" on a generic computer is just the same abstract idea in digital form.[19]

11 In the two-step test, if the answer to step one is yes, the analysis proceeds to step two, which considers whether the additional claim elements – individually or as an ordered combination – add "significantly more" than the ineligible concept, thereby transforming it into a patent-eligible application.[20] In *Alice*, the court further explained that merely implementing an abstract idea on a generic computer – through routine data processing or conventional post-solution activity – does not make the claim patent-eligible. However, a claim that reflects a specific improvement in computer functionality, a novel configuration of hardware components, or another inventive concept that transforms

11 561 US 593 (2010).
12 566 US 66 (2012).
13 569 US 576 (2013).
14 573 US 208 (2014).
15 *Bilski v Kappos* 561 US 593 at 601–613 (2010); *Mayo Collaborative Services v Prometheus Laboratories Inc* 566 US 66 at 77–82 (2012); *Association for Molecular Pathology v Myriad Genetics Inc* 569 US 576 at 589–595 (2013); *Alice Corp Pty Ltd v CLS Bank International* 573 US 208 at 217–221 (2014).
16 *Bilski v Kappos* 561 US 593 at 601–613 (2010).
17 *Mayo Collaborative Services v Prometheus Laboratories Inc* 566 US 66 at 77–82 (2012).
18 *Association for Molecular Pathology v Myriad Genetics Inc* 569 US 576 at 585-595 (2013).
19 *Alice Corp Pty Ltd v CLS Bank International* 573 US 208 at 217–221 (2014).
20 *Broadcom Corp v Sony Corp* No 8:16-cv-01052-JVS-JCG (6 June 2016, CD Cal) (US).

the abstract idea into a practical application may satisfy the requirement under the *Mayo-Alice* framework.

12 Since 2014, the Federal Circuit has released many key decisions that explain these rules. As a result, whether something is eligible now depends a lot on the exact facts of each case – so much so that critics say the law has become hard to predict.

13 Federal Circuit panels since *Alice* have developed a patchwork of precedents: *Enfish LLC v Microsoft Corp*[21] upheld a self-referential data table as a "specific improvement to computer functionality" whereas *Yanbin Yu v Apple Inc*[22] struck down an enhanced digital-camera algorithm as mere data manipulation, and *Broadcom Corp v Sony Corp*[23] highlighted how subtle claim-drafting distinctions can tip the balance.

14 By contrast, an improvement to the way computers work, a brand-new hardware arrangement, or an unconventional technical solution might save the claim. After *Alice,* the Court of Appeals for the Federal Circuit – the sole appellate court that hears patent cases – has tried to flesh out those fuzzy boundaries, but its opinions often point in different directions. Uncertainty at the boundary of patent-eligible subject matter can chill investment: founders cannot be sure their core algorithm will survive litigation, while incumbents may use eligibility attacks to keep new entrants out. To give applicants clearer signposts, the United States Patent and Trademark Office ("USPTO") issued detailed guidance in February 2024. One highlight is that inventions created with the help of generative AI are still patentable so long as at least one human made a "significant contribution" – borrowed from the old *Pannu* test for joint inventorship.[24] The Office also laid out practical examples showing when AI-assisted diagnostic methods, training pipelines, or user-interface innovations do (and do not) satisfy the two-step test.

15 In practice, effective US claim-drafting for software and AI inventions is an exercise in anticipatory compliance with the two-step test. The drafter should begin each independent claim in a recognised statutory form ("computer-implemented method", "non-transitory computer-readable medium" *etc*) and situate the invention in a concrete technical problem-and-solution context – a move the USPTO expressly

21 822 F 3d 1327 (Fed Cir, 2016).
22 1 F 4th 1040 (Fed Cir, 2021).
23 No 8:16-cv-01052-JVS-JCG (6 June 2016, CD Cal) (US).
24 See *Pannu v Iolab Corp* 155 F 3d 1344 (Fed Cir, 1998). The *Pannu* test emphasised qualitative contribution rather than the quantity of work or number of claims contributed. US Patent and Trademark Office, *Inventorship Guidance for AI-Assisted Inventions* (13 February 2024) Federal Register 89(30) 10043.

endorses in the *Manual of Patent Examining Procedure* § 2106.[25] The claim must then articulate the *how* of the improvement, not merely the *result*. If step one of the test flags an abstract idea, the remaining limitations must supply the "significantly more" that transforms the idea into a patent-eligible application – for example, reciting resource-saving matrix partitioning, sensor-to-actuator data flows, or other non-routine technical constraints highlighted in the USPTO's 2024 AI guidance document.[26]

16 Europe takes a different approach by embedding its software exclusion straight into the black-letter law: Art 52(2)(c) EPC lists "programs for computers" among those subject matters that are *not* regarded as inventions. However, Art 52(3) immediately softens such constraint by saying that the exclusion applies only to the extent the claim relates to the listed matter "as such" or "software as such" leaving room for protection when the software delivers a verifiable *technical* contribution beyond ordinary code execution.

17 To decide where that line is drawn, the European Patent Office ("EPO") applies the *COMVIK* approach from the Board of Appeal decision *T 641/00*.[27] Under the *COMVIK* approach, the examiner works through three clear-cut steps. Step one: Separate the wheat from the chaff. The claim is read with a highlighter in each hand – one colour for *technical* features (hardware components, data-flows that change a physical parameter, control loops, signal-processing operations) and another for *non-technical* features (business rules, economic concepts, pure mathematics, linguistic manipulations). Step two: Pick the most relevant prior art. Once the technical pieces are on the table, the examiner selects the single closest earlier disclosure that shares the most technical overlap. Step three: Ask what is *really* inventive. Only the features that give the claim its technical flavour are placed into the normal problem-solution framework: *What technical problem do they solve, and would a skilled engineer have found the same solution?* Any purely abstract elements stay in the margins; they influence the wording of the problem but cannot, on their own, supply an inventive step.

18 In practical terms, claims may certainly recite business logic, mathematical optimisations, or sophisticated natural-language

25 *Manual of Patent Examining Procedure* § 2106 (US Patent and Trademark Office, 9th Ed, revised July 2024).

26 US Patent and Trademark Office, *2024 Guidance Update on Patent Subject-Matter Eligibility, Including on Artificial Intelligence* (17 July 2024) Federal Register 89(137) 58128.

27 *T 641/00 – Two-Identities/COMVIK* (26 September 2002, European Patent Office ("EPO") Board of Appeal).

parsing; however, such non-technical features are disregarded unless they interact with technical elements to yield a concrete, measurable advantage – examples include a 50% reduction in Central Processing Unit ("CPU") load, a measurable decrease in signal latency, or improved lateral control of an autonomous vehicle. A bare assertion that "accuracy improves" is insufficient. This principle – now embedded in the *Guidelines for Examination in the European Patent Office* Part G-VII 5.4 (inventive step), Part G-II 3.6 (computer-implemented inventions), and the AI-specific Part G-II 3.3.1 – requires that applicants substantiate any alleged improvement with empirical data, comparative tests, or at least a well-reasoned technical explanation.[28] Demonstrating a further technical effect allows the examiner to credit the feature in the inventive-step analysis; merely claiming its existence does not.

19 The Boards of Appeal of the EPO are steadily applying the *COMVIK* framework to an expanding docket of machine-learning applications, and the outcomes illustrate a common direction: success turns on hard evidence of a *technical* improvement. In *T 161/18*, the applicant claimed a neural network for estimating aortic blood pressure, but the specification withheld the training data and offered no figures on speed, memory, or diagnostic accuracy. With nothing concrete to measure, the Board found no "further technical effect", so the claim was held ineligible.[29] A similar problem could be seen in *T 702/20*, which concerned a sparsely connected neural network for autonomous driving. Because the architecture was presented merely as "a class of mathematical functions", and the record lacked test results showing better lane-keeping or obstacle avoidance, the Board ruled that the claim added nothing technical over the prior art.[30]

20 Recent files show a more promising trajectory. In *T 1952/21*, the invention aimed to shorten braking distance in an anti-lock braking system – a goal the Board recognised as *inherently technical*. The decision held that a reinforcement-learning pipeline *could* support an inventive step if it demonstrably achieved that safety improvement, even though the claims ultimately failed for other reasons.[31] Likewise, *T 2412/22* examined a cloud-based retraining scheme designed to lighten the processor load inside an autonomous vehicle. The Board confirmed that off-board retraining targeted at reducing on-board CPU usage was, on

28 European Patent Office, *Guidelines for Examination in the European Patent Office* (April 2025) Pts G-II 3.3.1 and G-VII 5.4.

29 *T 161/18 – Equivalent aortic pressure/ARC SEIBERSDORF* (12 May 2020, EPO Board of Appeal).

30 *T 702/20 – Sparsely connected neural network/MITSUBISHI* (7 November 2022, EPO Board of Appeal).

31 *T 1952/21 – Reinforcement learning/BOSCH* (14 June 2024, EPO Board of Appeal).

its face, a technical effect that had to be considered in the inventive-step analysis, although the specific claim was found obvious in view of earlier publications.[32] Taken together, these decisions show the direction where machine-learning claims stand a realistic chance only when the file links the model to quantifiable engineering benefits, supported by data, or at least a detailed technical rationale.

21 Across the Asia-Pacific, patent offices steer a course between the European *COMVIK* rule set and the broader US view, but their touchpoints differ. In Japan, the Japan Patent Office ("JPO") does *not* carve out a blanket exclusion for computer programs. On the contrary, the 2002 revision Japan's Patent Act added Art 2(3)(i), which expressly treats "computer programs and any other set of information similar to a program that is designed to be used for computer processing" as a kind of *product* invention, putting software on the same statutory footing as machines or chemicals.[33] What remains, however, is the Act's overarching definition of an invention as "a creation of a technical idea utilizing a law of nature". To police that standard, JPO's *Examination Guidelines for Patent and Utility Model* require that the claimed information processing be "concretely realized by using hardware resources".[34] In practice this means that a claim reciting nothing more than code or weights is rejected as abstract information, while the very same code passes once the drafter shows it consuming real-world sensor data or driving a physical actuator. The paired AI case studies make the point vividly: a trained text-sentiment model claimed as a free-floating data object (Case 2-14') was refused, whereas the model embedded in a server that receives review text and outputs star scores to a computer was allowed (Case 2-14).[35] Thus, programs are patent-eligible in Japan, but only when the claims reveal a technical interplay between software and hardware; pure algorithms that never leave the abstract realm still fall outside the law's protection.

22 In Singapore, the treatment of computer-implemented inventions has undergone decisive liberalisation over the last three decades. When the Patents Act 1994[36] first came into force, it tracked UK-style exclusions, declaring that discoveries, business or mental schemes, "programmes for computers", and mere presentations of

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32 *T 2412/22 – Adaptive driving models/STRADVISION* (27 November 2024, EPO Board of Appeal).

33 Patent Act (Act No 121 of 1959) (Japan) Art 2(3)(i), as amended in 2002.

34 Japan Patent Office, *Examination Guidelines for Patent and Utility Model* (revised 2024) Pt III, Ch 1 at section 2.2.

35 Japan Patent Office, *Case Examples Pertinent to AI-Related Technology* (13 March 2024) Case 2-14 and Case 2-14.

36 (No 21 of 1994) (S'pore); the current version is Patents Act 1994 (2020 Rev Ed) (S'pore).

information were not inventions. Parliament reversed its course almost immediately: the Patents (Amendment) Act 1995[37] repealed the whole of the exclusionary s 13(2), and the repeal took legal effect on 1 January 1996 in order to align domestic law with TRIPS and to attract software investment.[38] Today, the only statutory bar in s 13(2) is the morality *proviso* against inventions that would "encourage offensive, immoral or antisocial behaviour".[39]

23 With the prohibitive list gone, subject-matter scrutiny shifted to practice. The Intellectual Property Office of Singapore ("IPOS") now applies a Europe-style "technical contribution" enquiry. Chapter 8 of the *Examination Guidelines for Patent Applications at IPOS* (October 2023) instructs examiners first to identify the "actual contribution" of the claim; if that contribution lies solely in an abstract discovery, mathematical method or business rule, the claim fails. For AI applications, paras 8.22-8.24 single out core machine-learning models – neural networks, support vector machines, k-means, and the like – as mathematical methods "by themselves". Patentability turns on whether the model is *functionally limited* to solving a specific technical problem and whether the steps are causally linked to concrete inputs and outputs that interact with hardware "to a material extent". Generic assertions that an algorithm delivers "better accuracy", without quantitative data or a worked example tying that improvement to system architecture, are expressly disallowed.[40] In practice, then, Singapore offers broad statutory eligibility – computer programs are not *per se* excluded – but imposes a rigorous *ex post* filter. Applicants must draft claims that show how the software co-operates with sensors, processors, or actuators to achieve a technical result.

24 In Australia, the doctrine of "manner of manufacture" was put under the microscope when the High Court split evenly in *Aristocrat Technologies Australia Pty Ltd v Commissioner of Patents*[41] ("*Aristrocrat*"). Three judges (Kiefel CJ, Gageler and Keane JJ) characterised the claimed electronic gaming machine ("EGM") as nothing more than a new set of

37 Patents (Amendment) Act 1995 (No 40 of 1995) (S'pore).
38 See World Intellectual Property Organization, *Computer Programs As Excluded Patentable Subject Matter* (SCP/15/3, 2010) at Annex II noting Singapore's deletion of the exclusion.
39 Patents Act 1994 (2020 Rev Ed) (S'pore) s 13(2); Intellectual Property Office of Singapore ("IPOS"), *Examination Guidelines for Patent Applications* (October 2023) Ch 8 at paras 8.195–8.199.
40 Patents Act 1994 (2020 Rev Ed) (S'pore) s 25(4), s 25(5)(*c*); IPOS, *Examination Guidelines for Patent Applications* (October 2023) Ch 5 (especially at paras 5.88, 5.93–5.98 and 5.104–5.118).
41 [2022] HCA 29.

game rules running on conventional computer hardware and therefore an unpatentable abstract scheme. The remaining three justices (Gordon, Edelman and Steward JJ) emphasised the engineered interplay between the configured game controller and the bespoke player interface, holding that the combination produced "an altered EGM involving an artificial state of affairs and a useful result" and was thus patent-eligible. Because the court stood at 3-3, s 23(2)(a) of the Judiciary Act 1903[42] required the appeal to be dismissed, leaving the Commissioner's refusal intact and confirming – without majority guidance – that computer-implemented game play is patentable only when the inventive step resides in computer technology itself rather than in the gaming logic.[43] The deadlock has sharpened examination practice. IP Australia's Manual[44] now devotes a stand-alone section to "Games and Gaming Machines", instructing examiners to treat new rules of play as mere schemes and to grant protection only where the claim discloses a *material* technical contribution – such as novel display hardware, improved random-number generation, or an unconventional interaction between software and physical components. The same passage cross-references the *Aristocrat* decision and warns that, for AI-driven titles, assertions of "better accuracy" or enhanced player engagement must be backed by engineering detail that shows how the model changes the operation of the machine.[45] As a result, applicants in the gaming and AI sectors now face a higher evidentiary burden: they must demonstrate genuine computer-technical innovation rather than repackaging game mechanics in code.

25 Taken together, these Asia-Pacific jurisdictions converge on a pragmatic compromise: pure information processing is excluded, but AI or software that *measurably* advances an engineering task – shorter braking distances, reduced CPU load, real-time sensor fusion – remains patent-eligible. Applicants who wish to succeed must therefore anchor their claims in hardware interaction, provide experimental or simulated benchmarks, and frame any algorithmic advance as a concrete technical improvement.

42 (Cth).
43 *Aristocrat Technologies Australia Pty Ltd v Commissioner of Patents* [2022] HCA 29, especially *per* Gordon, Edelman & Steward JJ at [154]; order dismissing appeal under Judiciary Act 1903 (Cth) s 23(2)(a).
44 IP Australia, *Patent Manual of Practice and Procedure* (Manual, current version).
45 IP Australia, *Patent Manual of Practice and Procedure* at section 5.6.8.7 (Manual, 18 October 2023) citing *Aristocrat Technologies Australia Pty Ltd v Commissioner of Patents* [2022] HCA 29 at [75] and [120].

III. Thailand's Patent Act s 9 software exclusion – statutory rule, administrative gatekeeping, and procedural timing

26 Thai law on software patents still rests on a single sentence that has remained unchanged since the Patent Act:[46] "Information systems for the operation of a computer are not considered to be patentable inventions within the meaning of this Act."[47] Notwithstanding this precise statutory language, the Department of Intellectual Property ("DIP") administratively interprets this phrase to broadly encompass "computer programs". Crucially, this provision, was adopted almost *verbatim* from the UK Patents Act 1977[48] and the original EPC,[49] but – unlike its European model – contains no "as such" qualifier and therefore it naturally operates as an absolute statutory bar. By adopting this language without the EPC's mitigating "as such" qualifier, Thailand created an absolute exclusion: once something is classified as a "computer program", it never proceeds to substantive examination on novelty or inventive step. By incorporating the EPC's language but omitting its limiting qualifier, Thailand created a rule that functions as a categorical exclusion, sweeping computer programs outside the patent system in a single, decisive stroke. Compounding this, no judgment of the Thai Central Intellectual Property and International Trade Court, the Court of Appeal for Specialised Cases or the Supreme Court has yet explored the scope of the term, so the provision's practical content is entirely a matter of administrative interpretation.

27 In the interpretive vacuum created by s 9(3)'s absolute exclusion of computer programs, the DIP has stepped in as gatekeeper through its *Guidelines for Examining Patent and Petty Patent Applications*[50] ("Guidelines"). First issued in 2012 and substantially overhauled in June 2019, these Guidelines divide claims into three classes. Mere program listings and computer-readable-media claims are rejected outright as "nothing more than the program text". Computer-implemented business schemes that manipulate data without any interaction with external hardware are likewise refused as abstract. By contrast, so-called

46 BE 2522 (1979) (Thailand). References to this Act in this article are references to the Patent Act BE 2522 (1979) as amended up to Patent Act (No 3) BE 2542 (1999).

47 Patent Act BE 2522 (1979) (Thailand) s 9(3): "Computer programs are not considered to be inventions."

48 (c 37) (UK). Section 1(2)(c) of the Patents Act 1977 (c 37) (UK) provided that a patent "shall not be granted … in respect of" specified subject-matter, including "a program for a computer".

49 European Patent Convention (5 October 1973), 1065 UNTS 199, Art 52(2)(c) (entered into force 7 October 1977) declares that "programs for computers shall not be regarded as inventions" within the meaning of the Convention.

50 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019).

"computer-related inventions", in which the inventive concept lies in the co-operation of software with a physical element – whether sensors, actuators, network interfaces, or method steps that produce a concrete technical effect – are allowed to proceed to substantive examination. Through this tripartite framework, the Guidelines reconcile the textual absolutism of s 9(3) with the practical necessity of protecting genuine technical advances that integrate code and machine.

28 To make the distinction concrete, examiners are given side-by-side examples. A claim directed to a transaction-processing algorithm that merely searches a database is deemed non-patentable subject matter; by contrast, a dynamic-currency-conversion system that identifies a card issuer, pulls live exchange rates from a server, and drives a point-of-sale terminal is allowed to pass the s 9(3) hurdle because the program does not "perform independently".[51]Although the Guidelines seldom mention artificial intelligence by name, they fold most AI building-blocks – neural-network architectures, loss functions, training regimes – into the rubric of *mathematical methods*, which s 9(2) independently excludes.[52]

29 The Guidelines make the abstract/concrete divide unmistakable by presenting examiners with paired case studies. On one side sits a claim to a "transaction-processing method" that simply searches and aggregates records in a merchant database – no sensors, no actuators, no network interfaces – so the software "performs independently" and is refused as non-patentable subject matter under s 9(3).[53] On the other side stands the "dynamic currency conversion for card payment system", in which the claim recites: (a) identification of the issuing bank code from a credit-card number; (b) retrieval of live exchange-rate data from a host server; and (c) command signals to a point-of-sale terminal to display and print the converted amount. Because the program cannot run in isolation – it relies on card readers, network links, and display/output hardware – examiners conclude that the software "does not perform

51 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019); see illustrative examples "System for Processing In/Out Transactions" (rejected) *versus* "Dynamic Currency Conversion for Card Payment System" (accepted).

52 Patent Act BE 2522 (1979) (Thailand) s 9(2).

53 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019); see illustrative examples "Pure Transaction-Processing Algorithm" (rejected) *versus* "Dynamic Currency Conversion System" (accepted) at pp 11–12.

independently", thus clearing the s 9(3) hurdle and proceeding to substantive examination.[54]

30 Although "artificial intelligence" as a buzzword barely appears in the text of the Guidelines, its core components are subsumed under the separate exclusion for "mathematical methods" in s 9(2) of the Patent Act. Accordingly, a claim directed solely to the architecture of a neural network, the choice of a loss-function, or any training algorithm will be filtered out at the subject-matter stage.[55] Only when that same network is described as part of a control-loop – taking raw sensor inputs, generating feature vectors, and issuing physical control signals to valves, motors, or displays – will the application survive the gate and face the usual novelty and inventive-step enquiries.

31 On the contrary, an AI pipeline will be treated exactly like any other software: if the claimed contribution is limited to model weights, training data, or inference code, the application fails at the gate; if the specification demonstrates a material physical effect – *eg*, a convolutional network embedded in an automotive vision module that issues a braking signal, or a reinforcement-learning agent that tunes an industrial kiln – the invention is examined on the merits. Recent practitioner guidance confirms that mere assertions of "higher accuracy" are insufficient; the applicant must trace the causal chain from sensor input through model output to mechanical action.[56]

32 Thailand's absolute statutory exclusion for computer programs, tempered only by administrative examples, stands in stark relief against the nuanced, multi-step frameworks adopted elsewhere. Whereas Thailand maintains absolute statutory bars against software – excising programs *per se* from patent coverage, albeit moderated by administrative guidelines that admit hardware-tethered solutions[57] – other offices enact nuanced filters. The US and Australia apply judicially crafted,

54 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019); see illustrative examples "Pure Transaction-Processing Algorithm" (rejected) *versus* "Dynamic Currency Conversion System" (accepted) at pp 11–12.

55 See Patent Act BE 2522 (1979) (Thailand) s 9(2) (excluding "mathematical or method of calculation"), and Baker McKenzie, "At a Glance: Intellectual Property for Digital Health in Thailand", *Lexology* (17 March 2025) (AI building blocks as mathematical methods).

56 Baker McKenzie, "At a Glance: Intellectual Property for Digital Health in Thailand", *Lexology* (17 March 2025).

57 Patent Act BE 2522 (1979) (Thailand) s 9(3) ("Computer programs are not considered to be inventions"); Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019) at sections 3.3–3.5.

multi-stage inquiries (the *Alice*/*Mayo* "inventive-concept" and the manner-of-manufacture tests) that sift out abstract schemes, generating significant litigation and doctrinal uncertainty yet permitting claims to proceed if they recite genuine computer-technology advances.[58] By contrast, the EPO applies a "technical contribution" approach, while Singapore adopts an "actual contribution" test to assess computer-implemented inventions. Neither concept appears in the statutes themselves but is developed through case law and reflected in examination practice.[59] Nevertheless, Japan's Patent Act and JPO's *Examination Guidelines* spell out in precise detail how to demonstrate that "information processing by the software is concretely realized by using hardware resources", complete with illustrative examples of acceptable claim language and paired case studies,[60] while Singapore's Patents Act 1994 and IPOS's *Examination Guidelines* require applicants to identify the specific technical problem solved and to show "material" interaction between mathematical models and hardware, thus offering clearer drafting guidance and greater certainty.[61]

33 What further distinguishes Thailand from many other jurisdictions is *when* the software exclusion is applied. The s 9(3) hurdle is addressed at the very outset of examination – before an application is even published in the Thai Patent Gazette. Under s 28 of the Patent Act, invention patent applications are first reviewed for compliance with s 17 (formality requirements and enablement) and for patentable subject matter under s 9.[62] If the invention passes both, s 28(2) permits publication, provided the applicant pays the publication fee.[63] Ministerial Regulation No 22[64] confirms this sequencing by directing examiners to consider s 9 exclusions before recommending publication to the Director-General.[65] The practical effect is that any application appearing

58 *Alice Corp v CLS Bank International* 573 US 208 (2014); US Patent and Trademark Office, *Manual of Patent Examining Procedure* § 2106 (9th Ed, revised July 2024); IP Australia, *Patent Manual of Practice and Procedure* (Manual, 18 October 2023) at section 5.6.8.7.

59 European Patent Convention (5 October 1973), 1065 UNTS 199, Art 52(2)(c) (entered into force 7 October 1977); *T 1173/97* (IBM); *T 641/00* (COMVIK); European Patent Office, *Guidelines for Examination in the European Patent Office* (March 2024) Part G-II 3.3; Patents Act 1994 (2020 Rev Ed) (S'pore) ss 13(1)–(2); IPOS, *Examination Guidelines for Patent Applications* (October 2023) Ch 8 at paras 8.3–8.4.

60 Japan Patent Office, *Examination Guidelines for Patent and Utility Model* (revised 2024) Pt III, Ch 1 at sections 2.1.1 and 2.2.

61 IPOS, *Examination Guidelines for Patent Applications* (October 2023) Ch 8 at paras 8.22–8.24.

62 Patent Act BE 2522 (1979) (Thailand) s 28.

63 Patent Act BE 2522 (1979) (Thailand) s 28(2).

64 (BE 2542) (Thailand).

65 Ministerial Regulation No 22 (BE 2542) (Thailand) cl 2.

in the Patent Gazette has already cleared the s 9(3) bar – meaning the DIP has determined that it is not an "information system for the operation of a computer" or a "computer program" under the Guidelines. Publication therefore serves as a strong procedural signal that the claimed invention was considered outside the absolute exclusion. In Thailand, s 9 thus functions as a front-end gatekeeper: applications failing at this stage never advance to novelty or inventive-step review. This sequencing also explains why purely abstract AI algorithms are absent from the Gazette and why successful filings almost always frame the invention as an integrated hardware-software system from the outset.

IV. Pragmatic responses to Thailand's software exclusion: filing and claim-drafting strategies

34 Thailand's statutory prohibition under s 9(3) of the Patent Act and the DIP's administrative distinctions have produced observable effects on both filing patterns and claim-drafting strategies in International Patent Classification subclass G06F (general computer technology). In 2023, fewer than two hundred domestic applications were recorded in G06F – accounting for under 2% of total filings, *versus* the global average of approximately 12% for the same subclass – a disparity widely attributed to s 9(3)'s statutory ban on "computer programs". This statistical gap both reflects and reinforces a drafting culture in which many foreign applicants therefore elect either to omit Thailand from their software-only portfolios or to reframe algorithmic innovations as hardware-anchored claims in the national phase, thereby avoiding direct confrontation with s 9(3).

35 Despite this deterrent effect, the DIP has occasionally granted patents or published applications for technically substantive "borderline" cases by applying section 11.3 of its Guidelines on "computer-related inventions". The Guidelines function as a soft-law carve-out, admitting inventions where the claimed subject matter exhibits a "technical character" through hardware-software co-operation. The present study's analysis of 13 AI-related Thai patent publications,[66] all admitted under section 11.3 of the Guidelines, reveals four recurring and often overlapping claim-drafting approaches: avoiding "red-flag" terminology, embedding concrete physical elements, claiming specific product outcomes, and emphasising technical aspects. Collectively, these constitute

66 Department of Intellectual Property (Thailand), Patent Publication Nos 1701002101A, 1801002751A, 1901002055A, 1901007336A, 2001000116A, 2101000535A, 2101000758A, 2101005574A, 2201004264A, 2201005924A, 2301000847A, 2301003361A and 2301003997A.

the *de facto* playbook for navigating Thailand's statutory-administrative interface.

36 Comparatively, Thailand's model occupies an intermediate position between Japan's rigorous "hardware-cooperation" test and Europe's "technical-contribution" doctrine. Under the EPC, the exclusion for computer programs in Art 52(2)(c) is tempered by the problem-solution framework, which allows mixed technical-non-technical inventions if they solve a concrete technical problem. Japan's Patent Act, by contrast, requires that "information processing by the software is concretely realised by using hardware resources". Thailand, however, relies solely on soft-law Guidelines to carve out a *de facto* exception to its absolute statutory ban. Critics argue that this non-binding, example-driven approach breeds examiner-by-examiner variability and legal uncertainty,[67] while proponents counter that it grants the DIP the agility to admit genuinely technical software without inviting a flood of pure business-method or gaming claims.[68]

A. *Eschewing "red-flag" terminology*

37 One of the most consistent tactics for reducing the risk of a s 9(3) objection is the deliberate avoidance of linguistic markers that would frame the invention as a "program *per se*". Words and phrases such as "software", "computer program", and "machine-readable medium" are conspicuously absent from the independent claims in many allowed cases. Instead, applicants deploy neutral technical descriptors – "system", "method", "apparatus", "module" – that present the claimed invention as a unitary technical arrangement rather than a disembodied algorithm.

38 Publication No 1701002101A, which claims a two-way AI communication system for controlling air conditioners and air purifiers, illustrates this strategy in textbook form.[69] The main claim describes the invention as a "system" comprising a server computer, user database, appliance-specific database, and AI control unit capable of wireless or LAN-based communication.[70] Nowhere does the claim characterise the

67 Baker McKenzie, "Purification and Programming: Thailand's New Patent Examination Guidelines" (August 2019).

68 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019) at section 11.3 (excluding "computer program *per se*" while admitting software-hardware inventions subject to a concrete technical effect).

69 Department of Intellectual Property (Thailand), Patent Publication No 1701002101A (12 April 2019).

70 Department of Intellectual Property (Thailand), Patent Publication No 1701002101A (12 April 2019).

AI control logic as "software"; rather, the AI module is described as a "processing unit" that "issues commands" and "interacts" with the user.[71] This reframing shifts the conceptual anchor from an abstract program to a concrete system architecture, which is less likely to be read as falling within the *per se* exclusion.

39 A similar lexical strategy is evident in Publication No 2101000758A (AI-assisted order-picking optimisation), where the claims refer to "processors configured to execute instructions" rather than "software modules",[72] and in Publication No 2201004264A (abnormal sound identification device), which frames the AI classifier as a "trained model" accessed by an "arithmetic unit" rather than a "signal-analysis program".[73] In each case, the absence of explicit programmatic terminology in the claim body avoids providing the examiner with a textual hook to invoke s 9(3).

B. Embedding concrete physical elements

40 While red-flag avoidance helps, it is rarely sufficient. The dominant and most effective strategy, observed in approximately 85% of the examined cases, is the explicit recitation of physical hardware in the independent claims. This "hardware anchoring" conforms to the DIP Guidelines' requirement that a computer-related invention must involve co-operation between software and hardware to produce a technical effect.

41 Some applications adopt straightforward hardware anchoring by reciting sensors, processors, and actuators integral to the claimed method. Publication No 2301000847A (AI-based non-contact vital-sign detection) claims an arrangement of infrared sensors, a camera, a signal conversion unit, a processor executing AI algorithms, and a display unit, all integrated into a measurement system.[74] The AI model is inseparable from the sensing apparatus; without the hardware components, the claimed process cannot function.

42 Others integrate more specialised hardware. Publication No 1801002751A (AI-enabled mobile waste water recycling) includes

71 Department of Intellectual Property (Thailand), Patent Publication No 1701002101A (12 April 2019).
72 Department of Intellectual Property (Thailand), Patent Publication No 2101000758A (2 October 2023).
73 Department of Intellectual Property (Thailand), Patent Publication No 2201004264A (4 September 2023).
74 Department of Intellectual Property (Thailand), Patent Publication No 2301000847A (18 November 2024).

in its independent claim a variable-dielectric high-speed rotating electromagnetic field disc, fluid pumps, sedimentation tanks, and filtration units, with AI control embedded in the sensor-actuator loop.[75] Publication No 2001000116A (AI-based polymer defect detection) similarly grounds its claims in a camera module, defect-removal mechanism, and image-processing AI.[76] Even in more abstract-seeming fields, hardware anchoring is maintained: Publication No 1901002055A (AI traffic monitoring) claims fish-eye cameras and dedicated processors,[77] while Publication No 2101000535A (AI-based fall-prevention alert system) recites a ceiling-mounted camera, wireless transmission hardware, and a mobile alert device.[78]

43 This physical anchoring does more than satisfy formal requirements – it reframes the invention's *locus* of novelty. Instead of presenting AI as a stand-alone code artefact, the claim depicts it as an embedded control or decision-making mechanism inseparable from, and integral to, tangible machinery.

C. Claiming specific product outcomes

44 A third observed tactic is the inclusion of quantifiable, real-world results in the claim language. While less prevalent – present in only about one-third of the analysed cases – this outcome-oriented claiming provides persuasive evidence of "technical effect" by making the invention's practical utility explicit. The importance of such recitations is heightened in process claims, given s 3 of the Patent Act defines "process" to include "a process, procedure, or method for producing, or preserving, or improving a product, and includes the use of such process".[79] Framing a process in terms of its tangible end-product therefore directly aligns the claim with the statutory conception of protectable subject matter, making it easier to demonstrate that the process achieves more than abstract data manipulation.

45 Publication No 1801002751A (AI-enabled mobile waste water recycling) illustrates this approach: the process steps are framed to culminate in "clean water free from pathogens, suitable for human

75 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).
76 Department of Intellectual Property (Thailand), Patent Publication No 2001000116A (26 December 2022).
77 Department of Intellectual Property (Thailand), Patent Publication No 1901002055A (25 May 2020).
78 Department of Intellectual Property (Thailand), Patent Publication No 2101000535A (5 December 2022).
79 Patent Act BE 2522 (1979) (Thailand) s 3.

use", an unambiguous and verifiable product outcome.[80] The AI control component is presented not as an abstract optimisation routine, but as a functional enabler of a specific, beneficial physical transformation. Similarly, Publication No 2301003997A (AI-based cervical cancer screening) frames its diagnostic model within a clinical workflow that outputs a final diagnostic report based on camera-captured images, bridging the AI inference to a concrete medical deliverable.[81] Publication No 2001000116A (AI-based polymer defect detection) ties the AI output directly to the ejection of defective items from a manufacturing line – again producing a measurable physical result.[82]

46 These examples demonstrate how product-outcome recitation can strengthen the perception of technical contribution, even where the AI's internal workings might otherwise be characterised as data processing. However, the lower frequency of outcome-based claims in the dataset indicates that, in practice, Thai examiners do not require such recitations where hardware anchoring and technical narrative are otherwise robust.

D. Emphasising technical aspects and problem-solution framing

47 Across all 13 examined applications, the single universal feature – present in 100% of cases – is the articulation of a technical problem and a correspondingly technical solution. This "technical narrative" is central to satisfying the "technical character" requirement in section 11.3 of the Guidelines and is often what rescues a claim that might otherwise be considered a disembodied algorithm.

48 In Publication No 2001000116A (AI-based polymer defect detection), the problem is manufacturing-line quality assurance; the solution is a trained neural network integrated with a defect-removal mechanism.[83] Publication No 1901002055A (AI traffic monitoring) defines its problem as the efficient classification of vehicle movements at intersections; its solution is a combination of fish-eye optical capture,

80 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).
81 Department of Intellectual Property (Thailand), Patent Publication No 2301003997A (11 November 2024).
82 Department of Intellectual Property (Thailand), Patent Publication No 2001000116A (26 December 2022).
83 Department of Intellectual Property (Thailand), Patent Publication No 2001000116A (26 December 2022).

AI classification algorithms, and communication hardware for real-time traffic data dissemination.[84]

49 Other cases reveal equally concrete technical narratives. Publication No 2101005574A (AI-equipped motorcycle) addresses the challenge of capturing and processing license-plate data from multiple traffic scenarios, solving it through a multi-camera arrangement, AI-based recognition, and integrated vehicle power management.[85] Publication No 2201005924A (AI-based facial image encryption) tackles the specific engineering problem of securely encoding biometric images using generated noise patterns, specifying the mathematical and graphical transformations applied.[86]

50 Even where the claimed invention concerns what might superficially appear to be "pure" AI or machine-learning innovation – such as Publication No 1901007336A (AI teaching system *via* block-based command construction) – the application frames the technical problem as the integration of AI model training with robotic control interfaces,[87] thereby situating the novelty in the co-ordination of software logic with physical input/output devices.

51 This consistent problem-solution articulation not only satisfies the DIP's interpretive framework but also aligns Thailand's practice more closely with the EPO's "technical contribution" analysis, albeit without statutory codification.

E. Interplay and synergy of strategies

52 Collectively, these four workarounds – avoiding red-flag terms, embedding physical elements, claiming concrete product outcomes, and emphasising technical aspects – constitute a pragmatic playbook for applicants seeking to transform potential "program *per se*" claims into permissible "computer-related inventions" in Thailand. While each of the four tactics can be deployed independently, the most robustly positioned applications employ them in combination. Publication No 2301003997A (AI-based cervical cancer screening) exemplifies this synergy: it avoids red-flag terminology, embeds specific imaging hardware, ties outputs to

84 Department of Intellectual Property (Thailand), Patent Publication No 1901002055A (25 May 2020).
85 Department of Intellectual Property (Thailand), Patent Publication No 2101005574A (8 July 2024).
86 Department of Intellectual Property (Thailand), Patent Publication No 2201005924A (3 March 2025).
87 Department of Intellectual Property (Thailand), Patent Publication No 1901007336A (22 June 2020).

a quantifiable diagnostic result, and frames the invention as solving the technical problem of accurate, real-time medical image interpretation.[88] Similarly, Publication No 1801002751A (AI-enabled mobile waste water recycling) combines hardware anchoring, outcome recitation, and problem-solution emphasis in a single coherent claim set.[89]

53 From the dataset, 100% of allowed applications articulated a clear technical problem-solution, 85% anchored the invention in specific hardware, 31% avoided red-flag terminology, and 30% claimed a concrete product outcome. Notably, some applications lacking both red-flag avoidance and outcome recitation were nevertheless allowed based on strong technical narrative and hardware co-operation – suggesting that the latter two factors are not strictly necessary under current practice, though they may strengthen borderline cases.

54 These findings underscore that, in Thailand, the decisive determinant for overcoming s 9(3) is not the omission of certain words nor the inclusion of product metrics *per se*, but the presence of a detailed and credible link between algorithmic logic and tangible technical apparatus. Examiners appear willing to overlook the absence of outcome-oriented claims or the occasional use of programmatic language if the application convincingly describes a hardware-software interplay that delivers a real-world engineering benefit.

55 At the same time, the heavy reliance on soft-law guidelines, rather than statutory or regulatory amendment, leaves this interpretive space vulnerable to inconsistency. Without binding criteria, the threshold for "technical character" remains examiner-dependent, creating uncertainty for applicants and potentially uneven outcomes for similar inventions. The next section turns from descriptive mapping to critical evaluation, examining whether these observed strategies represent genuine alignment with the legislative intent behind s 9(3) or operate as formalistic workarounds enabled by administrative discretion.

V. Critical assessment of filing and claim-drafting strategies

56 The four principal drafting workarounds each exhibit distinctive legal strengths but also carry inherent vulnerabilities that applicants must carefully manage. Avoiding "red-flag" terminology – "software", "computer program", or "machine-readable medium" in favour of

88 Department of Intellectual Property (Thailand), Patent Publication No 2301003997A (11 November 2024).
89 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).

neutral terms such as "system", "method", or "module" – can help avert an immediate s 9(3) exclusion. However, this strategy is purely lexical: an examiner focused on the claim's substance can re-characterise any recitation of data-processing steps as software in disguise, potentially invoking the *per se* ban notwithstanding the novel phrasing. Moreover, if the remainder of the claim lacks concrete hardware or technical detail, the absence of explicit red-flag terminology will often prove insufficient to carry the claim past examination.

57 This preventive approach works best when paired with other tactics. Publication Nos 1701002101A (AI-controlled HVAC and air-purification system)[90] and 2101000758A (AI-driven order-picking optimisation)[91] show how neutral descriptors like "system" or "processor configured to execute instructions" can keep the claim clear of obvious statutory triggers. However, applications such as Publication No 1901007336A (AI teaching system *via* block-based commands)[92] show the limits of terminology avoidance: without hardware anchoring or a well-developed technical narrative, an examiner could still view the claim as an excluded "information system".

58 By contrast, embedding physical elements directly engages with the hardware co-operation requirement in section 11.3 of the Guidelines and is the most consistently successful tactic in the dataset. In Publication No 2301000847A (AI-based non-contact vital-sign detection), AI inference is inseparable from infrared sensors, cameras, signal-conversion circuits, and display components.[93] Similarly, Publication No 1801002751A (AI-enabled mobile waste water recycling) ties AI control to electromagnetic-field reaction chambers, sedimentation tanks, and filtration units.[94] This approach reassures examiners that the claimed subject matter is genuinely technical, but the claim may still be attacked as an obvious aggregation, as could be argued for Publication No 1901002055A (AI traffic monitoring)[95] or Publication

90 Department of Intellectual Property (Thailand), Patent Publication No 1701002101A (12 April 2019).

91 Department of Intellectual Property (Thailand), Patent Publication No 2101000758A (2 October 2023).

92 Department of Intellectual Property (Thailand), Patent Publication No 1901007336A (22 June 2020).

93 Department of Intellectual Property (Thailand), Patent Publication No 2301000847A (18 November 2024).

94 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).

95 Department of Intellectual Property (Thailand), Patent Publication No 1901002055A (25 May 2020).

No 2001000116A (AI-based polymer defect detection).[96] Moreover, it is vulnerable to inventive-step attacks: opponents may argue at opposition or invalidation proceedings that the mere combination of known hardware and routine software control lacks the requisite non-obvious contribution, leading to revocation on grounds of obviousness rather than subject-matter eligibility.[97] Hardware anchoring clears the eligibility hurdle but can invite closer inventive-step scrutiny.

59 Outcome-oriented claiming – reciting quantifiable, real-world results – is less common but potentially persuasive, particularly for process claims under s 3, which defines a process as a method for producing, preserving, or improving a product. In Publication No 1801002751A, process steps culminate in "clean water free from pathogens, suitable for human use";[98] Publication No 2301003997A (AI-based cervical-cancer screening) integrates AI inference into a workflow that outputs a final diagnostic report;[99] Publication No 2001000116A ties AI detection to the physical ejection of defective items from a production line.[100] Such language helps position the invention as producing a tangible industrial result rather than abstract data manipulation. Nevertheless, product outcomes may be attacked as functional results lacking structural substance, with critics contending that they describe the effect of the algorithm rather than the algorithm itself. In such cases, tribunals may excise the outcome from the claim or relegate it to purposive construction, thereby exposing the claim to a subject-matter refusal.[101]

60 Emphasising technical aspects – framing the invention as a solution to a defined engineering problem – is both the most universal and the most doctrinally robust strategy. All 13 reviewed cases adopt this approach, from Publication No 2101005574A's dual-angle licence-plate capture for motorcycles to Publication No 2201005924A's facial-image encryption to Publication No 2301000847A's physiological-sensing challenge. This problem-solution framing aligns directly with the

96 Department of Intellectual Property (Thailand), Patent Publication No 2001000116A (26 December 2022).
97 P M Lewis, "The Conflation of Patent Eligibility and Obviousness: Alice's Substitution of Section 103" (2017) 17 *Utah OnLaw: The Utah Law Review Online Supplement* 1 at p 14.
98 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).
99 Department of Intellectual Property (Thailand), Patent Publication No 2301003997A (11 November 2024).
100 Department of Intellectual Property (Thailand), Patent Publication No 2001000116A (26 December 2022).
101 Department of Intellectual Property (Thailand), *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019) section 11.5.

"technical character" concept in section 11.3 of the Guidelines and helps avoid both s 9(3) and s 9(2) exclusions by embedding the algorithm within a tangible technical context. Because guidelines are non-binding, different examiners may reach divergent conclusions as to whether a claimed feature is sufficiently technical – resulting in inconsistent outcomes and potential appeals to the Central Intellectual Property and International Trade Court.[102]

61 The dataset suggests that the most durable allowances result from a combination of strategies. Publication No 2301003997A integrates hardware anchoring, outcome claiming, and a strong technical narrative, while avoiding explicit red-flag terms;[103] Publication No 1801002751A combines hardware co-operation, quantified results, and problem-solution framing.[104] Such layering gives the examiner multiple eligibility hooks and reduces reliance on any single interpretive point. However, this also reflects a pragmatic exploitation of administrative discretion rather than a stable statutory pathway. Ultimately, these strategies work not because s 9(3) has been narrowed in law, but because the DIP has chosen, through soft-law guidance, to recognise certain hardware-tethered, technically-framed AI inventions as outside the *per se* ban. The current practice is sustainable only so long as the DIP maintains its expansive reading of section 11.3 of the Guidelines.

62 Looking forward, the durability of these workarounds is uncertain. A judicial pronouncement affirming a strict, literal reading of s 9(3) could invalidate the DIP's *de facto* technical-effect exception, nullifying allowances predicated on hardware-tethered claims. Likewise, legislative reform – whether through an amendment mirroring the EPC's "as such" carve-out or *via* a ministerial regulation codifying technical-effect criteria – could tighten the statutory text and curtail administrative latitude. International pressures, including Asia-Pacific Economic Cooperation discussions on digital economy intellectual property, and obligations under free-trade agreements may further prompt Thailand to recalibrate its patentable-subject-matter regime in line with more structured, statute-based exclusions.

63 From a policy perspective, the present arrangement has mixed implications. On the positive side, it allows protection for AI-enabled innovations in sectors such as industrial automation (Publication

102 Patent Act BE 2522 (1979) (Thailand) s 74.
103 Department of Intellectual Property (Thailand), Patent Publication No 2301003997A (11 November 2024).
104 Department of Intellectual Property (Thailand), Patent Publication No 1801002751A (24 June 2024).

No 2001000116A), digital health (Publication Nos 2301000847A and 2301003997A), infrastructure (Publication No 1901002055A), and environmental technology (Publication No 1801002751A), supporting investment in areas where hardware-software co-operation is intrinsic. It also maintains a gatekeeping function that deters pure business-method claims. On the negative side, the need to embed AI logic into hardware-framed claims may deter or distort filings from pure-software innovators. A developer of a breakthrough scheduling algorithm akin to the optimisation engine in Publication No 2101000758A may have to contrive a hardware implementation to gain eligibility, adding cost and complexity. This creates a bias toward incumbents with hardware capabilities and may dampen participation from start-ups and service-based firms, constraining Thailand's software-platform economy.

64 The cost of playing within this system is also non-trivial. Applicants often need multiple drafting iterations to anticipate examiner preferences, and post-grant opponents can exploit the formalism of the workarounds, challenging either eligibility or inventive step. This raises the stakes for smaller entities and foreign applicants less familiar with Thai practice, potentially skewing the field toward those with specialist legal and technical resources. The broader implications of these drafting gymnastics extend beyond claim construction. On one hand, allowing hardware-anchored software inventions can stimulate investment in the Internet of Things, industrial automation, and digital-health sectors – areas with significant societal and economic benefits. On the other hand, the elevated drafting complexity and legal unpredictability disadvantage pure-software innovators and start-ups, which may lack the resources to engage in iterative claim redrafting or to bear the risk of inconsistent examination. This dynamic risks entrenching incumbent hardware-focused firms and constraining the growth of Thailand's burgeoning software-services and platform economy. For Thailand to balance the stimulation of AI-driven innovation with the integrity and clarity of its patent system, it will need to address this gap directly rather than rely indefinitely on examiner-level discretion. Policymakers must thus balance the social value of a robust technical-patent regime against the potential chilling effect on standalone software innovation, mindful that an overly rigid statutory exclusion may impede Thailand's broader digital-transformation goals.[105]

105 World Trade Organization, *Trade and Digital Economy: IP Provisions in Free Trade Agreements* (2024); APEC Intellectual Property Rights Experts' Group, *Trends in Digital Economy IP* (2023).

VI. Conclusion and policy recommendations

65 By focusing on Thailand – a jurisdiction where patent law is evolving in concert with global technological advancements – this article provides a microcosm for understanding broader controversies over software patentability and offers practical insights for legislators, patent examiners, and innovators worldwide. Examining how the four drafting "workarounds" operate in real-world settings helps clarify whether they constitute stable, legitimate solutions for incentivising AI innovation or risk creating legal loopholes that undermine the underlying policy goals of patent law.

66 This article has demonstrated that, under Thailand's current statutory regime and soft-law Guidelines, skilled applicants can – and routinely do – circumvent s 9(3)'s *per se* ban on computer programs by employing four interlocking drafting workarounds: avoiding red-flag terminology, embedding physical elements, claiming concrete product outcomes, and emphasising technical aspects. Empirical review of 13 "borderline" published applications between 2019 and 2025 shows that successful claims invariably tether software to hardware and articulate a demonstrable technical effect, even when product-outcome language or specialised terminology is omitted.[106] Nevertheless, these workarounds impose significant drafting complexity, generate examiner-by-examiner unpredictability, and place pure-software innovators at a disadvantage.

67 For policymakers, the current "statute plus guidelines" approach risks ossifying a system in which substantive patentability hinges on administrative discretion rather than clear legislative criteria. We therefore recommend that Parliament enact a targeted amendment to insert a statutory carve-out for inventions that produce a "further technical effect", defined by reference to specific statutory examples (*eg*, sensor-processor-actuator loops, control-system feedback, real-time data fusion). Embedding the technical-effect test in the Act would: (a) reduce examiner variance; (b) harmonise Thai practice with the EPC, JPO and IPOS frameworks; and (c) provide greater legal certainty to domestic and foreign innovators alike.[107]

106 Dataset compiled from Department of Intellectual Property (Thailand) file histories for 13 published applications (2021–2023) under section 11.3 of the *Guidelines for Examining Patent and Petty Patent Applications* (revised 13 June 2019), showing 100% inclusion of physical elements and technical aspects, 85% product-outcome claims, and 31% avoidance of red-flag terms.

107 European Patent Convention (5 October 1973), 1065 UNTS 199, Art 52(2)(c) (entered into force 7 October 1977); European Patent Office, *Guidelines for Examination 2025* at Pt G, Ch II, section 3.6; Japan Patent Office, *Examination Guidelines for Patent and*

(cont'd on the next page)

68 For patent practitioners, the data suggest that a dual-track filing strategy remains indispensable: a "pure-algorithm" claim set for jurisdictions with permissive eligibility doctrines (US, Europe, Japan, Singapore) and a hardware-tethered set for Thailand. In prosecuting Thai applications, practitioners should front-load the specification and independent claims with detailed descriptions of sensor technologies, data-processing architectures, hardware interfaces, and control-loop methodologies, supported by quantitative performance metrics. This specification-driven approach not only aligns with the requirements in section 11.3 of the Guidelines but also helps pre-empt inventive-step objections by illustrating non-obvious technical solutions.

69 For AI innovators, the Thai landscape underscores the importance of designing inventions with hardware in mind from the outset. Rather than treating AI models as standalone software components, innovators should architect integrated systems – edge-computing modules, embedded controllers, or robotic platforms – in which the model's inferential capabilities are inseparable from physical sensors, actuators, or mechatronic subsystems. Such holistic designs do not only facilitate patentability in Thailand but often yield genuinely superior product performance and market differentiation.

70 More broadly, Thailand's experience offers lessons for national intellectual property policy in the age of AI. Excessively rigid statutory exclusions can chill innovation and distort filing behaviour, while purely administrative carve-outs sacrifice predictability. A balanced statutory framework, combining a clear "as such" exclusion with a legislated technical-effect exception and illustrative examples, can both preserve the integrity of the patent system against abstract claims and nurture genuine technical advances in AI, Internet of Things, and beyond.

Utility Model (revised 1 May 2024) at Pt III, Ch 1, section 2.2; IPOS, *Examination Guidelines for Patent Applications* (October 2023) Ch 8 at paras 8.22–8.24.