

The Government Cloud Content Management Platform Is An Enabler For The Creative Content Industry In Malaysia

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ABSTRACT

With the advent of digitalization, the traditional process of managing creative content has become irrelevant due to its inability to handle the increasing volume of content generated and consumed daily. The amount of stored content is overwhelming conventional approaches, especially in local environments where digital content processing struggles to keep pace with the exponential volume of digital assets. Recognizing the need for a transformative solution, the adoption of cloud content management platform has emerged as a pillar in the quest for efficient content handling. The platform is designed to not only cope with the burgeoning content landscape but to thrive in it, serving as a catalyst for digital transformation across industries and boost digital experiences. Supported by visionary digital leadership, cloud content management promises to usher in a new era of digital experiences, revolutionising how organisations manage their valuable content assets. Within the landscape of digital evolution, Malaysia's very own Creative Content Unit in RTM (Radio Televisyen Malaysia) has been at the forefront of this paradigm shift. RTM's pioneering endeavour includes the successful implementation of the Electronic Television Content Management System (eTVCMS), a cloud content management platform that has redefined content procurement management. This transition has enabled RTM not to only adapt to the ever-shifting content demands but also excel in this dynamic environment. The advantages offered by the eTVCMS are multifaceted. Its scalability empower RTM to efficiently manage the relentless influx of content while maintaining a keen edge in an industry where RTM adapt to changing demands, collaborate effectively, enhance security and gain competitive edge in the dynamic media landscape. This cloud-based system fosters a culture of seamless collaboration, closing geographical boundaries and empowering content creators, editors and producers to collaborate harmoniously. This transition to cloud aligns with broader industry trends and signifies a groundbreaking change in how media organisations manage their content. It also pivotal not only to RTM but for entire media industry as it navigates the complexities of the digitalisation, embracing innovation, efficiency, and audience-centric content delivery. As we navigate the complexities of digitalisation, this article embarks on a journey to share profound insights into how cloud content management not only revolutionises RTM's content handling but also underpins its digital transformation journey, contributing to a personalised digital experience for the content industry. This transformation extends beyond operational efficiencies; it transcends into a real of personalised digital experiences that resonate with the ever-evolving creative content industry. This article provides a compelling narrative of how the Government Cloud Content Management is more than an enabler, it's a catalyst for the future of the creative content industry in Malaysia.

Keywords: *Digitalization; Content Management; Digital Experience; Creative Content; Transformation*

Platform Pengurusan Kandungan Perkomputeran Awan Kerajaan Adalah Pemboleh Daya Untuk Industri Kreatif Di Malaysia

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ABSTRAK

Dengan kemunculan digitalisasi, proses pengurusan kandungan kreatif telah menjadi tidak relevan kerana ketidakupayaannya untuk mengendalikan kandungan tradisional yang dihasilkan dan digunakan setiap hari. Jumlah kandungan yang disimpan membanjiri pendekatan konvensional, terutamanya dalam persekitaran tempatan di mana pemprosesan kandungan digital mengalami kesukaran untuk mengekalkan selaras dengan jumlah aset digital yang berkembang dengan pesat. Mengiktiraf keperluan untuk penyelesaian yang mengubahsuai, platform pengambilan pengurusan kandungan awan telah muncul sebagai tiang dalam usaha untuk mengendalikan kandungan secara efisien. Platform ini direka untuk tidak hanya menangani landskap kandungan yang berkembang tetapi juga berkembang dengan cemerlang di dalamnya, berperanan sebagai pemangkin untuk transformasi digital di seluruh industri dan meningkatkan pengalaman digital. Dibantu oleh pemimpin digital yang berwawasan, pengurusan kandungan awan berjanji untuk membawa era baru pengalaman digital, merevolusikan bagaimana organisasi menguruskan aset kandungan berharga mereka. Dalam landskap evolusi digital, Unit Kandungan Kreatif Malaysia sendiri di RTM (Radio Televisyen Malaysia) telah berada di barisan hadapan perubahan paradigma ini. Usaha pionir RTM termasuk pelaksanaan berjaya Sistem Pengurusan Kandungan Televisyen Elektronik (eTVCMS), platform pengurusan kandungan awan yang telah memaknai semula pengurusan pengadaan kandungan. Transisi ini membolehkan RTM tidak hanya menyesuaikan diri dengan permintaan kandungan yang sentiasa berubah tetapi juga unggul dalam persekitaran dinamik ini. Kelebihan yang ditawarkan oleh eTVCMS ialah pelbagai. Keupayaannya untuk membolehkan RTM menguruskan aliran kandungan yang tidak dikenali dan mengekalkan keunggulan yang tajam dalam industri di mana RTM menyesuaikan diri dengan permintaan yang berubah, berkolaborasi secara efektif, meningkatkan keselamatan, dan memperoleh keunggulan kompetitif dalam landskap media yang dinamik. Sistem berasaskan awan ini membina budaya kerjasama yang lancar, menutup sempadan geografi dan memberdayakan pencipta kandungan, penyunting, dan pengeluar untuk bekerjasama secara harmoni. Transisi ke awan ini selaras dengan tren industri yang lebih luas dan melambangkan perubahan baharu dalam bagaimana organisasi media menguruskan kandungan mereka. Ia juga penting bukan hanya untuk RTM tetapi untuk seluruh industri media apabila ia menavigasi kompleksiti digitalisasi, merangkul inovasi, kecekapan, dan penyampaian kandungan yang berorientasikan kepada penonton. Sementara kita menavigasi kompleksiti digitalisasi, artikel ini memulakan perjalanan untuk berkongsi wawasan mendalam tentang bagaimana pengurusan kandungan awan bukan sahaja merevolusikan pengendalian kandungan RTM tetapi juga menyokong perjalanan transformasi digitalnya, menyumbang kepada pengalaman digital yang dipersonalisasi untuk kandungan industri. Transformasi ini melampaui kecekapan operasi; ia melangkah ke dalam realiti pengalaman digital yang dipersonalisasi yang selari

dengan industri kandungan kreatif yang sentiasa berkembang. Artikel ini memberikan naratif yang meyakinkan tentang bagaimana Pengurusan Kandungan Awan Kerajaan bukan hanya sebagai pemboleh, tetapi sebagai pemangkin bagi masa depan industri kandungan kreatif di Malaysia.

Kata kunci: *Pendigitalan; Pengurusan Kandungan; Pengalaman Digital; Kandungan Kreatif; Transformasi*

INTRODUCTION

Cloud computing has emerged as a transformative force in the realm of technology, offering Internet-based access to shared computing resources, software applications, and data repositories. In recent years, the adoption of cloud-driven solutions has witnessed unprecedented acceleration, driven, by the global upheaval as a result of the COVID-19 pandemic. Organisations across diverse sectors have turned to cloud technologies to not only weather the challenges posed by the pandemic but also to innovate and thrive in an increasingly digital world. The integration of cloud-based solutions into the operations of Governments and Industries is nothing short of pivotal. It symbolised the confluence of government vision, technological innovation and imperative for economic growth and competitiveness.

The Government of Malaysia has been a proactive advocate for this digital shift, adopted a cloud-first policy through MyDigital, the Malaysia Digital Economy Blueprint, which aims to modernise and increase the efficiency of the government delivery system (Malaysia G. o., 2021). The MyDigital programme represents the government's desire to use digitization to make Malaysia a regional leader in the digital economy. In tandem with MyDigital, the Malaysian Cloud Computing Initiative (MyCCI), another government-led programme that aims to promote cloud computing usage among Malaysian enterprises and government agencies. These strategic initiatives reflect Malaysian government's commitment to promoting cloud computing and digital transformation as a means of boosting economic growth and improving the country's competitiveness in the global market.

In response to the initiatives, Radio Televisyen Malaysia (RTM), a Malaysia national broadcaster, has embraced a cloud transformation of TV content acquisition by digitalizing end-to-end business processes through the Electronic Television Content Management System (Malaysia J. P., n.d.). eTVCMS marks a pivotal shift from traditional, time consuming and paper based content proposal submissions to an agile, end-to-end digital workflow. Creative industry players can now seamlessly submit proposals and navigate and complete the entire tender process within the digital realm. This transformation, embodied by eTVCMS hold a promise of being a significant enabler for the dynamic creative content industry in Malaysia. The successful integration of cloud content management platform within governmental institutes sets a precedent for the broader field of technology adoptions and digital transformation. Within the landscape, the creative content industry emerges as a focal point, benefiting immensely from the agility and efficiency that cloud based solutions can provide. By embracing the cloud, creative industry players can navigate a digital realm that empowers them to collaborate seamlessly, enhance productivity, and ensure the confidentiality and integrity of their valuable content assets.

Cloud computing represents a paradigm shift that transcends traditional silos of computing resources includes applications, computing, storage, networking, development, and deployment platforms, as well as business processes. It transforms isolated computing assets

into shared pools of resources underpinned by the vast expanse of the Internet to maintain data and applications (Hurwitz, Kaufman, & Halper, 2012). By centralising storage, memory, processing and bandwidth, cloud computing offers more efficient and scalable approach to technology utilisation.

Within the cloud computing ecosystem, services such as Infrastructure as a Services (IaaS), Platform as a Services (PaaS) and Software as a Services (SaaS) empower organisations with diverse solutions. Various stakeholders, including End-Users who benefit from cloud services without needing in-depth technical knowledge, Business Management who needs to take responsibility for overall governance data or services, and Cloud Service Providers who are responsible for Information Technology assets and maintenance, contribute to the dynamic landscape of cloud computing.

At its core, the Cloud Content Management Platform exemplifies the potential of cloud computing to tailor and customise workflows, foster collaboration, and enable seamless content production, management, and dissemination. The platform makes use of cloud computing to offer a sustainable, scalable, and secure way to manage digital assets through a centralised repository. By keeping content in the cloud, the platform eliminates the need for local storage and provides instant access to assets from any location, at any time, on any device with an Internet connection. This accessibility and flexibility greatly enhance productivity and efficiency and address all the business requirements, including the acquisition of creative content, which can be handled efficiently with high confidentiality and integrity. It provides a centralised repository for storing and managing digital assets, which helps creative industry players collaborate and access the content as and when needed.

The COVID-19 pandemic has accelerated the adoption of cloud-driven transformation across industries. The survey by Harvard Business Review Analytic Services on October 2021 revealed that organisations are increasingly familiar with their cloud strategy and adoption rates (Carlson, 2021). The journey towards cloud adoption is characterised by two distinct approaches; full scale transformation and partial implementation. Cloud adoption is a core component of digital transformation. Organizations must align modern technology and current economic models with business strategies. Transformation requires a new approach that balances cost and technology choices with company direction and client consumption models (Jackson & Goessling, 2018).

Cloud computing has emerged as a force of innovation and resilience for organisations worldwide. Its transformative impact extends beyond technology, reaching into the very of business operations. The subsequent sections of this article will delve deeper into the specific benefits and implications of cloud content management, emphasizing its capacity to drive revenue growth and help organisations achieve their strategic objectives.

The benefits of cloud computing are summarised below in Table 1 (Dar, 2018):

Table 1: Benefits of Cloud Computing

Impacts	Advantages
Reduced cost	Resources are acquired when needed and only paid for when used, as the billing model works as per usage with no up-front cost.
Unlimited scalability	Flexibility to scale up or scale down as per the needs and future demands

Flexibility	Easy testing and deployment of the services and meeting the changing business demands by providing various services
Better mobility	Access the services of the cloud anytime, anywhere, from a variety of devices.
Improved communication	Improved communication and collaboration among employees via joint work on documents and projects
Reliability	The services are available anytime and can be accessed with backup and recovery technology.
Increased storage	Companies can store a lot more data on the cloud than on their local devices.
Easier upgrade	It is the responsibility of cloud providers to upgrade the infrastructure and services for their customers.
Disaster recovery	Companies need not frame a complex disaster or failure recovery plan as the service providers take care of such issues.
Security	Important factor for choosing the cloud provider as companies can adhere to their security policies to ensure their data is safe.

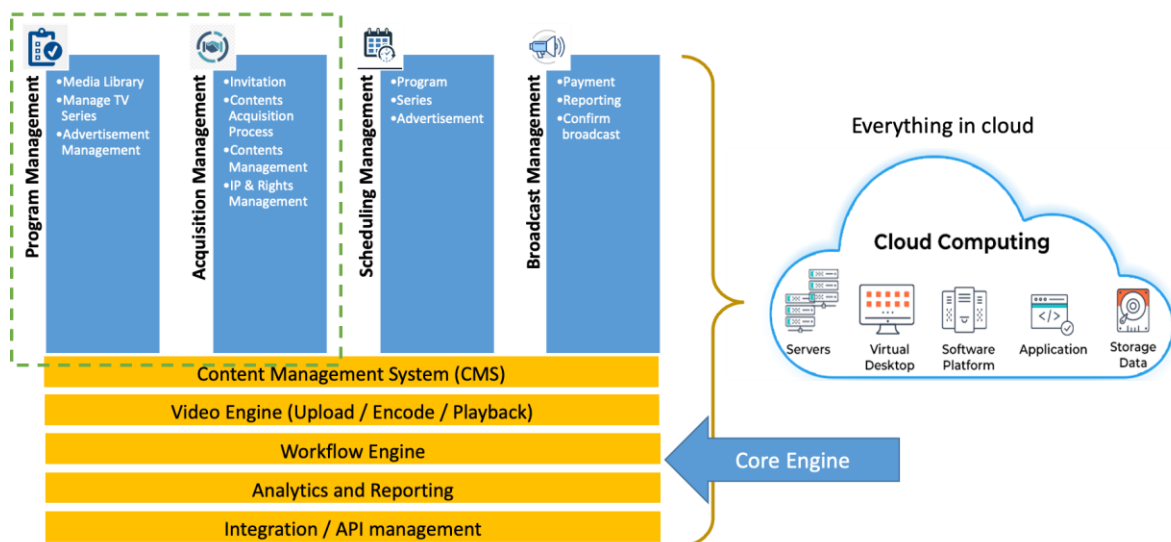


Figure 1: High Level Eco System Broadcast Architecture

This article seeks to elucidate the transformative capabilities of cloud computing, with a specific focus on its applications within the realm of government operations and creative content industry. By examining the adoption of cloud content management platforms, we aim to underscore how cloud technologies are reshaping the way government deliver services and how creative content stakeholders interact with their digital assets. We aim to highlight Malaysia’s visionary approach and how it is positioning itself as a regional leader in the digital economy. Moreover, we aim to showcase the concrete steps taken by RTM in embracing cloud technologies through eTVCMS as a pioneering example.

To achieve the aforementioned purposes, this article sets forth the following objectives:

- Examine MyDigital and MyCCI Initiatives: We will delve into the core objectives and strategies outlined in the Malaysia Digital Economy Blueprint (MyDigital) and the

Malaysia Cloud Computing Initiative (MyCCI). This examination will provide a comprehensive understanding of Malaysia's governmental approach to digital transformation

- Analyse RTM adoption of Cloud Content Management: By focusing on RTM implementation of eTVCMS, we aim to provide a detailed case study of how a prominent Malaysian Institution has embraced cloud-based content management to streamline operations and support the creative content industry
- Highlight the Benefits of Cloud Content Management: Our article will elucidate the tangible advantages of cloud content management platforms, emphasizing their potential to enhance collaboration, efficiency, security and accessibility in content-related workflows
- Explore the broader implications: We will explore how the adoption of cloud technologies within the government and creative content industry can have broader implications for Malaysia economic growth, competitiveness and its standing in the global digital marketplace

In essence, this article serves as an insightful exploration of transformation journey Malaysia takes through cloud-driven digitalisation and its pivotal role in enabling the creative content industry. Through a multifaceted analysis, we aim to illuminate the path that not only Malaysia but also other nations and industries can transverse to unlock the potential of cloud computing and digital transformation.

LITERATURE REVIEW

In the era of digital transformation, government agencies are struggling with managing the rigorous content acquisition efficiently, especially when dealing with extensive creative libraries. The existing workflow and infrastructure are inadequate to support the efficient and seamless review of extensive creative content libraries, resulting in delays, inefficiencies, and potential missed opportunities. This literature review delves into the challenges faced by RTM, a government broadcasting agency, and explores how the implementation of the eTVCMS serves as a transformative solution. The main objective is to show how government cloud content management platforms are catalysing efficiency, collaboration, security and scalability within the creative content industry.

RTM, like many government agencies, face a considerable challenge in managing content acquisition, particularly when dealing with large video files (Edstrom, Chen, Gong, Wang, & Gong, 2019) and extensive documentation. The prevailing workflow and infrastructure fall short in efficiently supporting the review of extensive content creative libraries. The content acquisition process heavily relies on manual tasks such as physical content transfer, document handling, and communication through various channels. Content creators, reviewers, and decision-makers are geographically dispersed, making it challenging to share, review, and provide feedback efficiently. Without automated workflows, content verification, metadata tagging, and content routing hamper efficiency and increase the likelihood of delays in acquiring and reviewing the content. The lack of visibility on the status and progress of content submission makes it challenging to keep track of the content's journey through the acquisition process, hindering the identification of bottlenecks and ensure timely delivery. This inadequacy results in delays, inefficiencies and potential missed opportunities.

Furthermore, RTM's on-premise system struggles to cope with sudden increases in storage capacity and traffic surges, resulting in performance issues, especially when handling large file uploads and high quality video content streaming (Singh, Singh, & Verma, 2022).

Streaming high-quality video requires significant bandwidth to deliver content seamlessly. To keep up with necessary hardware upgrades, software updates, and infrastructure upgrades, it can be resource-intensive and time-consuming. It can result in performance degradation and distort the digital experience.

The implementation of eTVCMS emerges as a silver lining in addressing the key challenges. This cloud content management platform promises to revolutionize the efficiency, collaboration, security, and scalability of the creative content industry by introducing streamlined workflows, a centralised content repository, secure access, version control, and improved communication (Alsmirat, Obaidat, Jararweh, & Al-Saleh, 2017; James, 2016). eTVCMS empowers RTM to navigate content acquisition processes smoother and maximises the value of digital assets. By harnessing the capabilities of the cloud, eTVCMS, most video contents can be streamed with optimised content delivery and robust infrastructure, which significantly enhances performance compared to on-premise architecture. The cloud has the ability to dynamically allocate resources based on demand, ensuring smooth video playback even during high traffic periods seamlessly, bolstering the quality of digital experiences (Jewapatarakul & Ueasangkomsate, 2022). Crucially, cloud content management platform, such as eTVCMS, incorporate robust availability measures, minimising downtime and prevent service disruptions. This resilience ensures uninterrupted service delivery, a pivotal aspect for government agencies and the creative content industry alike.

The literature review underscores the transformative potential of government cloud content management platform in addressing the multifaceted challenges encountered by agencies like RTM. The implementation of eTVCMS not only promises to revolutionise content acquisition but also stands as a testament to Malaysia's commitment to embracing digital transformation as a means of bolstering economic growth and competitiveness.

By enhancing efficiency, collaboration, security and scalability within the creative content industry, eTVCMS represents a milestone in the evolution of government content management. As the digital landscape continues to evolve, the role of cloud based solutions in fostering innovation and resilience becomes increasingly pivotal. In this context, the adoption of cloud content management platform, exemplified by eTVCMS, serves as an indicator of transformation and efficiency, ensuring that government agencies can thrive in the digital age while delivering unparalleled digital experiences to their constituents and stakeholders.

METHODOLOGY

In the context of our analysis into the role of government cloud content management platform in empowering the creative content industry, we performed Proof of Concept (POC) as our methodology approach. The POC methodology is a systematic approach used to validate the feasibility and effectiveness of a proposed solution and technology.

The primary purpose of implementing the POC methodology in our study is to assess whether the adoption of government cloud content management such as eTVCMS, can deliver the anticipated benefits and address the identified challenges effectively. Through POC, we aim to provide evidence of the capability and functions that the proposed solution can work as intended and provide real case value.

The key components of POC are:

- a) Identification of Objectives: We begin by clearly defining the objectives we intend to achieve through the implementation of the government cloud content management

platform. These objectives often related to improving efficiency, enhancing collaboration, ensuring security and achieving scalability within the creative content industry

- b) **Prototype Development:** In the POC phase, we create a prototype of a small scale version of the proposed solution. This prototype is designed to demonstrate the core functionalities and capabilities of the cloud content management platform within the context of our analysis
- c) **Testing and Evaluation:** We subject the prototype to rigorous testing and evaluation. This involve simulating real-case scenarios and assessing how well the platform performs in achieving the defined objectives. We pay close attention to factors such as usability, reliability and scalability during this phase
- d) **Data Collection:** To support our findings, we collect data and evidence that showcase the impact of the government cloud content management platform on various aspects of the creative industry and procurement management. This data includes performance metrics, user feedback and measurable improvement in efficiency and collaboration
- e) **Analysis and Conclusion:** Based on the outcomes of our POC, we analyse the results and draw conclusions regarding the platform visibility and its potential to serve as an enabler for the creative content industry in Malaysia. We also consider any limitations or challenges identified during the POC phase

To establish the viability and effectiveness of the eTVCMS as a solution for RTM content acquisition, we acknowledge and address three (3) core challenges that RTM has encountered. These issues serve as the foundation for our POC methodology, guiding our assessment of the suitability and potential impact of this technology solution:

- a) **On -Premise Limitations: Storage Capacity, Scalability, Accessibility, Performance, and Reliability**

One of the primary challenges RTM faced with its existing infrastructure is the limited capacity for storage. As data volumes continue to grow, scalability becomes a critical concern. When storage demands exceed available capacity, it leads to performance issues and compromise accessibility. Furthermore, high concurrent access to large files can lead to downtime or compromised accessibility. Insufficient security measures for content access can also lead to data breaches and hinder overall productivity.

- b) **Video Streaming: Video Playback, Scalability, Network Performance, and User Experience**

RTM on-premise solution encounters difficulties in effectively processing and distributing streaming content, particularly large video files, without a streaming engine that supports adaptive streaming. Due to bandwidth restrictions, playback capabilities could be constrained, which could cause buffering, latency, and a poor user experience. Moreover, when multiple users simultaneously access the streaming content, the on-premise infrastructure may struggle to handle the increase demand, leading to performance issues due to its limited scalability.

- c) **Centralised Platform: Visibility, Scalability, Interoperability, and Security**

The lack of centralised platform at RTM has resulted in content scattered across various systems, repositories, and storage locations, making it difficult to locate, manage, and utilise effectively. Inconsistent data metadata hinders effective data

governance, analytics, and information discovery, which may increase the risk of data breaches, unauthorised access, and non-compliance.

Incorporating these core challenges into our POC methodology enables us to systematically evaluate the impact and feasibility of eTVCMS, providing empirical evidence of its potential to address RTM content acquisition needs and contribute to the advancement of the creative content industry in Malaysia. This empirical validation is critical in substantiating our claims and recommendations for the broader adoption of such platforms, ultimately contributing to the digital transformation of the industry.

Therefore, eTVCMS, a cloud content management platform with a centralised repository and optimised workflow, helps manage content acquisition in a shorter time period and strengthens the confidentiality and integrity of the managed content. A centralised platform provides the foundation for efficient content management, enabling organisations to embrace cloud technologies, enhance collaboration, and drive their digital transformation strategies more effectively.

Data Analysis

i) Utilising Cloud Services

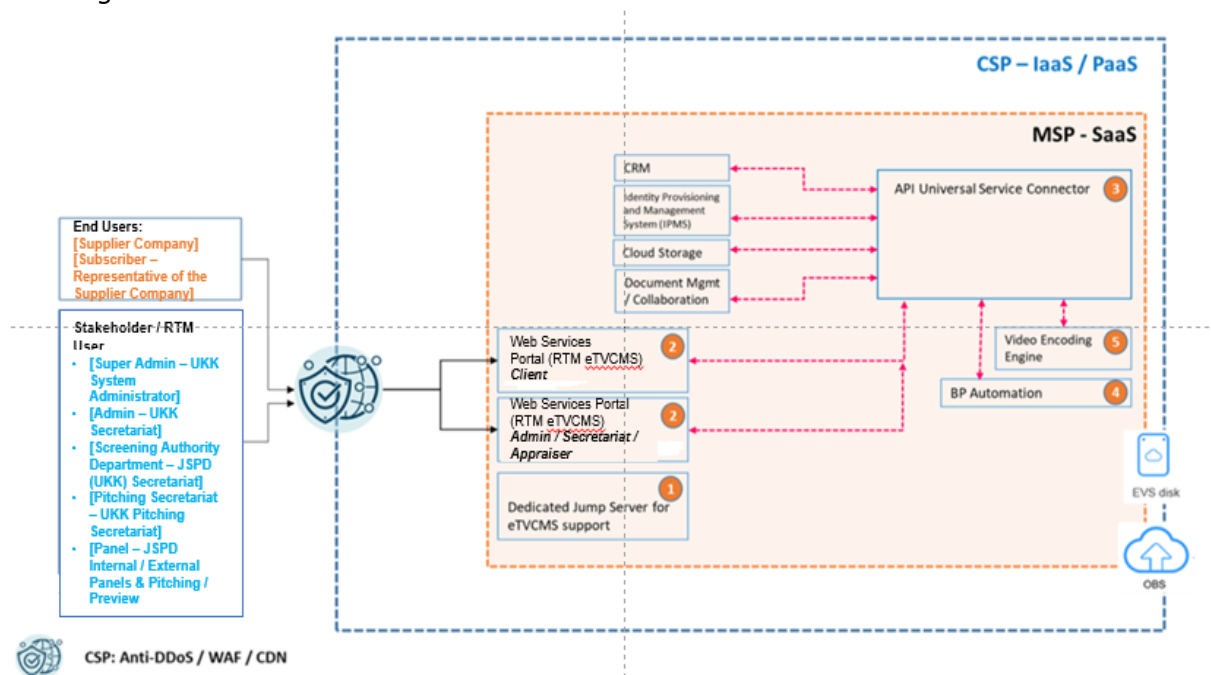


Figure 2: High Level Architecture Cloud Content Management Platform

In addressing the challenges faced by RTM acquisition, eTVCMS has undertaken a rapid digital transformation process by embracing Software as a Service (SaaS). This strategic decision has paved the way for personalised and customised workflows tailored to the specific requirements of RTM without investing significant resources in development, testing, and maintenance. The agility of SaaS solution is particularly noteworthy, enabling RTM to commence platform usage and workflow customisation almost immediately. With SaaS

solution accessible via the cloud, the implementation process is swift and straightforward. Notably, eTVCMS marks a significant milestone as the first SaaS to be implemented at RTM that is designed to be flexible and scalable, accommodating the needs of organisations and allowing growth and changes over time.

The data resides on a Malaysian public cloud addresses compliance issues of data sovereignty, data locality, and data residency. This ensures that sensitive data remains within the boundaries of Malaysia, aligning with regulatory requirements. Importantly, the flexibility of SaaS solution allows any organisation to adopt and adapt to match specific business processes and scale as requirements evolve. By opting to SaaS solution, organisations can leverage cloud infrastructure, security measures, and technical support. This in turn simplify the technical complexity and allows the organisation to focus on their core business activities. It provides a balance between customization and time to market. This approach prove to be pragmatic and efficient especially when factors such as time, cost, and scalability considerations are key considerations in the content acquisition process.

The integration of eTVCMS with SaaS capabilities represents a critical component of our POC methodology, enabling us to showcase the rapid transformation and customisation potential of this innovative solution within the content of RTM content acquisition challenges. Through this strategic adoption of SaaS technology, we aim to demonstrate how eTVCMS can serve as a transformative enabler for the creative content industry in Malaysia, addressing the identified issues while offering adaptability and scalability for future growth.

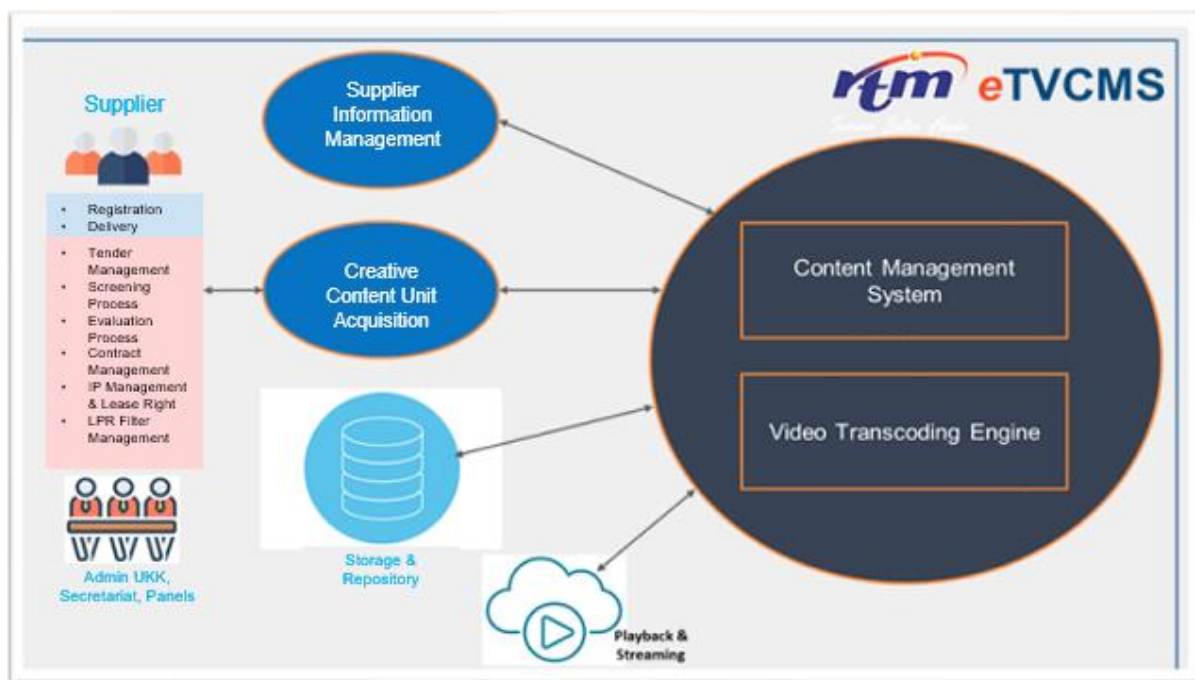


Figure 3: eTVCMS – SaaS Component Mapping

As part of our methodology, we leverage the cloud capabilities integrated into the eTVCMS platform, which play a pivotal role in addressing several critical aspects of content acquisition and management. These cloud-enhanced capabilities are instrumental in overcoming challenges and optimising the content acquisition process.

a) Scalability and Resource Optimisation

The cloud based platform enables efficient handling of large volumes of content without constraints. As demand increases, the platform can dynamically scale up its resources, ensuring that storage capacity can be scaled to the growing data volumes. This scalability not only enhances operational efficiency but helps reduce capital expenses by optimising the cost based on actual storage needs. On average, RTM uses up to 4 TB of storage for 1,000 vendor applications and video submissions per tender released, highlighting the importance of scalability in managing the prompt needs of every RTM acquisition cycle.

b) Accessibility and Availability

Given RTM engagement with both local and international vendors to acquire content, accessibility and availability are critical deciding factors in cloud implementation. The cloud-based platform ensures that content is accessible and available when needed. Its high-availability architecture (as shown in Figure 2) incorporated redundant infrastructure, load balancing, and disaster recovery mechanisms helps minimise downtime and ensure uninterrupted access to content. A stable and uninterrupted user experience is guaranteed by cloud-based infrastructure, which makes use of robust distributed networks with high bandwidth capacities.

c) Content Delivery Network (CDN)

To further enhance user experience and global content delivery, RTM takes advantage of the Content Delivery Network (CDN). This integral component of the infrastructure efficiently distributes digital content worldwide and optimise user experience. CDN is designed to handle heavy traffic loads and unexpected demand spikes. They distribute the content across multiple edge servers, allowing efficient load balancing and scalability. CDN is strategically positioned worldwide, ensuring that users can access from a nearby edge server instead of having to be fetched from the origin server. This reduces the distance data needs to travel and minimises network congestion, thereby enhancing performance and reliability. Additional CDN offload traffic from the origin servers, freeing up resources for other critical tasks and further improving overall system performance.

d) Security Measures:

Recognising the value and sensitivity of Intellectual Property involved in content acquisition during sharing and transferring, security measures are a paramount concern to safeguard content from unauthorised access, data breaches, and other security risks. These measures include regular data backups and disaster recovery capabilities to ensure content remains protected and available even in the event of an unexpected system failure or data loss. To prevent unauthorised access, role-based access control and encryption during storage, transport, and access are employed providing layers of security. Furthermore, the use of a Cloud Web Application Firewall (WAF) helps to minimise Distributed Denial of Service (DDoS) attacks by filtering the malicious requests, only clean traffic is allowed.

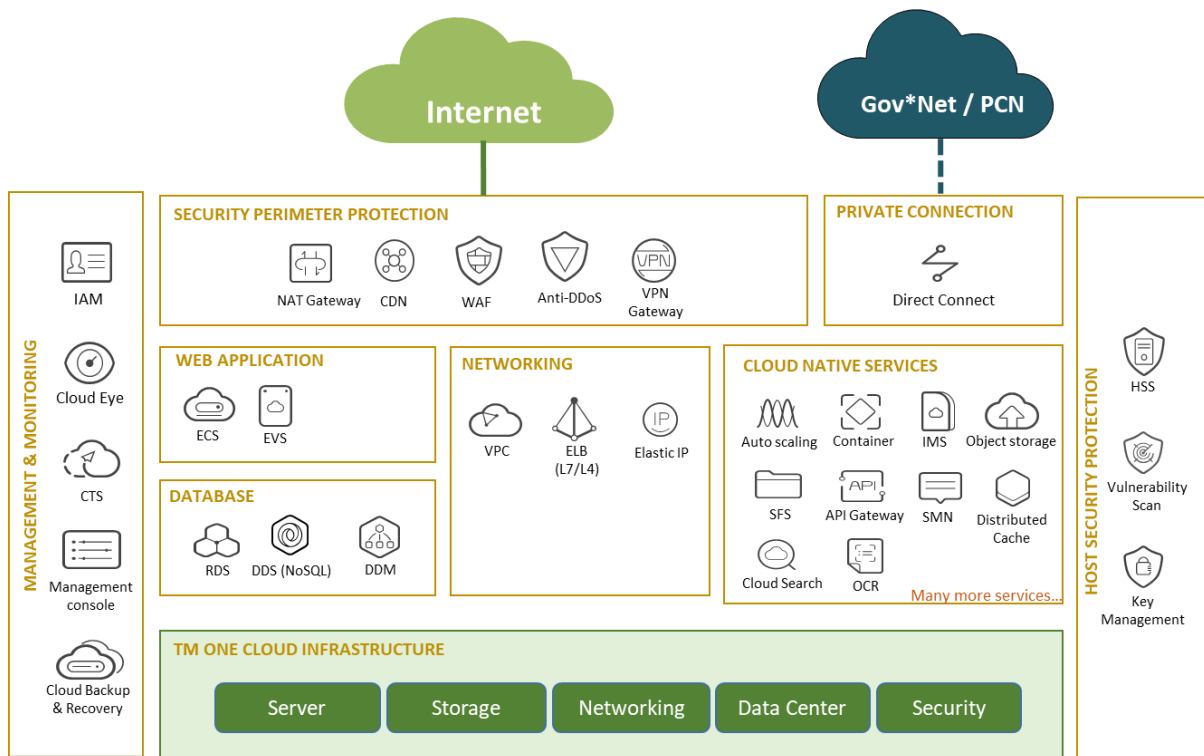


Figure 4: Comprehensive Cloud Offerings

By incorporating these cloud-enhanced capabilities into our methodology, we aim to demonstrate how eTVCMS with its integrated cloud features, contributes to efficient and secure content acquisition within the creative content industry, ultimately aligning with RTM digital transformation objectives.

ii) Implementing Secure Streaming Engine

As we delve into the data analysis phase of our methodology, it is imperative to explore how the built-in secure streaming engine within eTVCMS contributes to the efficient handling and secure dissemination of streamed content. This engine plays a pivotal role in ensuring the confidentiality, integrity, and availability of content which are critical aspects of content within the creative content industry.

The Secure Streaming Engine integrated into eTVCMS is meticulously designed to optimise all aspects of video management, including uploading, downloading, playback, and delivery. The engine supports a variety of streaming protocols and formats, making it compatible with diverse platforms and devices. In dealing with a diverse group of vendors, RTM encounters inconsistent content formats. The eTVCMS platform equipped with the secure streaming engine, addresses this challenges by enforcing standardised content formats and set criteria upon uploading the content. This standardisation ensures uniformity and compatibility across the content acquired from various sources.

The streaming engine enables efficient video encoding, a process of compressing the size of raw video files into smaller file sizes for playback delivery, more manageable sizes suitable for Internet transmission. During encoding, video content is typically encoded and segmented into smaller chunks to enable efficient delivery and adaptive bitrate streaming. Multiple

versions of the video, varying in resolution and bitrate, are created to cater to diverse user network conditions and device capabilities.

Transcoding comes into play when there is a need to convert the video from one format or codec to another or to optimise it for specific devices or network conditions. This may involve adjustments to resolution, bitrate or other encoding parameters. Transcoding is particularly valuable for adapting video content to various streaming protocols, network configurations and devices. Adaptive streaming uses multiple encoded and transcoded versions of the video to deliver the most appropriate quality to the end users. The users, based on their network conditions and device capabilities, select and play the most suitable video segments from the available versions. It ensures that content is accessible and optimised for devices with varying bandwidth and processing capabilities.

Adaptive streaming is a dynamic technique that continually adjusts the quality of the video stream based on the viewers network conditions. It ensures smooth playback by monitoring available bandwidth and adapting video quality accordingly. The content is divided into smaller segments, each encoded at different quality levels. Users can seamlessly switch between these segments based on their network speed and device capabilities, enabling uninterrupted viewing.

All in all, the built-in streaming engine in eTVCMS is designed based on interconnected processes of encoding, transcoding, and adaptive streaming.

- a. Encoding is the process of reducing the size and transforming a video clip into a format suitable for transmission over the Internet. The video file is compressed during encoding to lower its size while retaining an acceptable degree of quality. AAC and MP3 are used for audio encoding as well as video codecs like H.264, H.265 and VP9.
- b. Transcoding is the process of converting a video file's format or codec. It may involve changing the resolution, bitrate, or other encoding parameter. Transcoding is frequently done to adapt video content to various streaming protocols, network configurations, and devices. To accommodate devices with constrained bandwidth or processing capability, a high-definition video might be transcoded into one with a reduced resolution or bitrate.
- c. Adaptive streaming is a technique that dynamically adjusts the quality of the video stream based on the viewer's network conditions. It allows for smooth playback by continuously monitoring the available bandwidth and adapting the video quality accordingly. Adaptive streaming divides the video into smaller segments, each encoded at different quality levels. The users can then switch between these segments based on their network speed and device capabilities, seamlessly transitioning between different quality levels.

To safeguard content from unauthorised access and data breaches, the streaming engine employs robust encryption methods. It encrypts the video files or streams using industry-standard encryption algorithms, rendering them unreadable without appropriate decryption keys. It also uses secure streaming protocols, such as HTTPS or Secure Real Time Transport Protocol (SRTP), to transmit the encrypted content over the network. These protocols mitigate the risks of tampering, unauthorised access and man-in-the-middle-attacks.

The secure streaming engine ability to deliver encrypted content through adaptive streaming and transcoding ensures compatibility and optimised playback across diverse devices and platforms. This key success factor of eTVCMS enables smooth playback without the need for

extensive downloads, reducing buffering and latency, ultimately enhancing the user experience.

Incorporating the capabilities of the Secure Streaming Engine within our data analysis allows us to comprehensively assess how eTVCMS effectively addresses security, accessibility and content delivery challenges within the creative content industry. This analysis contributes valuable insights into the platform role as an enabler for efficient content acquisition and management, aligning with RTM digital transformation objectives.

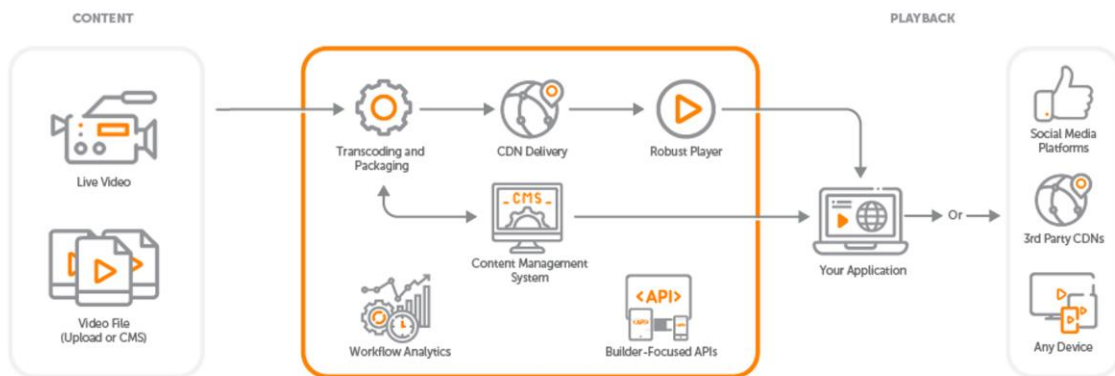


Figure 5: Secure Streaming Engine

Streamlined Workflows in Centralized Platform

iii) Streamlined Workflows in Centralised Platform

Our analysis focuses on understanding how eTVCMS, a customised Software as a Service (SaaS) Content Management platform, streamlines the content acquisition process within RTM. This analysis is essential for comprehending the platform role in optimising workflows and enhancing communication among stakeholders.

Before implementing eTVCMS, RTM encountered challenges in processing content submissions efficiently. On average, RTM received more than 3,000 content submissions to be assessed, and it took about three (3) months to complete the assessment from content submission until screening and marking completion due to manual processes and some requiring physical presence for content transfer and document handling. RTM foresees the need for automation and workflow optimisation when confidentiality and integrity are questionable without a proper system in place.

eTVCMS, a custom-tailored SaaS Content Management platform serves as a centralised system capable of managing the entire content acquisition with a streamlined workflow. It takes about one (1) month to complete workflow automation based on a structured framework for the RTM procurement process. This automation not only enhances transparency but also provides a well-documented workflow. It captures, organises, and manages all aspects of the acquisition process, from initial content submission to final approval. It becomes a single point of access and visibility into the organisation's digital assets with standardised processes, version control, and automation capabilities.

Effective communication among stakeholders is vital for transparency and effective delivery. eTVCMS introduces essential features like messaging, file sharing, task assignment, and

notifications help organise better communication and locate information when needed. For instance, an extension of the deadline can be notified via email once the new date is released in the system, or even to notify missing or incomplete documents submitted. This keeps everyone informed about the progress or changes during the procurement cycle, enhancing collaboration and coordination.

With eTVCMS, all vendors can now submit their content online from anywhere. The interface is user-friendly, making user adoption easier. The platform simplifies content uploads and organises the content files without much hiccups. Collaboration and streamlines workflows among content creators, reviewers, and decision-makers are supported through features like version control, annotation, commenting, and task assignment. Additionally, the platform facilitates the management of metadata associated with the content, including titles, descriptions, tags, copyright information, and all other relevant details required. As a result, RTM has increased their procurement cycle to monthly basis, and the end-to-end process is complete within fourteen (14) days.

Content acquisition often involves sensitive or confidential materials, that acquired rights and permissions for the content. Implementation of robust security measures includes encryption and role-based access management that allow authorised access to sensitive content for specific individuals. All uploaded contents are encrypted both in transit and at rest to prevent unauthorised interception or data breaches. This helps maintain confidentiality and prevent the unauthorised distribution or leakage of sensitive information.

The platform also supports metadata management for easy categorization, tagging, and search ability of content. It includes advanced filtering and metadata-based search, so users can quickly locate and retrieve specific content assets. This comprehensive analysis and reporting capability provide insights into content usage, performance, and end-user behaviour. Reports can be generated on the status of content submissions, review timelines, content acquisition costs, and other relevant custom data needed. These insights help identify bottlenecks, optimise processes, and make informed decisions for future content acquisition strategies.

eTVCMS offers a ready API for integration with other systems or third-party applications. The integration allows seamless transfer and synchronisation of content and metadata between systems, eliminating manual data entry and improving overall efficiency. Customization, extension, and integration with existing tools and workflows that are compatible and flexible. Two (2) features that address data governance in eTVCMS implementations are data logging and an audit trail. Data logging enables businesses to monitor and document all operations, including timestamps, inputs, outputs, and other crucial parameters. In addition to providing evidence-based information, it can also be utilised for analysis, troubleshooting, or historical record-keeping. By capturing and recording all the activities, the system can generate an audit trail that shows a chronological record of messages, updates, file uploads, and other relevant actions taken by users. It provides a trail of evidence or documentation that allows for examination and verification of actions or events. The timestamp of the action, the identity of the person or organisation who carried it out, and any pertinent information or data are all included. For tracing the history of communication, settling disputes, confirming acts, and guaranteeing compliance with laws or internal policies, it offers transparency, accountability, and traceability.

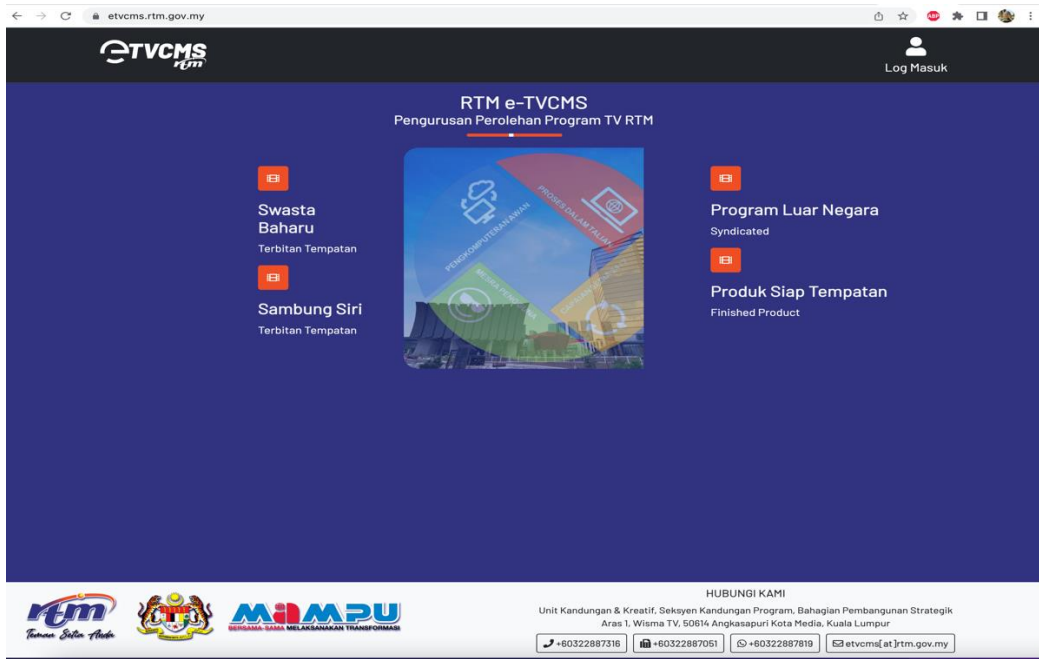


Figure 6: eTVCMS – TV Program Procurement Management

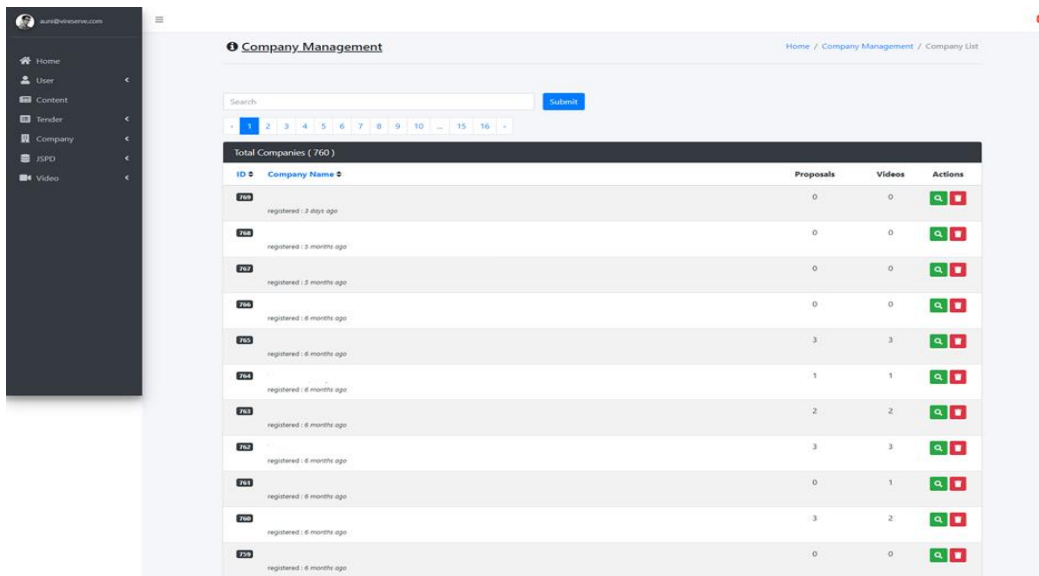


Figure 7: Centralised Information Management

Animasi [S-A130]

<table style="width: 100%; border-collapse: collapse;"> <tr><td>ID</td><td>218</td></tr> <tr><td>Language</td><td>Bahasa Inggeris</td></tr> <tr><td>Channel</td><td>TV1</td></tr> <tr><td>Category</td><td>Animasi</td></tr> <tr><td>Code</td><td>S-A130</td></tr> <tr><td>Episode</td><td>13-26</td></tr> <tr><td>Duration</td><td>30</td></tr> </table>	ID	218	Language	Bahasa Inggeris	Channel	TV1	Category	Animasi	Code	S-A130	Episode	13-26	Duration	30	<p>NEED STATEMENT</p> <p>Programme Rights (Tempoh Hak Tayangan) : Eg: 18 bulan (atau lebih) / 2 kali tayangan (atau lebih)</p> <p>Tahun terbitan : 2018 dan ke atas</p> <p>Tema: Education & entertainment - Moral values - Acquire knowledge - Fun learning - Entertainment</p> <p>Sasaran audien: 5 hingga 12 tahun</p> <p style="text-align: right;">APPLY</p>
ID	218														
Language	Bahasa Inggeris														
Channel	TV1														
Category	Animasi														
Code	S-A130														
Episode	13-26														
Duration	30														

Dokumentari [S-D160]

<table style="width: 100%; border-collapse: collapse;"> <tr><td>ID</td><td>219</td></tr> <tr><td>Language</td><td>Bahasa Inggeris</td></tr> <tr><td>Channel</td><td>TV1</td></tr> <tr><td>Category</td><td>Dokumentari</td></tr> <tr><td>Code</td><td>S-D160</td></tr> <tr><td>Episode</td><td>10-30</td></tr> <tr><td>Duration</td><td>60</td></tr> </table>	ID	219	Language	Bahasa Inggeris	Channel	TV1	Category	Dokumentari	Code	S-D160	Episode	10-30	Duration	60	<p>NEED STATEMENT</p> <p>Programme Rights (Tempoh Hak Tayangan) : Eg: 18 bulan (atau lebih) / 2 kali tayangan (atau lebih)</p> <p>Tahun Terbitan : 2018 dan ke atas</p> <p>Tema: Megatrends, Megacities, Dynamic Population (Ageing Population), Climate Change, Increasing Connectivity, Growing Opportunity & Inequality, Heathier & Sicker (Tired Planet), Rise Of Individual Choice & Fracturing Of The Mass Market, Rise Of The Individual & Decline Of Social Cohesion, Culture Convergence, Work Life Balance, Emergence Of Public Opinion As Revolutionary Force, Artificial Intelligence, Industrial Society 5.0, Natural Disaster / Aftermath, Nature, Science & New Technology, Wildlife, Digital lifestyle</p> <p style="text-align: right;">APPLY</p>
ID	219														
Language	Bahasa Inggeris														
Channel	TV1														
Category	Dokumentari														
Code	S-D160														
Episode	10-30														
Duration	60														

Figure 8: Procurement Notification by Category

Utama
Tender
Penyataan Keperluan
Garis Panduan
Kod Etika
FAQ

WhatsApp
Email
Akaun

Sijil Kementerian Kewangan

- [Profil Saya](#)
- [Kata Laluan](#)
- [Butiran Syarikat](#)
- [Proposal](#)
- [Log Keluar](#)

Nombor Sijil MOF	MOF-99999
Tarikh Sah Laku Dari	01/02/2023
Tarikh Sah Laku Ke	31/01/2024
Status ePerolehan	Aktif
Sijil MOF	Lihat Dokumen

Kementerian Komunikasi & Digital (KKD) Tempatan

[Kemaakini](#)

Nombor Pendaftaran KKD Tempatan	KKDT-99999
Tarikh Luput	30/06/2023
Sijil KKD Swasta	Lihat Dokumen

Kementerian Komunikasi & Digital (KKD) Luar Negara

[Kemaakini](#)

Nombor Pendaftaran KKD Luar Negara	KKDLN-99999
Tarikh Luput	30/06/2023
Sijil KKD Luar Negara	Lihat Dokumen

Figure 9: Criteria for Submission

Tender Name : **Finished Product** Expired in : **6 months ago** Max proposal : **2**

Message from RTM -6 months ago

LULUS (Finished Product)

Bagi tajuk program TV Produk Siap Tempatan (Finished Product), sila muat naik surat rasmi syarikat yang mempunyai pemilikan sah untuk setiap tajuk yang didaftarkan. Syarikat yang mendaftar untuk pembekalan program TV PRODUK SIAP TEMPATAN (FINISHED PRODUCT) dibenar untuk menawarkan MAKSIMUM DUA (2) TAJUK SAHAJA di bawah mana-mana KATEGORI yang ditawarkan.

Status : **APPROVED** Request for Approval : **Submit**

Your application has been approved. Now you can browse all the available tenders. **Browse Tender 5**

- Ministry of Finance ✓
- Suruhanjaya Syarikat Malaysia ✓
- Company Profile ✓
- Board of Directors ✓
- Experiences ✓
- Company Audit ✓
- Bank Informations ✓
- FINAS Film Distribution ✓
- KKMM Syndicated ✓
- Official Company Letter ✓

Figure 10: Status

admin@local

- Home
- Company
- Video**
- Videos
- Failed Uploads
- Encoding Status
- Queue Monitor

Video List Home / Video Management / Show Video

365 Proposal by Company Name

Filename : Original.m4v
 Created at : 2022-12-19 15:52:40 around 3 weeks ago
 Updated at : 2022-12-19 16:01:12 around 3 weeks ago
 Playback URL : https://admin-ukk.rtm.gov.my/assets/3342/playlist.m3u8

Video Duration 3 hours 34 minutes 39 seconds	Size 510 MB	Processing Time 8 minutes 32 seconds	Original Resolution 352x 180
Upload Duration 1 minute 35 seconds	Upload Speed 43 Mbps	Original Bitrate 0 Mbps	
Asset Size (HLS) 1,335.66 MB	Codec H264/AAC	Encryption AES Rotating keys	Stream Type 5 MBR streaming

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Figure 11: Metadata

Roles Management

Home / Users / Permission Management

Total Permissions (119)

ID	Name	ADMIN	USER	SUPER-ADMIN	PEMBEKAL	JSPD-PENANDA	JSPD-URUSETIA	JSPD-ADMIN	JSPD-KETUA	JSPD-ASSISTANT	PITCHING-PENANDA	PITCHING-URUSETIA	PITCHING-ADMIN
12	CATEGORY-CREATE	●	✓	✓	●	●	●	✓	●	●	●	●	●
13	CATEGORY-DELETE	●	✓	✓	●	●	●	✓	●	●	●	●	●
14	CATEGORY-EDIT	●	✓	✓	●	●	●	✓	●	●	●	●	●
15	CATEGORY-LIST	●	✓	✓	●	●	●	✓	●	●	●	●	●
16	COMPANY-APPROVAL-CREATE	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
17	COMPANY-APPROVAL-DELETE	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
18	COMPANY-APPROVAL-EDIT	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
19	COMPANY-APPROVAL-LIST	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
20	COMPANY-CREATE	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
21	COMPANY-DELETE	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
22	COMPANY-EDIT	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
23	COMPANY-LIST	✓	●	✓	●	●	✓	✓	✓	✓	●	●	●
24	CONTENT-CREATE	●	●	✓	●	●	●	●	●	●	●	●	●
25	CONTENT-DELETE	●	●	✓	●	●	●	●	●	●	●	●	●
26	CONTENT-EDIT	●	●	✓	●	●	●	●	●	●	●	●	●
27	CONTENT-LIST	●	●	✓	●	●	●	●	●	●	●	●	●
28	DASHBOARD-CREATE	✓	✓	✓	✓	●	●	✓	✓	✓	●	●	●
29	DASHBOARD-DELETE	✓	✓	✓	✓	●	●	✓	✓	✓	●	●	●
30	DASHBOARD-EDIT	✓	✓	✓	✓	●	●	✓	✓	✓	●	●	●
31	DASHBOARD-LIST	✓	✓	✓	✓	●	●	✓	✓	✓	●	●	●
32	HOME-CREATE	●	●	✓	●	●	●	●	●	●	●	●	●

Figure 12: User Roles Access Management

RESULTS AND DISCUSSION

The presented results and discussion on the substantial benefits that RTM has gained from adopting the eTVCMS cloud content management platform, particularly in the context of Environmental, Social, and Governance (ESG) considerations. Organisations may lessen their impact on the environment, encourage responsible governance, and support sustainable practises within their operations through resource efficiency, paperless processes, improved collaboration, and adherence to regulatory standards.

- **Environment Impact:** The paper highlights RTM notable reduction in its environmental footprint compared to traditional on-premise solutions, which minimise waste and resource consumption and contribute to sustainable resource management. This is a significant achievement in the context of environmental responsibility, indicating that cloud based solution can contribute positively to ESG goals
- **Paperless Processes and Sustainability:** RTM promotes digital transformation, enabling the organisation to transition from paper-based to digital workflows that reduce its ecological footprint. This transition towards paperless processes is not only resource-efficient but also aligns with sustainability objectives, reflecting the organisation responsible governance
- **Governance and Compliance:** Adhering to strong governance practises through security measures for data privacy and compliance enhances RTM transparency, accountability, and ethical conduct in handling procurement processes.

RTM has shown improvement in public service delivery through eTVCMS implementation. With the right technology, the government can streamline the platforms to provide convenient access to public services. It also encourages citizen engagement by prioritising areas of service delivery with constant and regular monitoring to evaluate public service performance. This outcome demonstrates how technology can enhance public service delivery and engagement.

The paper recognised the importance of managing change effectively when implementing transformative technologies like eTVCMS. RTM understands the potential of technology and how it can impact the organization's goals and objectives, which are articulated with a roadmap aligned with the overall business strategy. RTM ability to drive this change by engaging stakeholders and fostering a culture of innovation and agility is exceptional. This approach ensures a smooth transition and reflects the organisation commitment to embracing technological advancement.

RTM has a deep understanding of emerging technologies and the potential of eTVCMS to keep up with the latest trends and assess the relevance and impact of new technologies on the organization's operations and customer experience. They drive technology adoption by implementing an agile approach. By prioritizing a seamless and personalised digital experience, eTVCMS has evolved into customer-centric and data-driven platform that focuses on optimising business processes and delivering exceptional digital solutions.

In summary, the results and discussion section effectively showcases the multifaceted benefits of eTVCMS adoption in RTM. It underscores how this technology aligns with ESG principles, promotes sustainability, improves service delivery and drives innovation and customer centricity. These outcomes not only benefit RTM but also serve as a valuable case study for organisations seeking to leverage cloud content management platform for responsible governance and operational excellence.

CONCLUSION

In conclusion, the implementation of a Government Cloud Content Management Platform, such as the Electronic Television Content Management System (eTVCMS), has proven to be an important facilitator for Malaysia's creative content business. The cloud content management platform addresses industry concerns such as massive content volume management, inefficient workflows, and limited accessibility. By employing cloud computing capabilities, the platform offers a single location for storing and managing digital assets, fostering collaboration, and facilitating seamless content generation, management, and distribution. It offers scalable storage that is safe, enabling quick access to assets from anywhere, at any time, on any internet-connected device.

The Department of Broadcasting Malaysia's (RTM) implementation of eTVCMS has expedited the content purchase process, eliminating the need for hardcopy proposals and enabling end-to-end digital operations. Content confidentiality, integrity, and efficiency are ensured by platform features such as the secure streaming engine, content encryption, and adaptive streaming. Overall, the Government Cloud Content Management Platform has transformed Malaysia's creative content industry by increasing productivity, efficiency, and collaboration while also supporting the government's digital transformation efforts.

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