



The future of compliance: How Digital Regulations as a Platform is transforming digital governance



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Executive summary

As the Middle East advances towards becoming a global digital hub, the need for a unified, technology-driven regulatory approach has become increasingly urgent. The region faces several challenges, such as regulatory fragmentation across diverse jurisdictions, higher cost of compliance, and the increasing lag between rapid technological adoption and evolving laws.

Recognising this gap, PwC Middle East has defined the concept 'Digital Regulations as a Platform (DRaP)' aimed at digitising the regulatory compliance process that reduces reliance on traditional legal intermediaries, making legal compliance more agile, accessible and cost-effective. The key benefits of DRaP include faster digital service delivery, proactive issue resolution through simulations, and enhanced compliance automation to mitigate risks and improve efficiency. Ultimately, the adoption of DRaP promises to revolutionise legal processes, fostering greater transparency, efficiency, and accessibility across sectors.

This whitepaper provides an in-depth examination of the current and future landscape of DRaP, addressing how this innovative approach is transforming the realms of legal regulation, compliance and governance. At its core, the document analyses the foundational elements of DRaP, particularly focusing on how the integration of Rules as Code (RaC) and Compliance Management Systems (CMS) across various sectors is promoting a shift toward the automation and digitisation of regulatory frameworks.

This whitepaper discusses how DRaP is playing a key role globally in enhancing the transparency, accessibility and efficiency of regulatory compliance, emphasising how the adoption of technology-driven strategies significantly improves the interpretation and application of regulations. As per research done by CSIRO (Australia's national science agency), digital legislation can save up to 30% of compliance cost[1].

This paper also discussed the key role of AI and ML in predictive compliance and risk management, noting how these technologies contribute to the proactive adaptation of compliance systems in a changing regulatory environment.

Furthermore, this paper delves into the practical challenges that accompany the implementation of DRaP, such as the technical barriers that arise when coding discretionary laws; the complexity of developing solutions that accommodate the diversity of legal interpretations; and the financial considerations that particularly impact small and medium enterprises (SMEs).

In its conclusion, the paper contemplates the balance between the benefits and potential pitfalls of DRaP. It calls for robust ethical guidelines and accountability measures to navigate this new digital frontier, asserting that such governance will be crucial for ensuring effective governance while maintaining the stability and integrity of regulatory environments in the digital age.

Introduction

With technological advancements driving the emergence of digital regulatory activities, regulators worldwide must adapt to stay aligned [2]. This is where Digital Regulation as a Platform comes in.

A concept to digitise regulatory activities on platforms via rule-based algorithms, DRaP has the potential to revolutionise regulatory compliance and enforcement. The concept stems from the term Regulations as a Platform (RaaP) and focusses on digitisation of regulations. RaaP refers to a comprehensive approach in which regulators, private and government entities, and citizens work together to foster innovation and enhance regulatory compliance.

RaaP was first developed in Australia by Data 61, an entity within the Commonwealth Scientific & Industrial Research Organisation (CSIRO) wherein the platform offered 'free and open access to legislation and regulation via public APIs, enabling users to access a database of endorsed logic rules and a reasoning engine to process these rules and data into accessible digital logic' [3].

The RaaP workflow translates regulations into digital logic, ensuring alignment with regulations. Following quality checks, regulatory documents are approved by regulators and made publicly available on the Regulation as a Platform prototype.

With the emergence of new and advanced technologies, there has been a growing need for the compliance and enforcement of digital regulations, which has led RaaP to evolve into DRaP. Still in an early stage of development, DRaP relies on elements such as Rules as Code (RaC) and Compliance Management Systems (CMS) to maintain efficacy. RaC translates regulatory instruments into machine-consumable code for automated compliance [4], while CMS helps organisations enforce and monitor legal requirements [5] [6].

This paper analyses the adoption of Digital Regulation as a Platform, key challenges, and future implications across the public and private sector while also examining the roles of RaC and CMS in regulatory practices.

DRaP journey

The concept of DRaP originates from collaborative efforts between legal and computing science experts in the 1980s, aiming to automate regulations by digitising laws using Prolog programming language¹ [7] [8]. Though encountering hurdles, the initial attempts demonstrated the potential of logical approaches in rule-based implementation of regulations across the platforms. This led to the growth of foundational elements of RaaP like Rules as Code (RaC) which could convert regulations rules into machine-consumable logic, and Compliance Management Solutions (CMS) which could help organisations enforce and monitor legal requirements digitally.

Despite obstacles and technological limitations hindering widespread adoption, recent interest in RaC has reignited global attention. For example, in UAE the Ministry of Finance (MoF) in partnership with Artificial Intelligence, Digital Economy, Remote Work Applications Office, and Mohammed Bin Rashid Centre for Government Innovation (MBRCGI), launched an RaC platform to digitise financial legislations and policies.

Similar initiatives in New Zealand, Canada, and France, emphasise the renewed interest in RaC.

Simultaneously, the historical context of CMS is crucial. Traditionally, industries relied on manual paperwork for regulatory compliance [10]. The evolution of CMS, especially in RegTech, has progressed through three distinct phases: from risk monitoring (RegTech 1.0) to compliance management (RegTech 2.0) to advanced analytics and AI-driven solutions (RegTech 3.0) Fig 1.0 [11].

This evolution has set the stage for the integration of RaC and CMS into regulatory technologies and digital platforms to form RaaP model, which has enabled the regulators to unlock the wealth of data to better monitor risks, enhance their supervisory role, and increase business process efficiency.

Furthermore, the upcoming phase of RegTech (RegTech 4.0) which focuses on open-source compliance and embedded RegTech, will set the stage for the evolution of RaaP into DRaP by completely intertwining RegTech, digital platforms and regulations.

RegTech evolution journey

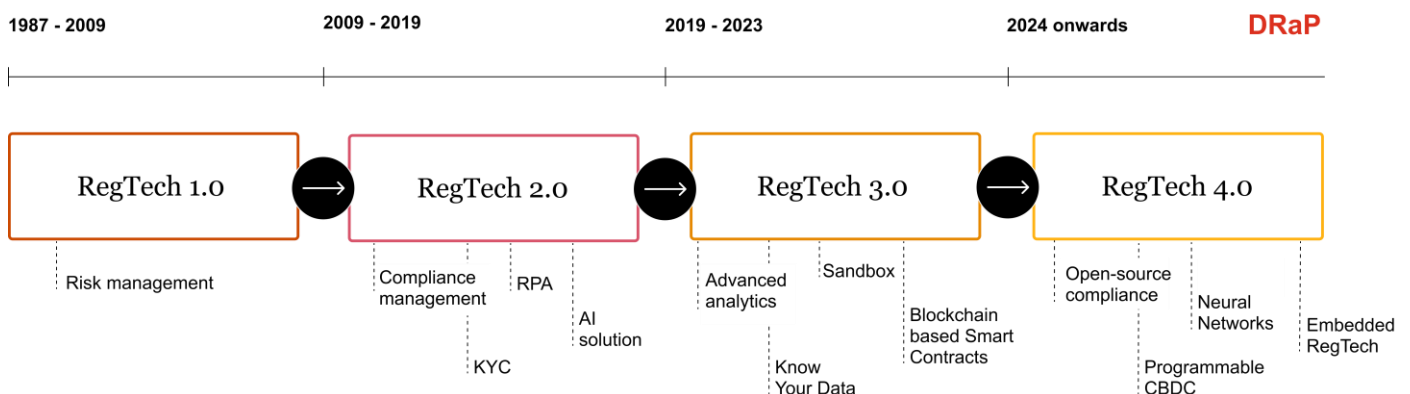


Fig 1.0

The emergence of DRaP will open up avenues for the creation of innovative applications for both regulators and businesses. By incorporating "machine-consumable legislation" as a new data feed into this existing infrastructure, DRaP will help regulators make better decisions, resulting in improved outcomes for all stakeholders.

¹Prolog is a powerful and flexible programming language that's well-suited for developing logic-based artificial intelligence applications.

DRaP concept

Regulatory systems are often complex, subject to change and difficult to navigate for the regulated entities (e.g. businesses, startups, MSMEs) costing time, money, and ultimately reducing productivity. Moreover, the regulatory landscape is increasingly getting more and more convoluted due to new regulations and emerging compliance requirements arising from evolution in technologies [12][13]. This calls for a solution to:



Facilitate interactions with different regulators.



Help reduce the compliance burden, manage complexity and save users time and cost.



Standardise interpretation of regulations by building a common understanding.



Increase speed from policy to compliance.

DRaP is adopted to manage this complexity, mitigate compliance risks, and ensure resilience [14]. It aims to deliver efficient, user-centric digital services by ensuring consistent application of rules and legislation. It provides businesses with an easy-to-use interface to verify regulatory obligations, reducing burdens [15].

DRaP bridges the gap between policy intent and implementation by making legislation machine-consumable, ensuring highly reliable interpretations and reducing the risk of misunderstanding legislative text [16]. Through its core foundational elements, it automates tasks, monitors in real-time, and streamlines processes, enhancing productivity and transparency.

Digital Regulation as a Platform is comprised of two key elements:

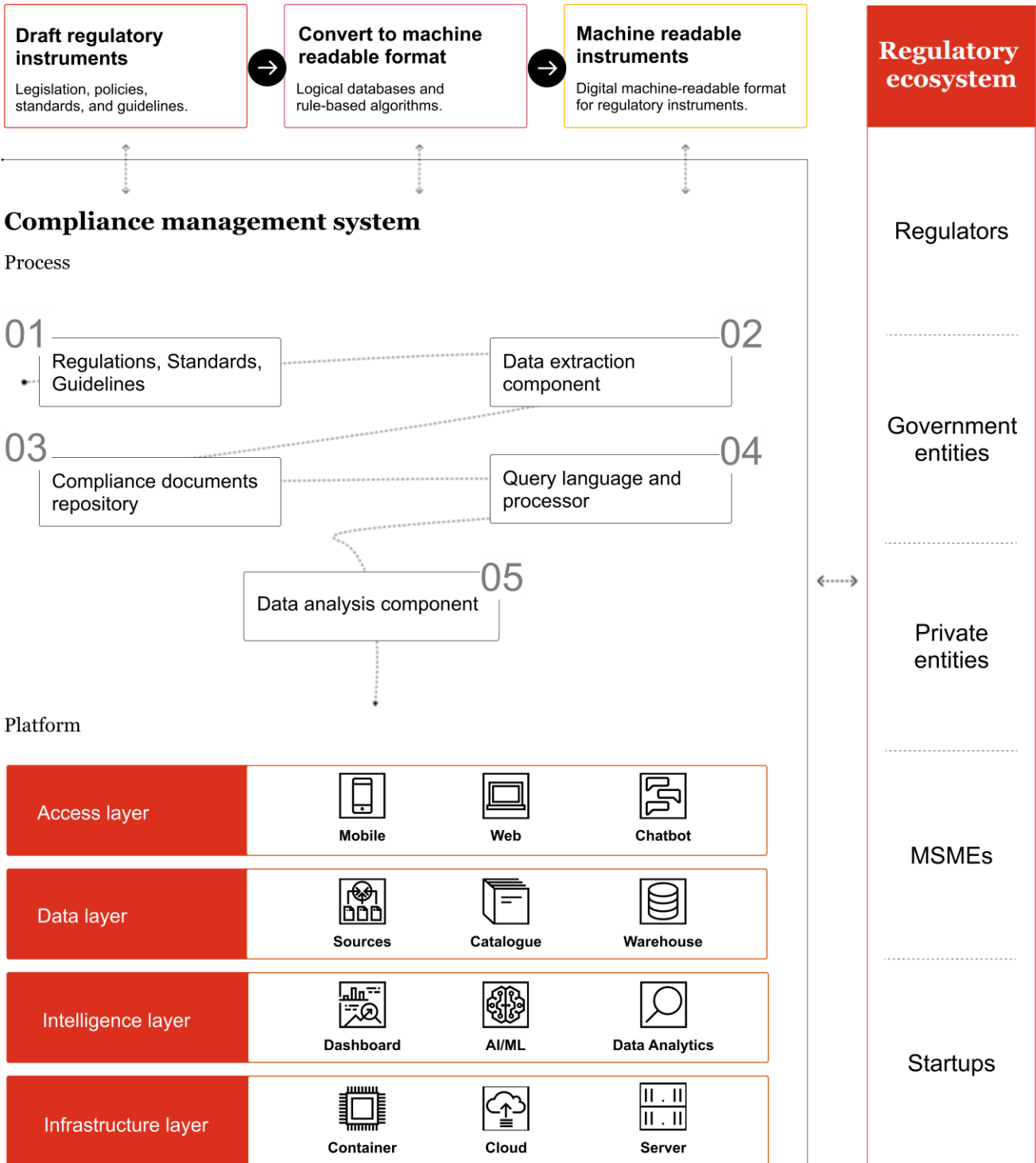
01 Rules as Code (RaC)

RaC converts regulatory rules into machine-consumable logic to capture the intent and operation of regulation and standardise interpretation [4].

02 Compliance Management System (CMS)

CMS helps organisations enforce and monitor legal requirements, in order to quality check these rules and endorse them for publication on an open platform [5].

Rules as a code



Together, both these components enable DRaP to assist entities in quickly identifying specific obligations for their business activities, as well as supporting decision making on compliance. Additionally, DRaP acts as a tool to check compliance for entities when regulation changes occur or when considering new activities or products.

DRaP helps the governments build an independent platform that is controlled by the regulator and works for all stakeholders. As per research done by CSIRO, digital legislation can save up to 30% of compliance cost [1].

The emergence of digital legislation and DRaP opens up avenues for the creation of innovative applications for both regulators and businesses by adding "machine-consumable legislation" as a new data feed to the existing infrastructure. Further, combining DRaP with data analytics can foster the development of digital compliance solutions to help regulators make better decisions, leading to improved outcomes for all stakeholders [17].

The benefits from DRaP can be categorised into three types:

1

Automating the digital regulations

- a Digital regulations can be converted into business rules through machine learning and rule-based algorithms.
- b Enable integration of metadata to consolidate the regulations from different legislations, policies, standards, frameworks and guidelines.

2

Enhance regulatory compliance

- a Implement an alert system for the organisation to assess potential regulatory compliance issues. This system enables real-time responses, adding certainty and traceability to compliance processes by incorporating automation into workflows.
- b Use business rules and compliance workflows to ensure that data governance is implemented, enforced and monitored.

3

Increase awareness of stakeholders

- a Data owners can push the business rules to the cloud for the benefit of all relevant stakeholders.
- b Increasing awareness of significant regulatory events that impact organisation's operations, thereby reducing ambiguity and mitigating risks.

As the technology continues to advance, DRaP is set to revolutionise regulatory compliance, monitoring and enforcement. The implementation of DRaP, particularly in its current forms of RaC and CMS, has already enhanced regulation interpretation and driven efficiency in compliance management across the private sector.

DRaP use cases

The following case studies highlight the integration of Digital Regulation as a Platform, through its operational components, into diverse initiatives, showcasing their impact on enhancing transparency, efficiency, and accessibility in regulatory processes:

Case in Point - Financial Conduct Authority (FCA) UK Smart Regulatory Reporting [15]

In 2018, the Financial Conduct Authority (FCA) and Bank of England (BoE) jointly developed the Digital Regulatory Reporting (DRR) project to reduce the regulatory reporting burden on firms.

The project explores how FCA can automate and streamline various aspects of the

regulatory re-porting process by analysing the entire reporting lifecycle.

This project has relied heavily on automating reporting through machine readable regulation (MRR) and machine-executable regulation (MER). MRR refers to coded regulation that can be interpreted by software, while MER refers to coded regulations that are executable by software.

—→ 2018

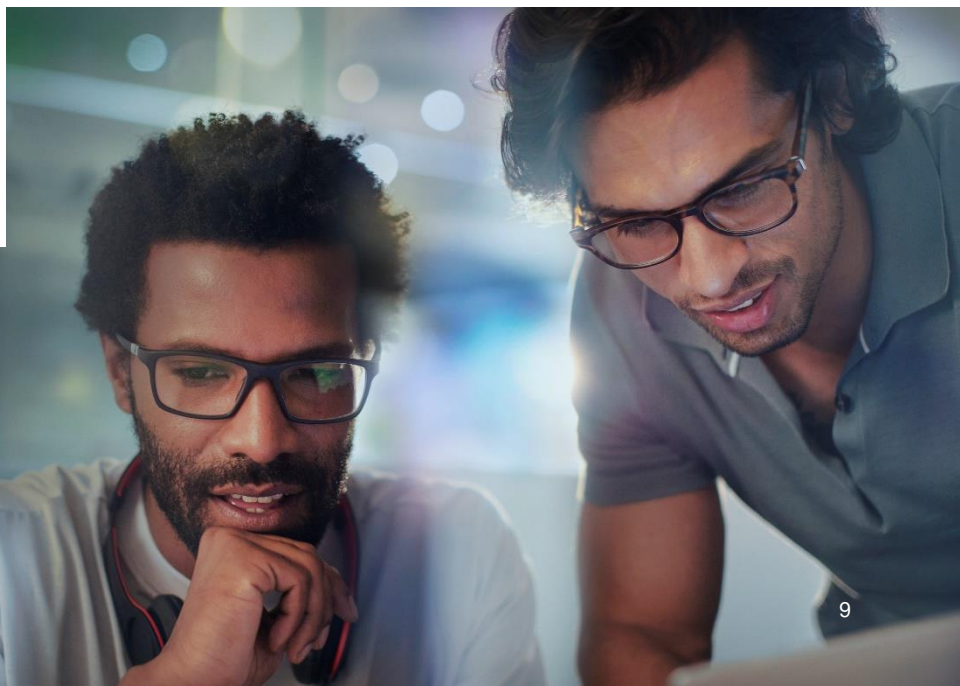
The focus of this phase was to explore how the regulatory reporting process could be automated by writing regulations in a MER format.

—→ 2019

The focus of this phase was to determine how Domain Specific Languages (DSLs) could be leveraged to generate MER and to assess the viability of DRR by modelling the cost-benefit business case for multiple implementation scenarios.

—→ 2020 – Present

Phase three establishes the foundational requirements necessary to eventually create MRR and MER. It also introduces immediate changes to the data requested by the regulator and how this data is used in both new and existing areas of regulation.



Other use cases

Smart contracts for Australian businesses



CSIRO's Data 61 has formed a consortium with Herbert Hills Freehills and IBM to build legal contracting blockchain platform called the Australian National Blockchain (ANB). This platform will enable business to digitise legal contracts and exchange data relating to those contracts, to meet Australian legislative requirements [18].

Ministry of Solidarities and Health (France)



The 'My Social Rights' platform, created by the French government, includes a simulator with machine-consumable Rules as Code. It informs citizens about eligibility for 58 types of financial aid schemes. Users can determine their eligibility through the platform and then apply for relevant aid with the corresponding authority [19].

Barcelona City Council (Spain)



The DRaP platform from Barcelona City Hall enables users to check their eligibility for aid and benefits using machine-consumable legal texts. It covers 24 types of financial aid benefits. Users answer questions that are cross-referenced with the rules as code to determine their eligibility for financial aid [20].

Direct Federal Credit Union (USA)



Direct Federal Credit, a not-for-profit banking service provider, previously managed compliance through decentralised delegation, posing organisational challenges. To address this, the bank implemented a centralised CMS, resulting in a 50-80% reduction in compliance research time and a 20% decrease in day-to-day compliance efforts [21].

ITC Limited (India)



ITC, a leading Indian conglomerate [22], initially managed compliance manually, leading to errors, inconsistencies, and high compliance costs. By adopting a CMS, ITC automated compliance processes, reducing time and effort. Automation enabled ITC to identify and mitigate compliance risks efficiently [23].

Key insights

These case studies demonstrate the transformative influence of DRaP across both public and private sectors. They showcase how the integration of RaC and CMS effectively streamlines processes, reduces compliance, and empowers organisations to optimise operations while achieving their objectives, regardless of industry or scale. Furthermore, the adoption of DRaP fosters innovation and adaptability, positioning organisations to thrive in an ever-evolving regulatory landscape.

DRaP benefits



Aid eligibility assessment

A key trend involves providing Rules as Code (RaC) as a public service to aid citizens in understanding complex legal texts governing aid eligibility. Simple interfaces use machine-consumable rules to create tools and calculators for accessing government services, like eligibility assessment and benefit calculation [24]. This approach has been highly prevalent in Spain and France [25] [26].



Leveraging AI and ML

AI and ML algorithms revolutionise DRaP by analysing data to identify patterns, assess risks, and predict compliance issues. They improve decision-making with real-time insights, automate tasks, and boost efficiency in compliance management. As regulations evolve, AI and ML algorithms ensure adaptive and proactive compliance systems [32].



Scalable solutions

Through adoption of cloud technology, DRaP regulatory solutions offer scalability, flexibility, and accessibility, allowing organisations to adapt to changing compliance needs. The platform promotes collaboration among geographically dispersed teams, providing real-time access to compliance data, and are scalable for businesses of all sizes, streamlining compliance management across diverse regulatory frameworks [33].



Compliance as Code (CaC)

CaC automates compliance checks, streamlining processes and reducing manual intervention. With organisations facing regulatory standards across diverse industries like banking regulations (e.g., Payment Card Industry Data Security Standard for secure maintenance of credit card data) and data regulations (e.g., GDPR for proper handling of personal data) compliance is crucial for maintaining trust and reputation [27]. Various CaC tools such as Open Policy Agent (OPA), and HashiCorp Sentinel [28] [29] [30] [31] integrate into business systems, ensuring adherence to regulations and standards.



Emphasis on data security

With the surge in data volumes handled by organisations, prioritising data compliance, particularly in cases of cross-border data transfer, has become imperative. This surge is driving the increased adoption of DRaP. Specifically, CMS serves as a vital tool for organisations to align with data regulations like GDPR. By leveraging CMS functionalities, organisations can proactively ensure compliance, mitigating risks associated with data management and reinforcing a secure and accountable approach to handling sensitive information [34].

DRaP adoption challenges

Despite the numerous benefits associated with DRaP, its widespread adoption at an international level faces challenges in its implementation. When viewed through the lens of RaC and CMS, it becomes evident that certain barriers hinder the seamless

integration of these innovative regulatory approaches. Understanding the specific challenges and potential solutions can provide valuable insights into overcoming obstacles and fostering the broader acceptance and adoption of DRaP.



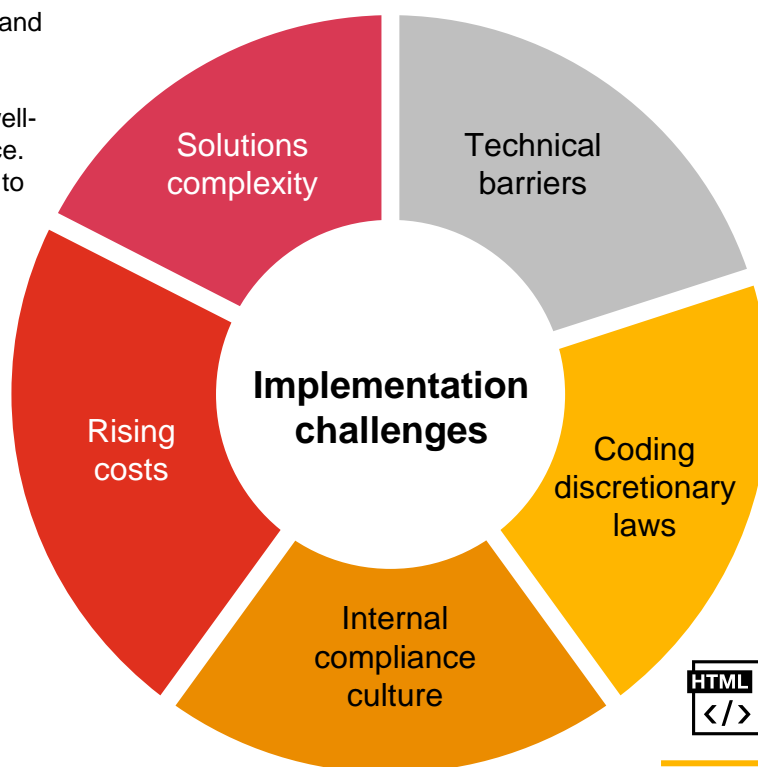
Solutions complexity

The complexity of DRaP and some CMS solutions can hinder implementation, especially for those not well-versed in legal compliance. This complexity can lead to errors, frustration, and decreased efficiency, making it challenging to effectively manage legal compliance [39].



Technical barriers

While DRaP can be a powerful tool, it has its limitations. Understanding regulatory intervention is something that requires human expertise and calibration. People who are responsible for drafting rules don't have the technical skills to explore this space [35].



Rising costs

The cost of deploying DRaP and CMS, especially amid new regulations, places a heavy financial burden on organisations, particularly SMEs. This may raise questions about the value of these digital compliance solutions versus manual compliance methods, with a focus on finding the most cost-effective approach for SMEs [38].



Coding discretionary laws

Translating legislation into machine-consumable code for RaC is more effective with specific and clear rules. Guidelines that minimise uncertainty are easier to automate, while rules open to interpretation or discretion pose challenges due to their subjective nature [36].



Internal compliance culture

Investing in DRaP and CMS does not automatically resolve all compliance challenges. To ensure full compliance, a culture shift led by top management is necessary, integrating compliance into every aspect of decision-making [37].

Future implications

DRaP holds the potential for both positive and negative implications, offering transformative opportunities for various stakeholders involved, while also raising important legal and ethical concerns.

Positive implications



Enhanced legal understanding

By translating legislative rules into machine-consumable code, RaC can improve legal understanding, making laws easier for citizens, businesses and other stakeholders to comprehend and apply [40] [41].

Streamlined compliance

By using APIs from regulators, businesses can automate compliance updates through RaC, significantly reducing the time and cost of manually tracking regulatory developments [42].

Reduced intermediaries

The rise of DRaP indicates a shift towards less reliance on intermediaries in the legal field, as digital technologies like RaC make rules more accessible, reducing the need for expensive legal professionals and lower legal service costs [43].

Accelerated service delivery

The adoption of DRaP, through codifying rules with RaC, can expedite service delivery by addressing potential issues like unclear legislation. This leads to faster and more efficient service delivery for both citizens and government officials [44].

Reduced policy amendments

Governments can conduct computer simulations on codified laws to identify and resolve potential issues before publication. This proactive approach reduces the need for future amendments and enhances the legislative process's effectiveness and efficiency [45].

Reduced risk of non-compliance

The adoption of DRaP is expected to reduce the risk of non-compliance for businesses by automating compliance tasks, enabling companies meet their obligations thereby minimising the administrative burden on public agency for fines or legal actions due to non-compliance [46].

Streamlined collaboration and communication

CMS is expected to enhance collaboration among departments like legal, IT, and operations, aligning stakeholders on compliance objectives, leading to smoother workflows, improved coordination, and more effective compliance strategies within organisations [47].

Negative implications



Legal and ethical implications

The integration of DRaP raises legal and ethical considerations, prompting questions about its suitability and measures to prevent misuse. As the DRaP concept reshapes the landscape of law creation, delivery, and enforcement, it carries profound implications on how users interact with regulations [48].

Reduced accountability

The adoption of DRaP and RaC raises accountability concerns, as companies could shift responsibility for biased or harmful outcomes, arguing companies were following encoded rules. This highlights the need for clear accountability mechanisms to ensure companies are not absolved of their ethical and legal obligations if their systems cause harm, despite following the coded rules [49].

Discrepancies between legal text and code

To manage potential discrepancies between coded and natural language versions of regulations, an official version must be designated. Additionally, a dispute resolution mechanism should be established to prevent confusion among businesses that rely on government-provided coded regulations for compliance [50].

Financial repercussions

Non-compliance with regulatory standards, like GDPR, can lead to fines, potentially up to 4% of a company's annual revenue. In the context of DRaP, if CMS fails to adapt to evolving regulations or lacks sufficient human oversight, the financial risks of non-compliance could increase. Regularly updating CMS and ensuring robust oversight mechanisms are crucial to mitigate these risks [51] [52].

Key insights

DRaP signifies a shift towards decreased reliance on legal intermediaries, making legal services more accessible and cost-effective. Expedited digital service delivery, proactive issue resolution through simulations, and enhanced compliance automation mitigate risks and improve efficiency. However, integration raises accountability and ethical concerns, necessitating clear mechanisms for accountability and conflict resolution. Ensuring oversight of CMS updates is crucial to mitigate financial risks associated with non-compliance. Ultimately, the adoption of DRaP promises to revolutionise legal processes, fostering greater transparency, efficiency, and accessibility across sectors.

What's next

The evolving landscape of Digital Regulation as a Platform represents a digital transformation in regulatory practices, driven by technological advancements and the necessity to adapt to a digital age. As explored throughout this whitepaper, DRaP encompasses various components, with RaC and CMS at its core, aimed at enhancing transparency, efficiency, and accessibility in regulatory processes.

By examining the implementation of DRaP in both public and private sectors, it is evident that the utilisation of DRaP poses significant benefits in streamlining compliance and reducing the risk of regulatory breaches. As these use cases demonstrate, the integration of DRaP is not only feasible but also essential for navigating the complexities of modern regulatory environments.

Looking ahead, DRaP holds promising outcomes in enhancing legal understanding, streamlining regulatory compliance, and accelerating digital service delivery. By leveraging RaC and CMS, stakeholders can anticipate more efficient and transparent regulatory processes, reducing the risk of non-compliance and fostering collaboration. However, challenges such as legal and ethical implications, reduced accountability, and discrepancies between legislative text and code must be addressed to ensure responsible adoption and mitigate potential risks.

Ultimately, the future implications of DRaP depend on how effectively its components are integrated and how regulatory bodies and organisations navigate the evolving landscape of compliance management. As technology continues to advance, the role of DRaP in shaping the regulatory environment will be crucial in ensuring effective governance and accountability in the digital age.

Contributors



Fadi Komati

Senior Partner, Technology Consulting, PwC Middle East

✉ fadi.komati@pwc.com



Amit Bisht

Director, Digital Government and Regulations, PwC Middle East

✉ amit.bisht@pwc.com



Joseph Abboud

Partner, Technology Consulting, PwC Middle East

✉ joseph.abboud@pwc.com



Shashank Singh Rathore
























Senior Manager, Digital Government and Regulations, PwC Middle East






























✉ shashank.x.rathore@pwc.com

List of abbreviations

CSIRO	Commonwealth Scientific & Industrial Research Organisation
RaaP	Regulations as a Platform
DRaP	Digital Regulations as a Platform
AI	Artificial Intelligence
API	Application Programming Interface
CaC	Compliance as Code
CMS	Compliance Management Software
RPA	Robotics Process Automation
GDPR	General Data Protection Regulation
ML	Machine Learning
OPA	Open Policy Agent
PCI DSS	Payment Card Industry Data Security Standard
RaC	Rules as Code
RegTech	Regulatory Technology
CBDC	Central Bank Digital Currency
MSME	Micro, Small and Medium Enterprise

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