

INF20030-CLOUD APPROACHES FOR
ENTERPRISE SYSTEMS

ASSIGNMENT 2

SYSTEM ANALYSIS AND SELECTION

Implementing The Smart Urban Management System in Metroville City

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EXECUTIVE SUMMARY

This report delivers a comprehensive analysis of Metroville City's path to operational enhancement through the adoption of a Smart Urban Management System (SUMS). Beginning with an overview of Metroville's foundational operational domains, strengths, challenges, and growth vision, the report details the city's strategic implementation approach. Key business challenges are then identified and prioritized, with a focus on how a SUMS solution can effectively address these issues. Based on this assessment, we outline essential business requirements linked to specific SUMS functionalities, clarifying the potential impact of SUMS on Metroville's operations. To ensure an effective vendor selection, we recommend five criteria aligned with Metroville's operational and implementation needs. In support of a successful SUMS rollout, the report also explores change management strategies and proposes contingency plans for both pre- and post-go-live phases. Further, we assess SUMS's prospective contributions to Metroville's key operational areas, supporting the city's broader objectives. Lastly, we examine the potential benefits of upgrading Metroville's SUMS to SAP S/4HANA, considering both its capabilities and limitations. Based on case study insights and supplementary research, we recommend this upgrade as a valuable step for Metroville. This report serves as a strategic guide, offering Metroville in-depth insights to support informed decision-making and enhance its operational efficiency.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
I. KEY FINDINGS.....	3
1. Background and Operation	3
1.1 Background and operation.....	3
1.2 Current Key Strengths	3
1.3 Key Stakeholders & Factors affecting their relationship	4
1.4 Major challenges.....	5
1.5 Vision and Goals	6
2. Business Problem	6
2.1 Priority Level	6
2.2 Critical Business Problems faced by Metroville City from the case study.	7
3. Business Requirements	13
4. Vendor Selection Criteria	17
4.1 Customisation & Flexibility.....	19
4.2 Scalability:	20
4.3 Data Integration Capabilities:	20
4.4 Cybersecurity and Compliance:	20
4.5 Post-implementation Support:.....	21
5. Change Management Evaluation	21
6. Implementation Strategy	26
6.1. Implementation Plan	26
6.3. Contingency plans for post go-live phase.....	31
7. Value Realisation	34
8. Sap S4/Hana Analysis And Recommendations.....	37
8.1 SAP assessment	37
8.2 Recommendation regarding its business requirement.....	46
8.3 Recommendation regarding identified vendor selection criteria.....	48
II. CONCLUSION	52
III. REFERENCES	53

I. KEY FINDINGS

1. Background and Operation

1.1 Background and operation

Metroville City was founded in 1950 and has experienced substantial growth, positioning itself as a hub for technology and innovation due to its strategic location and thriving economy. However, with this rapid urban expansion, the city has faced challenges common to growing metropolitan areas, including increased traffic congestion, rising energy demands, and the need for more efficient public services.

Under the leadership of Mayor Linda Hartfield, elected in 2015, the city has pursued a progressive agenda focused on integrating advanced technological solutions into its infrastructure. This vision aims to enhance operational efficiencies, improve residents' quality of life, and ensure long-term sustainability. The Metroville City Council plays a critical role in overseeing policy implementation across various urban projects. Their focus includes legislative oversight, urban planning, economic development, and the provision of community services. The Council prioritizes maintaining and upgrading infrastructure to support the city's growth, as well as fostering economic growth through investment and innovation.

1.2 Current Key Strengths

1.2.1 Visionary Leadership and Strategic Planning

Under the leadership of Mayor Linda Hartfield, Metroville has committed to integrating advanced technologies to improve urban management and sustainability. The city's forward-thinking approach ensures that it stays at the forefront of smart city initiatives, leveraging technological advancements to enhance public services and operational efficiencies.

1.2.2 Economic Vitality and Innovation Hub

Metroville's vibrant economy and strategic geographic location have made it a hub for technology and innovation. This strong economic base allows for significant investment in infrastructure, technological upgrades, and urban development projects without compromising essential services. The city's economic strength also attracts foreign investment, making it conducive to business growth and fostering a competitive environment.

1.2.3 Robust Governance and Public Engagement

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The Metroville City Council's commitment to transparency and active public engagement has built a strong relationship with the community. Regular town hall meetings and public forums allow for citizen feedback, fostering civic participation and trust in the city's governance. This participatory approach ensures that residents' needs are considered in city planning and operations.

1.3 Key Stakeholders & Factors affecting their relationship

Types	Identification
Internal	<ul style="list-style-type: none">- Mayor and City Leadership Mayor Linda Hartfield and her leadership team are responsible for setting the strategic vision for Metroville's smart urban management. They are driving the integration of advanced technological solutions to improve public services, operational efficiency, and sustainability. Their leadership is pivotal in ensuring that smart city initiatives align with Metroville's long-term goals.- City Council The City Council, comprising elected officials from various districts, plays a legislative role, overseeing policy implementation and urban development projects. Their responsibilities include reviewing and approving legislation related to urban growth, public safety, environmental policies, and budget allocations. They work closely with the mayor's office and other city departments to ensure alignment with the city's broader strategic goals.- Department Heads and Senior Managers Leaders from city departments such as Urban Planning, Public Safety, and Environmental Services are critical in implementing the Smart Urban Management System (SUMS). Their coordination and collaboration across departments are essential for ensuring that new technologies integrate seamlessly into the city's existing operations.- Employees and Staff City employees, including public servants, planners, engineers, and emergency responders, are vital in the day-to-day running of Metroville's services. Their involvement and adaptation to SUMS are crucial for its successful implementation, as their interactions with the system directly affect operational efficiency and service delivery.

External	<ul style="list-style-type: none"> - Residents and Community Groups Metroville’s residents and various community organizations are key external stakeholders. Their feedback and engagement are essential in shaping how the city’s smart initiatives impact daily life. Ensuring transparent communication and improving quality of life through better public services are critical to maintaining strong relationships with this stakeholder group. - Technology Partners and Vendors Companies like Oracle and UrbanTech Solutions, responsible for providing the technological infrastructure and services for SUMS, play a vital role. These partners are involved in system development, customization, and technical support. - Regulatory Bodies Governmental and environmental regulatory agencies are external stakeholders that ensure Metroville complies with legal and environmental standards. These agencies oversee compliance with public safety laws, urban planning regulations, and sustainability practices, influencing the city's operational strategies. - Funding Organizations and Investors Metroville receives financial support from government grants, private investors, and other funding organizations to help implement its smart city initiatives. These stakeholders expect accountability and transparency regarding the use of funds, with a focus on visible returns such as improved city services and sustainability outcomes.
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1.4 Major challenges

The Metroville City case study highlights several major challenges that impede its progress and sustainability. Key issues include the increasing pressure on aging infrastructure, which is inadequate to meet the demands of a growing population and the integration of modern technologies. Urban sprawl has added to greater traffic congestion, necessitating the implementation of smart traffic systems to optimize flow. Additionally, the city’s fragmented administrative operations across departments have created inefficiencies, with redundant data accumulation and poor communication hindering effective coordination. These operational

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

inefficiencies, combined with escalating regulatory obligations, pose significant challenges to maintaining service delivery and compliance. Environmental challenges such as pollution and the strain on natural resources, further compound these issues, requiring the city to implement environmental monitoring tools. Overall, these multifaceted challenges highlight the need for a comprehensive, scalable system to support sustainable growth and enhance operational efficiency across the city's services

1.5 Vision and Goals

1.5.1 Technological Innovation:

Metroville envisions leveraging advanced technologies to optimize public services and urban management. The city is preparing to meet future challenges while supporting its expanding population and growing technological demand.

1.5.2 Sustainability and Environmental Stewardship:

The city aims to reduce its carbon footprint through smart environmental monitoring systems that track air quality, manage water resources, and ensure responsible urban development.

1.5.3 Enhanced Quality of Life for Residents:

The city focuses on improving the quality of life for its residents. By implementing smart traffic and transportation management systems, upgrading infrastructure, and enhancing public safety. Hence, Metroville is working to create a more liveable, efficient, and resilient city.

2. Business Problem

2.1 Priority Level

The priority level of each issue is evaluated based on its urgency, categorized from high to low. This assessment allows us to focus on addressing the most critical challenges, shaping our business requirements, and establishing criteria for selecting SUMS vendors and solutions. Given the vast number of issues, diverse needs, and numerous SUMS options available, it is impossible to find a single solution that addresses every problem. Therefore, it is essential to prioritize the most pressing issues to ensure effective problem-solving.

Level of Priority	Justification
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High	High-priority problems collectively impact residents, and city departments by diminishing the quality of public services, raising operational costs, and undermining public safety and economic growth.
Medium	Problems categorized as medium priority indirectly affect Metroville City's operational efficiency and sustainability such as neglected regulatory compliance issues. environmental sustainability problems and delays in integrating new technologies hinder the city's ability to improve services, creating inefficiencies and stalling Metroville's growth and innovation potential, which could prevent the city from reaching its smart city goals.
Low	Low-priority problems may not immediately disrupt city operations, but it can weaken community support for city initiatives. Ultimately, this can affect long-term governance and the success of urban projects.

2.2 Critical Business Problems faced by Metroville City from the case study.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Key Problems	Jusification	Priority Level	SUMS Solution Needed
Aging Infrastructure	Aging infrastructure in Metroville City poses significant safety and functionality risks, as it struggles to support the city's growing population and modern technological demands (Capacci et al., 2022). Failing infrastructure could disrupt essential city services like water, electricity, and transportation, leading to costly emergency repairs and service outages that directly affect residents and businesses (Beer, Kougioumtzoglou, & Patelli, 2014).	High	Yes. SUMS offers smart monitoring systems that can track the health of the city's infrastructure and trigger maintenance workflows before critical failures occur (Rodrigues et al., 2023). For instance, IoT sensors can be embedded into critical infrastructure like bridges, roads, pipelines, and utilities, continuously collecting real-time data on factors such as structural integrity, disasters, traffic loads, etc. (Papadopoulou, 2021) Overall, this preventive approach would minimize disruptions and extend the lifespan of key city assets. Moreover, by addressing potential issues early through predictive maintenance, the city can avoid expensive emergency repairs and also ensure safety for pedestrians.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Data Management and Real-Time Analytics	Metroville faced the absence of real-time data collection and analytics, which is essential for quick decision-making, especially in crisis situations. Without advanced analytics, it becomes difficult to identify trends, make predictions, or optimize resource allocation.	High	Yes. SUMS incorporates AI-driven analytics to assist city officials in making data-informed decisions by leveraging machine learning to identify inefficiencies across city services (Herath & Mittal, 2022). It provides recommendations to optimize resource allocation and improve service delivery. By analysing historical data, SUMS can generate predictions for future needs, enabling better planning and proactive management (Son et al., 2023). Additionally, SUMS offers a centralized data repository that consolidates data from various departments into a single, integrated platform (Joshi et al., 2016; Kim et al., 2021). This allows departments to collaborate more effectively, drawing from the same reliable pool of information, reducing redundancy, and improving data accuracy and reliability.
Traffic Congestion	Traffic congestion, exacerbated by urban sprawl, reduces productivity, increases pollution, and delays emergency response times, which could endanger lives during critical situations (Balbo, 1993).	High	Yes. SUMS can address this issue through Intelligent Transportation Systems (ITS) solutions that optimize traffic flow, reduce congestion, and improve overall mobility (Elassy et al., 2024). By utilizing real-time data collection and analysis to manage traffic efficiently, Metroville can have immediate judgments based on current traffic circumstances without the need for central processing delays.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Fragmented Administrative Operations	Fragmented administrative operations result in inefficiencies, slow decision-making, and misallocation of resources, affecting the city's ability to respond to citizen needs in a timely manner.	High	Yes. SUMS allows an integrated platform that consolidates data from various city departments into a single system (Attaran et al., 2022). SUMS ensures that all departments have access to the same, up-to-date information, allowing for improved collaboration, communication, and coordination by using tools that have real-time data and AI-driven analytics.
Environmental Monitoring and Resource Management	Environmental sustainability problems, such as pollution, gradually lead to health issues, reduced air and water quality, and strained resources, ultimately raising healthcare costs and impeding future urban development (Säynäjoki et al., 2014; Chen, 2021).	Medium	SUMS can help Metroville address environmental issues by implementing an environmental monitoring system based on IoT sensors. These sensors can provide real-time data on air and water quality, waste management, and energy consumption, allowing the city to monitor environmental parameters continuously (Malche et al., 2019; Narayana et al., 2024). SUMS would enable smart responses to environmental changes, such as adjusting traffic to reduce emissions or managing water resources more efficiently (Malche et al., 2019). This ongoing monitoring ensures that environmental concerns are addressed proactively, promoting sustainability for the city's long-term development.
Regulatory Compliance	Neglected regulatory compliance issues can result in legal and financial penalties, tarnishing the city's reputation	Medium	Yes. SUMS provides tools for automating compliance tracking and reporting, simplifying the process of meeting regulatory requirements. Additionally, its real-time data management capabilities help ensure that

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	and making it harder to secure future funding, thus weakening its long-term financial stability (Bertaud, 2024). For instance, in Victoria, failure to comply with regulatory requirements, such as maintaining proper infrastructure or adhering to urban planning regulations, could result in penalties of up to 1,200 penalty units, amounting to \$237,108 in fines, with additional daily penalties of up to \$11,855 if violations continue (Department of Environment, Land, Water and Planning, n.d.).		the city's data remains accurate and up to date, further supporting compliance and operational efficiency.
Integration of New Technologies	Delays in integrating new technologies hinder the city's	Medium	Yes. SUMS can collect and process real-time data from connected devices (IoT) across the city, enhancing city services such as traffic management,

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	ability to improve services, creating inefficiencies and stalling Metroville's growth and innovation potential, which could prevent the city from reaching its smart city goals		environmental monitoring, etc (Wolniak & Stecuła, 2024). Furthermore, by processing and storing vast amounts of data through cloud computing, SUMS enables scalability and ensures that the city's systems can handle growing volumes of information without delays (Liu et al., 2024).
Public Engagement and Transparency	Although valuable for maintaining trust and participation, public engagement does not pose an immediate threat to city operations	Low	Yes. SUMS utilizes IoT and 5G to gather real-time feedback from residents, ensuring quicker and more effective responses to city operations. It incorporates blockchain technology to secure transactions and feedback mechanisms, fostering trust among citizens (Bhardwaj et al., 2024; Mistry et al., 2020). Through collaborative computing with 5G, SUMS can efficiently manage real-time public concerns, allowing for immediate adjustments (Son et al., 2023; Deng et al., 2021). Additionally, simulation technology supports policy planning and offers early warning systems by forecasting the potential impacts of proposed measures, enhancing both responsiveness and strategic decision-making in Metroville City.

3. Business Requirements

Brennan (2009) describes "business requirements" as broad goals and objectives driving a project's initiation. Identifying these requirements is crucial for selecting a software solution that meets as many businesses needs as possible, ensuring the most effective outcome. In this section, we will list Metroville's business requirements and explain how Smart Urban Management System (SUMS) addresses them. By aligning Metroville's needs with SUMS, we lay the groundwork for Task 4, selecting a vendor, and Task 8, evaluating SAP S/4HANA's fit for Metroville's operational and regulatory challenges.

In the table below, we will identify each business requirement for Metroville and propose corresponding SUMS functionalities that have the potential to effectively address these needs. The table will demonstrate how SUMS capabilities can be tailored to meet Metroville's goals for improved efficiency, service delivery, and regulatory compliance.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

No	Criteria	SUMS functionality	Justification
1	System Scalability	<ul style="list-style-type: none"> • SUMS Characteristics: Flexible infrastructure • SUMS Tools: Oracle platform 	Oracle technology for SUMS provides the city with the scalability it needs due to the well-built infrastructure that incorporates machine learning, multicloud, and multiple types of storage (Oracle, 2020) to suit the city's scalability needs
2	Compliance	<ul style="list-style-type: none"> • SUMS Characteristics: Flexible infrastructure • SUMS Tools: Analytical software, machine learning 	The centralised system that SUMS utilises provides timely data to all parts of the business. This involves notifications sent by software to notify users about budget changes and policy impacts, which are created from SUMS advanced analytical capabilities
3	Traffic management system	<ul style="list-style-type: none"> • SUMS Characteristics: Flexible infrastructure • SUMS Tools: Third party application integration 	The Oracle system that SUMS utilises is capable of installing many different programs which increase the amount of utility that SUMS can provide (Elbahri et al., 2019). This includes an advanced traffic management system, which helps direct and control traffic to ease congestion in the city.
4	Environment/Sustainability Monitoring	<ul style="list-style-type: none"> • SUMS Characteristics: Flexible infrastructure 	The Oracle system that SUMS utilises can install many different programs which increase the amount of utility that SUMS can provide (Oracle, 2020). Environment monitoring applications can be used with the SUMS system, which monitors

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

		<ul style="list-style-type: none"> • SUMS Tools: Third party application integration 	important environmental measures, such as carbon levels. This can provide the city with important statistics which can help the city make the right decisions regarding the environment.
5	Customisation	<ul style="list-style-type: none"> • SUMS Characteristics: Flexible infrastructure • SUMS Tools: Oracle platform 	The city requires many different functions from SUMS, as they need to cater to the many different business needs that the public requires. Therefore, it is important that SUMS has the customisation to suit the city's needs. SUMS oracle technology is highly customisable, able to meet many different business requirements at once which helps fulfil the city's need for customisation (Sarfaraz et al., 2012).
6	Real time data analytics	<ul style="list-style-type: none"> • SUMS Characteristics: Forecasting capabilities • SUMS Tools: Inbuilt analytical software 	AI driven analytics provide real time data to users, which can help alter the government's actions in real time to help provide the public with the resources and services they need (Gain Insights with Oracle Analytics, 2021).
7	Fast response time	<ul style="list-style-type: none"> • SUMS Characteristics: Fast infrastructure • SUMS Tools: Machine learning 	Real time data analytics allow for faster response times, as the information that the government needs to make decisions can be analysed and sent to the right sources. This increased response time can be attributed to machine learning, which calculates and analyses faster than a human.
8	Administrative system	<ul style="list-style-type: none"> • SUMS Characteristics: Centralised command center 	The central command centre allows orderly and smooth flow of data to and from places that need it. This can help greatly, as all information can be analysed in one place which preserves data integrity.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

		<ul style="list-style-type: none">• SUMS Tools: Notifications, analytical software	
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SUMS is the ideal solution for Metroville due to its scalability, flexibility, and ability to integrate future technologies. It is designed to handle the complex, multi-layered urban environment that Metroville faces. Unlike traditional ERP systems, SUMS is tailored specifically to meet the unique needs of cities, with features such as IoT-driven real-time data collection, AI analytics, and automated response systems.

4. Vendor Selection Criteria

In the context of Metroville City's efforts to upgrade its Smart Urban Management System (SUMS), a thorough evaluation of potential SUMS vendors is required to ensure alignment with the city's operational and implementation needs. Selecting the right vendor is critical to the success and sustainability of Metroville's SUMS implementation. It is essential to define criteria that match Metroville's unique operational and implementation needs. The following five criteria are proposed for vendor selection, each tailored to Metroville's requirements:

Vendor Selection Criteria	How it solves Metroville's problems	Rank of priority	Justification
Customisation and Flexibility	Tailored solutions, such as smart traffic control, address Metroville's congestion and urban inefficiencies. Customisation enables the SUMS to configure features that meet specific requirements, such as integrating environmental monitoring for carbon levels or adjusting public alerts for changing traffic patterns (Khan et al., 2020; Lee et al., 2017).	High	Customisation is critical for Metroville's unique needs, allowing SUMS tools to meet specific urban challenges through features that monitor, report, and adjust in real time. This level of flexibility reduces the city's reliance on external systems, allowing processes to be more efficient and accurate.
Scalability	As Metroville grows, scalability ensures that the SUMS can handle more data and new technologies such as AI, IoT, and future city expansion. This is critical for allowing the city to expand its infrastructure without requiring large-scale upgrades, which	High	Metroville's long-term growth depends on a scalable SUMS system. Expanding urban services such as emergency notifications and resource monitoring demands

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	may affect public services and raise costs (Ali & Miller, 2017; NetSuite, 2024).		systems that can handle a larger user base and process more data without losing efficiency.
Data Integration Capabilities	Unified data flow improves communication among departments (e.g., urban planning, public safety), centralises information, and allows for faster decision-making. For example: Integrated data can enable real-time traffic monitoring to feed into public safety notifications or urban development planning, resulting in coordinated city responses.	Medium	Integrating data across departments reduces redundancy, increases accuracy, and allows for faster, data-driven responses. Metroville's departments can collaborate in crisis situations to provide citizens with faster, more reliable services while improving the government's overall resource allocation efficiency.
Cybersecurity and Compliance	Strong security measures and compliance to data regulations secure sensitive information concerning public safety, transportation, and citizen data. Compliance with data regulations is especially important for avoiding legal issues and ensuring that data use meets privacy standards (Menon et al., 2019; NetSuite, 2024).	Medium	Metroville's security and regulatory compliance protect against data breaches that might harm public trust and city functions. Given the sensitivity of public safety and personal information handled by the city's SUMS, advanced cybersecurity measures are required to prevent potential breaches while complying to local and international data regulations.

Post-implementation Support	Regular software updates, help desk support, and training ensure that Metroville's SUMS continues to meet its changing needs. This assistance also reduces system downtime and ensures that city employees can efficiently use new features as they are introduced (Ali and Miller, 2017).	Low	While post-implementation support is critical for long-term functionality, it rates lower at first. Continuous technical support is essential for ensuring that the SUMS adapts to Metroville's changing needs, and regular training enhances system usability, keeping operations running smoothly and employees informed.
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4.1 Customisation & Flexibility

When choosing a vendor for a complex system, such as Metroville City's Smart Urban Management System (SUMS), customisation and flexibility are critical as they provide these benefits:

- Addressing Specific Urban Challenges: Metroville faces urban challenges such as traffic congestion and environmental monitoring requirements. A flexible system enables the city to implement specific solutions, such as smart traffic management systems that can adjust to changing traffic patterns and environmental conditions (Khan et al., 2020).
- Adapting to Technological Advancements: As technology evolves, A flexible system can utilise advancements in AI, IoT, and data analytics (Bashiir, 2024).
- Enhancing User Experience: Customisation enables the design of user-friendly interfaces customised to the specific needs of city employees (Khan et al., 2020)

Metroville City's complex infrastructure and various difficulties highlight the importance of customisation and flexibility. The city's decision to collaborate with UrbanTech Solutions, which provided a solution based on Oracle technology. Customisation of the system to Metroville's specific

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

requirements was a key consideration in the vendor selection process, ensuring that the SUMS could effectively address the city's operational and strategic objectives (UrbanTech Solutions, 2016).

To catch up with the urban problems like traffic jams. The vendor should offer solutions that can be customised to the city's specific needs, such as smart traffic management or environmental monitoring tools (Lee et al., 2017). This adaptability is critical for implementing systems that support initiatives such as smart city technologies and public safety improvements (Ali & Miller, 2017).

For example: A one-size-fits-all solution will not meet Metroville's criteria.

4.2 Scalability:

Metroville is expanding rapidly. The chosen vendor must provide a system that is scalable to satisfy population growth and future technologies. This helps Metroville integrate with additional IoT devices, AI systems, and data analytics tools without requiring a largescale renovation. Scalability will help meet the growing demand for real-time monitoring and urban services (CIO, 2023; Zhang & Huang, 2020).

4.3 Data Integration Capabilities:

Metroville's systems varies across departments, resulting in inefficiencies and poor communication.

As Metroville grows, SUMS will need to incorporate additional data sources and adapt to new technologies, such as IoT devices or cloud platforms

Also, the vendor must have demonstrated data integration capabilities that motivates connection between existing systems such as public safety such as traffic lights to be adjusted to prioritize emergency vehicles. For urban planning, the vendor's system may analyze incident data over time to identify high-risk areas and improve road safety designs. This would centralise data, and enable better decision-making using real-time analytics (CIO, 2023; Zhang & Huang, 2020).

4.4 Cybersecurity and Compliance:

Nowadays, cyber threats are on the rise, protecting sensitive information and complying with sector-specific regulations have become essential priorities for organizations in diverse industries (Patil & Seshadri, 2014). In case of Metroville city, it is essential to control the data via a variety of information sources such as public safety, transportation, and environmental monitoring which requires modern technology application. Metroville's regulatory obligations are increasing, so to meet both local and international standards is critical (Menon, Muchnick, & Butler, 2019; NetSuite, 2024). Vendor security certifications like ISO 27001 or CSA STAR could form a critical part of the vendor selection criteria to ensure robust data protection and trust in cloud services. Hence, the chosen vendor should establish a solid knowledge and understanding these regulations and systems that align with

compliance such as reporting functions customized to meet specific regulatory requirements (Harris et al., 2009).

4.5 Post-implementation Support:

The SUMS project requires a long-term commitment. Metroville requires continuous technical support, system updates, and employee training to function properly. The vendor must provide extensive post-implementation services, such as regular software updates, help desk support, and new feature installations, to ensure that the system adapts to changing urban management requirements (Menon, Muchnick, & Butler, 2019). For instance, post-implementation support from the vendor helps the city avoid obsolescence by facilitating structured upgrades. This is to make sure that SUMS remains up to date at least every 3 years with minimal disruptions, preventing the need for a complete overhaul and reducing long-term costs (Olson & Zhao, 2007). Furthermore, vendor post-implementation support for system optimization and employee training enhances SUMS's performance, ensuring that city staffs can effectively leverage the system with regular training and system improvements (Oseni et al., 2017). Overall, without ongoing support, SUMS may struggle to keep pace with these needs, leading to inefficiencies and operational misalignment.

5. Change Management Evaluation

To implement SUMS, Metroville City had to use management strategies to smoothly implement the system. The strategies they undertook can be understood using John Kotter's 8 step change model (Kotter, 1996), which consists of 8 steps: creating urgency, forming a coalition, creating a vision, communicating a vision, empowering others, gaining early wins, consolidating change and anchoring change.

Step 1: Creating Urgency

Dr Simon Fredericks created the sense of urgency, making sure that the team was aware of the urgency of implementing SUMS, to ensure that the teams involved in the implementation are driven and focused on the task at hand.

Step 2: Forming a Coalition

A coalition was formed when many of the city's influential leaders such as the chief of urban planning and the director of public safety came together to lead the implementation of SUMS, to help align their

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

workforces with the final goal. The main challenge of this step stemmed from the stakeholders having a variety of interests and personal goals, which made it hard to unite all their resources.

Step 3: Creating the Vision

A vision was created by Dr Simon Fredricks, to inspire those involved with the implementation of SUMS (Ifinedo, 2008). Even after providing a vision for the project, some members of the teams were uncertain about the project, due to personal issues and uncertainties.

Step 4: Communicating the Vision

Workers had the vision communicated to them through constant communication between departments to ensure that all workers got the support they needed, as well as keeping stakeholders up to date with the latest information about the project (Hamrin et al., 2016). This constant communication to workers and stakeholders was crucial in gaining the trust and understanding of these parties, but underwent the risk of misunderstandings, should the information be communicated the wrong way.

Step 5: Empowering Others

Training helped empower workers, giving them the skills needed to complete their jobs. This came in the form of a learning-based strategy, which involved providing oracle systems to all future users to help familiarise themselves with the system. This approach helped get their employees used to the systems they would need to use in the future, but lacked the actual elements of the final product, such as user interface which may not provide an authentic training experience (McKenzie & Woodruff, 2013).

Step 6: Gaining Early Wins

The early wins came from the successful initial start of SUMS positive feedback, to help keep morale of the teams high. These provided the boost for the team to continue in their implementation but were hampered by the delay of the system (Kramer, 2011).

Step 7: Consolidating Change

The momentum of the change was continued and consolidated through the constant addition of more features to SUMS, such as real time traffic management systems. These continued wins helped maintain

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the team's morale to provide more efficient work. The momentum was also aided by the positive feedback that came from the departments that utilised SUMS.

Step 8: Anchoring Change

The changes were anchored through more post implement training of the related parties that would be using SUMS. This helped finalise the change in the minds of employees, to establish it as a part of day-to-day business and solidify its place in their operations. Feedback from users however asked for the training to be less intensive, as they trained the employees too little on the basics. While the accelerated learning plan had helped those who were more competent with technology, the less technology literate of the users was left confused.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Steps	Description	Metroville City's Application	Evaluation
Step 1: Creating Urgency	Create an urgent need to achieve change (Appelbaum et al., 2012)	Dr Simon Fredericks created the sense of urgency, making sure that the team was aware of the urgency of implementing SUMS, to ensure that the teams involved in the implementation are driven and focused on the task at hand.	-Strength: Helped focus the teams on the goal -Weakness: Some weren't convinced that SUMS was required
Step 2: Forming a Coalition	Create a group of influential individuals who possess the authority to drive the change (Appelbaum et al., 2012)	Influential leaders such as the Chief of Urban Planning, the Director of Public Safety and the Environmental Commissioner came together to lead the project.	-Strength: Formed a cohesive and influential group due to its leaders -Weakness: Stakeholders had differing goals, which hampered cohesiveness
Step 3: Creating the Vision	Clearly define the change, why its important and how it will be implemented (Appelbaum et al., 2012)	Dr Simon Fredricks created the vision of what SUMS was meant to be and what he desired for SUMS to do. He envisioned SUMS as an integrated platform with multiple functionalities supporting public safety, transportation, environmental management, crisis response and infrastructure upgrades.	-Strength: Helped form the goal, increasing the cohesiveness of the teams -Weakness: Some people had doubts about the vision, diminishing its effectiveness
Step4: Communicating the Vision	Share the vision widely, explain the purpose and the benefits of the change (Appelbaum et al., 2012)	The vision was communicated through the fostering of thorough communication between departments. Department heads were	-Strength: Communication was clear and concise -Weakness: Led to worries about job security

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

		required to communicate the benefits of SUMS to their departments. For example, the Director of Public Safety highlights the system's ability to report risks to public safety in real-time.	
Step 5: Empowering Others	Engage employees in the change process and encourage them to contribute to the change instead of resisting it (Appelbaum et al., 2012)	Metroville applied a comprehensive change management approach that focuses on communication, engagement and training. Employees were empowered with the use of a learn-based strategy, providing oracle to all employees to help familiarise themselves with the software which allows for a smooth transition to SUMS.	-Strength: Employees were able to become more confident with the software -Weakness: Elements of the training software would not accurately represent the final product, leading to disillusion
Step 6: Gaining Early Wins	Recognise and celebrate early achievements to show that the changes are working and to keep people motivated (Appelbaum et al., 2012)	Early wins came from the positive feedback from testers on the testing phase of the software. These provided the boost for the team to continue in their implementation but were hampered by the delay of the system (Kramer, 2011).	-Strength: Rose the morale of the teams -Weakness: Software release being delayed diminished some of the morale
Step 7: Consolidating Change	Leverage early wins to maintain momentum and encourage further changes (Appelbaum et al., 2012)	Implementation of other systems within SUMS such as the traffic management system and environmental pollution level monitoring software. These continued wins helped maintain the team's morale to provide more efficient work.	-Strength: Helped boost the morale of the team, as software was further proven to work -Weakness: High amounts of praise may have made the team complacent and

		The momentum was also aided by the positive feedback that came from the departments that utilised SUMS.	less driven to improve the software
Step 8: Anchoring Change	Ensure the changes are anchored in the organisation's culture to secure long-term success (Appelbaum et al., 2012)	The changes were anchored using post launch training which was to help supplement and add onto the initial training. Feedback from users however asked for the training to be less intensive, as they trained the employees too little on the basics. While the accelerated learning plan had helped those who were more competent with technology, the less technology literate of the users was left confused.	-Strength: Helped make sure that employees knew how to use the software and strengthened their knowledge with the software -Weakness: Learning process was too fast for some employees, causing knowledge gaps

6. Implementation Strategy

6.1. Implementation Plan

Since SUMS project is developed in the public sector, the best practice of ERP implementation from the case study of the Canadian government is adopted to ensure a successful SUMS implementation. According to Kumar et al. (2002), the "ERP Systems Experience Cycle" framework consists of four phases: chartering, project configuration, shakedown and onward/upward.

The project-chartering phase involves all activities and decision-making processes that lead to the approval of SUMS (Kumar et al., 2002). In the context of Metroville City, the project chartering phase was initiated by Dr. Simon Fredericks as the Chief Technology Officer when he pushed the idea of SUMS forward. Following this is the analysis of organisational fit, vendor fit, budget and other resources, risks, etc. to assess the possibility of SUMS project (Anwar & Mohsin, 2011).

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

The project configuration phase consists of activities needed to set up SUMS and get it running in Metroville (Kumar et al., 2002). This phase includes the development of project plan, training users, selection of team members and ongoing project management (Kumar et al., 2002). This phase was demonstrated in the context of Metroville City in how visionary leaders came together and form a team and how training was tailored to each department, ensuring that there is limited user resistance to the system. Testing of the system was also conducted in this phase to assess the readiness for the implementation.

Shakedown is the most critical phase in SUMS implementation (Kumar et al., 2002). This phase refers to the period after configuration until normal operations are restored (Kumar et al., 2002). In the case of Metroville City, this phase includes additional training to departments, reviewing regulatory compliance and constant improvements and reflection.

Phased rollout was implemented in the SUMS project. Phased implementation is adopted when one functional module is made up and running at a time which requires less resources and allows users to gradually adapt to the new system (Anwar & Mohsin, 2011). Phased implementation allowed Metroville to identify issues in traffic and public safety modules, leading to delayed go-live date.

6.2. Risk matrix

To develop a comprehensive contingency plan for implementing SUMS in Metroville City, we first identify the risks associated with the SUMS project in the pre go-live and post go-live stage, using the risk matrix to rank these risks based on its impact on the project and its stakeholders alongside with its probability of occurrence (Murray et al., 2011).

Category	Risk name	Impact	Probability	Assessment of Risk
Pre go-live	Risk 1: Lack of top management support	5	4	Extreme
	Risk 2: Data loss or corruption during migration	5	4	Extreme
	Risk 3: Data incompatibility issues	4	3	High
	Risk 4: Cost overruns	3	3	Medium
Post go-live	Risk 5: Resistance to change among users	5	5	Extreme

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	Risk 6: Delays in addressing user concerns and feedback	4	3	High
	Risk 7: Delays in solving system issues and updating systems	4	3	High
	Risk 8: System Downtime and failures	5	3	Very High
	Risk 9: Cybersecurity threats	5	4	Extreme
	Risk 10: Lack of vendor support	4	2	Medium

Table 1: Risks involved with implementing SUMS

		Impact				
Likelihood		Insignificant 1	Minor 2	Significant 3	Major 4	Severe 5
	5 Very Likely	Medium	High	Very High	Extreme	Extreme
	4 Likely	Medium	Medium	High	Very High	Extreme
	3 Possible	Low	Medium	Medium	High	Very High
	2 Unlikely	Very Low	Low	Medium	Medium	High
	1 Very Unlikely	Very Low	Very Low	Low	Medium	Medium

Table 2: Risk matrix (Murray et al., 2011)

After assessing the risks involved with implementing SUMS in Metroville City, four main risks labelled as “Extreme” are *Risk 1: Lack of top management support*, *Risk 2: Data loss or corruption during migration* during the pre-go-live stage, *Risk 5: Resistance to change among users* and *Risk 9: Cybersecurity threats* during the post go-live stage. With a clear vision of the extreme risks, two contingency strategies are developed in each phase to provide Dr. Fredericks with a detailed action plan in these worst-case scenarios.

6.2. Contingency plans for pre-go-live phase

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

6.2.1. Top management engagement strategies

Top management support is considered the most important factor throughout the SUMS implementation stages including the initiation or pre-go-live phase (Somers & Nelson, 2004). The complexities and risks associated with SUMS project require high levels of involvement from top management in financial and personnel support to prevent cost overruns and facilitate positive attitudes among employees towards the project (Barth & Koch, 2019). Additionally, the need for management support is highly emphasised in government project like SUMS due to budget restrictions in government organisations (Mpanga, 2019). Leader engagement is also vital in change management process in government settings, ensuring high user acceptance of SUMS (Ifitikhar et al., 2011). As evident in the case of Metroville, performance of a department enhanced significantly when its leaders embraced the system.

Lack of top management commitment is one of the most common reasons for project failure (Loonam et al., 2018); therefore, it is pivotal to develop contingency plans before the SUMS goes live to deal with this risk. The contingency measures include providing incentives, replacement of disengaged top management leader and forming a steering committee to distribute responsibility.

Contingency measures	Detailed plan	Personnel	Justification
1. Provide incentives to leaders to boost engagement	Step 1: Establish a formal performance measure with clear criteria Step 2: Link performance metrics with incentives Step 3: Communicate incentives clearly Step 4: Closely monitor top manager's performance and adjust compensation model if needed	Chief Operating Officer (COO), Human Resources (HR) and Project Management Office (PMO)	Employee's performance is better when the compensation is closely tied to their efforts and performance (Heinrich & Marschke, 2010). Providing incentives sends a message that Metroville City Council is interested in applying SUMS and appreciate the additional time and efforts leaders spent on the project (Legare, 2002)
2. Replace disengaged leaders with more	Step 1: Establish a formal performance metrics	Human Resources personnel,	Disengagement from leaders can lead to project delays and high

committed senior leader	<p>Step 2: Develop comprehensive conditions for replacement (e.g. consistent demonstration of lack of interest in the project)</p> <p>Step 3: Create a pool of alternative executives with history of successful projects</p> <p>Step 4: Closely monitor project leaders' performance</p> <p>Step 5: Replace disengaged leaders</p>	Project manager	user resistance (Barth & Koch, 2019). Replacing such leaders with more committed ones ensures better project leadership and decision-making.
3. Form a steering committee to distribute responsibility	<p>Step 1: Appoint key members from each department in Metroville City Council to be in the committee</p> <p>Step 2: Define key responsibilities for each member of committee</p> <p>Step 3: Schedule and hold regular meetings for updates</p>	PMO, Heads of key departments	According to Ahmad & Pinedo Cuenca (2013), steering committee with executive leadership is one of the critical success factors for ERP implementation. Dividing responsibility among leaders helps reduce reliance on one individual and ensures accountability from multiple sources.

Table 1: Contingency measures and detailed plan for lack of top management support

6.2.2. Data backup and recovery plan

Data migration and conversion are critical in the initial stages of SUMS project as availability and timeliness of accurate data play a fundamental role in effectively implementing ERP systems (Somers & Nelson, 2004). Since ERP system like SUMS is highly integrated with organisation and business processes, a significant number of transactional data in daily business activities is entered into the new system (Hussain et al., 2018). Challenges can arise from converting disparate data structures into a consistent format before the system goes live (Somers & Nelson, 2024). Considering in the case of Metroville where Dr. Frederick has a vision of SUMS as a central hub providing access to real-time data collection, data migration is especially important in the pre-go-live stage of SUMS, preventing

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

data loss and ensuring business continuity. Thus, comprehensive contingency plans should be developed in cases where there are errors in the process of entering data to the system.

Contingency measures	Detailed plan	Personnel
1. Develop a rollback plan	Step 1: Identify important stages in data migration process that might require a rollback plan Step 2: Step 3: Run rollback plan under different possible scenarios Step 4: Train IT staff to execute the rollback plan when needed	Head of IT department, IT department, PMO
2. Back-up system data before migration	Step1: Perform backup on master and transactional data stored in existing system Step 2: Store the back up in encrypted cloud Step 3: Verify the backup for data integrity	IT department, Data management team
3. Conduct mock data migrations	Step 1: Setup a test environment to simulate the migration Step 2: Run mock migrations to assess data and system compatibility Step 3: Document any problem that arise and address them Step 4: Adjust the migration plan	IT department, Data management team

6.3. Contingency plans for post go-live phase

6.3.1. User feedback and change management plan

The adoption of SUMS is an organization-wide change that, without effective management, can lead to resistance, errors and redundancies within the organization (Somers & Nelson, 2004; Iftikhar et al., 2011). Moreover, in a case study conducted by Iftikhar et al. (2011) which focused on the implementation of ERP in public organisations, most of the users were reported to be against the transition to an automated system as they feared loss of jobs or changes in current jobs. In the context of Metroville City, user resistance was observed among administrative staff whose roles are closely attached to the old municipal systems. This has led to challenges in adapting the new technology.

Thus, a comprehensive change management program should be developed to deal with high risk of resistance to change often associated with ERP projects and build user acceptance of new technology (Finney & Corbett, 2007). Top management support also has a significant influence on the level of user resistance (Iftikhar et al., 2011). However, this factor is managed pre-post go live (See 6.2.1. Top management engagement strategies). Contingency measures that project leaders should adopt to minimize user resistance include creating a feedback loop, establishing a specialised team management team and customising training approach according to user needs.

Contingency measures	Detailed plan	Personnel	Justification
1. Create a feedback loop that allows users to report issues and suggest improvements	Step 1: Select feedback channels (e.g. online forms, in-person interviews, emails, etc.)	IT support team, Change management team	Lack of clear feedback mechanisms and change management can lead to resistance and negative

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	Step 2: Review and prioritise to address feedback based on urgency Step 3: Communicate changes and actions taken to users		attitudes of users towards the new system, hindering the success of SUMS (Venkatraman b& Fahd, 2016).
2. Form a change management team	Step 1: Form a team with project champions from each department Step 2: Schedule regular meeting to collect reviews and attitudes on the systems Step 3: Implement changes and updates Step 4: Review changes and adjust	Change Management team, IT department	
3. Customise training approach according to user needs	Step 1: Assess users' technical proficiency and job requirements to develop training program Step 2: Hold regular meetings with each head of department to identify difficulties in adoption Step 3: Adjust and tailor training programs for each department based on feedback and requirements Step 4: Review and offer ongoing support for departments	HR, Heads of key Departments	Training of system users plays a critical role in effective change management in ERP implementation (Iftikhar et al., 2011).

6.3.2. Cybersecurity measures

The growing reliance on information and communication technologies (ICTs) has led to increased risks of cyberterrorism and cyber attacks across various industries (Wirtz & Weyerer, 2016). Government or public administration are one of the industries experience the most attempts of cyber attacks as reports on cybersecurity showed (Wirtz & Weyerer, 2016). In Australia, cybercrime continues to be one of the major threats (Defence, 2023). From 2021-22, reports of cybercrime in Australia saw a 23 per cent increase (over 94,000 reports) (Defence, 2023).

The implementation of SUMS would make Metroville city become more reliant on IoT networks and centralised data hub to manage its critical functions which increases the likelihood of potential data breaches and cyber threats. This highlights the need for comprehensive contingency plan for such scenarios to protect Metroville and its stakeholders against data vulnerabilities, ensuring that the city complies with security regulations.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Contingency measures	Detailed plan	Personnel	Justification
1. Create an Incident Response Plan (IRP)	<p>Step 1: Create a comprehensive IRP with clear protocols for recognising and responding to incidents</p> <p>Step 2: Define clear responsibilities for each team member of the IT department when an accident occurs</p> <p>Step 3: Conduct training and simulations</p> <p>Step 4: Review and update IRP</p>	IT department	IRP provides Metroville with a comprehensive framework for cyber risk management to ensure business continuity (Shinde & Kulkarni, 2021)
2. Perform vulnerability assessments regularly	<p>Step 1: Schedule regular vulnerability assessment and penetration testing</p> <p>Step 2: Analyse the findings and prioritise to address vulnerabilities based on risk level</p> <p>Step 3: Adopt security measures accordingly</p>	IT department	-Vulnerability assessment and penetration testing (VAPT) gives Metroville a thorough evaluation of potential threats so that critical vulnerabilities can be addressed (Shinde & Ardhapurkar, 2016)
3. Establish a disaster recovery plan	<p>Step 1: Create a disaster recovery plan for data backup and system recovery</p> <p>Step 2: Test the plan in simulations to ensure effectiveness</p> <p>Step 3: Update the plan if needed</p>	IT department	-VAPT helps prevent network downtime caused by breach, unauthorised access and data corruption (Shinde & Ardhapurkar, 2016)

7. Value Realisation

SUMS offers values to four key areas of Metroville city's urban management: Traffic and Public Safety Management, Environmental Sustainability Initiatives, Infrastructure Upgrades and Maintenance and Crisis Response and Management. Based on the business requirements provided in part 3: Business Requirements, this section will critically assess how SUMS benefits these aspects of urban management through key criteria: data management, real-time data analytics, automation, scalability and flexibility, stakeholder collaboration, compliance and alignment with strategic goals. These criteria emphasise how SUMS supports Metroville's vision for a smarter and more sustainable urban management.

Area of Urban Management	Data Management	Real-Time Data Analytics	Automation	Scalability and Customisation	Stakeholder Collaboration	Compliance	Alignment with Metroville's goals
Traffic and Public Safety Management	SUMS integrates traffic data, enables speed data entry and enhanced accuracy (Oracle, 2022)	Provides real-time situation awareness and alerts for quick response to congestion and incidents (Oracle, 2022) -Provide predictive insights for	-Built-in intelligence tools provide automated location and subjects alerts (Oracle, 2022) -Deep learning is applied for disaster management (Ahmad & Mehmood, 2020)	Scalable to handle increased traffic and adaptable to new technologies	Allows coordination and collaboration between emergency services, traffic authorities, and law enforcement	Supports compliance with traffic laws, safety standards, and reporting requirements by integrating regulatory compliance policies into business operations (NetSuite, 2023)	Contributes to reduced congestion, enhanced safety, and smart transportation

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

		strategic planning			(Oracle, 2022)		
Environmental Sustainability Initiatives	SUMS manages and monitors data about resource usage, air quality, energy consumption, and waste	Monitors pollution levels, energy use, and sustainability goals in real time	Automates reporting on energy consumption, waste recycling, and green initiatives	Adaptable to accommodate new environmental projects and regulations (NetSuite, 2023)	Encourages collaboration between environmental agencies, planners, and citizens	Ensures compliance with environmental regulations, sustainability standards, and renewable energy policies	Supports long-term sustainability initiatives by optimising resource usage, tracking sustainability goals,
Infrastructure Upgrades and Maintenance	SUMS manages data on roads, utilities, and public buildings for infrastructure monitoring	Utilises IoT devices to monitor real-time road/ infrastructure conditions (De bari, 2024)	Predicts and automates maintenance planning process to ensure timely repairs (Hakimi et al., 2023)	Scalable for future constructions of infrastructure and adaptable to evolving utility systems	Supports collaboration between public works department, contractors, and utility providers for upgrades and repairs	Tracks compliance with building codes, infrastructure standards, and safety regulations	Limits disruptions and supports automated upgrades and maintenance for long-term infrastructure improvements

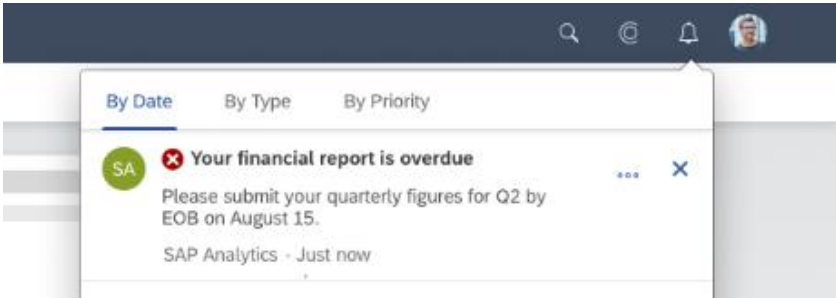
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Crisis Response and Management	SUMS integrates emergency data from multiple sources, supporting decision-making in crises (Oracle, 2022)	Monitors crises in real-time, enabling quick resource deployment and fast response (Oracle, 2022)	Automates emergency communications and resource deployment, improving crisis management	Scalable to handle large-scale emergencies and flexible to adapt to different crisis types	Coordinates responses across departments, emergency services, and external agencies like hospitals and security forces	Ensures compliance with public safety regulations, emergency response protocols, and disaster recovery plans (Oracle, 2022)	Enhances Metroville's resilience by ensuring effective and timely responses to emergencies and crises
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8. Sap S4/Hana Analysis And Recommendations

8.1 SAP assessment

The following table provides an assessment of SAP S/4HANA as a potential SUMS solution for Metroville. The evaluation is based on the business requirements of Metroville, as highlighted in our previous discussions in section 4. This assessment aims to guide Metroville in making an informed decision regarding their SUMS system upgrade.

Business Requirements	SAP capabilities	SAP Strengths	SAP weaknesses
System Scalability	Traffic Management & Public Safety: Manage Notification List- Sends real-time notifications; Automated alerts notify residents of emergency situations 	SAP's automated alert systems and real-time notification systems improve public safety by optimising traffic flow and crisis management (Khan et al., 2020).	Implementing and maintaining can be complex and resource-intensive, making it challenging to adapt the system

Citizen Services: User Feedback and My Appointments- schedule and manage their appointments and direct communication between residents and city officials)

Enhance the efficiency of managing appointments and feedback by integrating with other city management systems.

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Financial Management:

Cost Centers- Oversee and control financial performance across different cost centres

The screenshot displays the SAP S/4HANA 'Manage Cost Centers' configuration page for cost center MCABC000001. The 'Control' tab is active, showing various planning and posting locks. The 'Budget Availability Control' section is also visible, showing the budget-carrying cost center and the budget availability control profile, both set to CC5100.

Manage Cost Centers

Standard * ▾

Search

Costing Status: **All**

*Controlling Area: 6030 (Controlling Area 6030 IS)

Cost Center: MCABC000001

Cost Center Category:

Valid On: Today (10.12.2016)

Standard Hierarchy Node:

Adapt Filters (4)

MCABC000001

Line Item

Display Saved Version Copy Validity Period Where Used

General Information Organizational Units **Control** Address Communication Translation

Lock Primary Costs Planning: **ON**

Lock Secondary Costs Posting: **ON**

Lock Revenue Planning: **ON**

Lock Containmentment Upgrades: **OFF**

Budget Availability Control

Budget-Carrying Cost Center: CC5100

Budget Availability Control Profile: CC5100

Budget Availability Control is Active: **ON**

Manage Financial Statement -Generates various financial reports

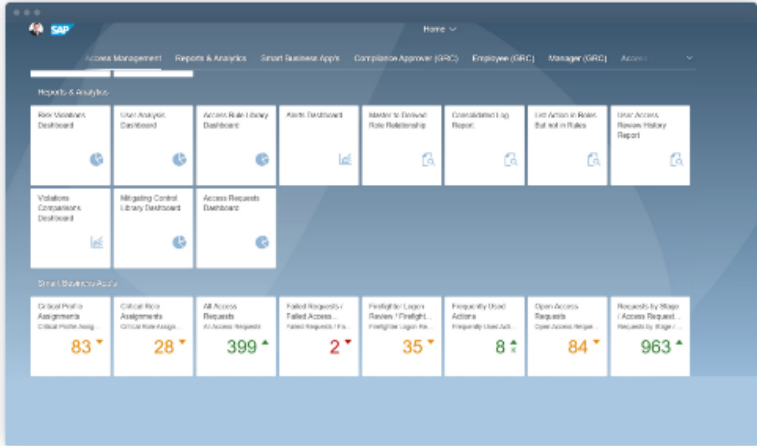


Provides comprehensive financial oversight, enabling real-time tracking of costs across different departments and generating detailed financial reports



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Compliance	<p>Regulatory Compliance: Management for track compliance with specific regulations</p> <p>Integrated Risk and Compliance Dashboards to monitor compliance across all departments in real-time.</p> <p>Audit Trail: To support comprehensive tracking of changes. This feature aids in monitoring data integrity, which is crucial for maintaining trust and ensuring compliance (SAP, 2024).</p>	Allows for centralized monitoring , which helps reduce the risk of non-compliance by giving instant access to compliance status updates (CIO, 2023)	Implementing and customizing is a complex and resource-heavy process, often requiring specialized technical expertise and extra training programs (Menon, Muchnick, & Butler, 2019)
	<p>Solutions for Governance, Risk, and Compliance (GRC): SAP offers complete GRC solutions to assist businesses in managing risk and compliance. Tools for risk management, audit management, and access control are among these solutions.</p>	Provides centralized risk management, audit management, and access control (CIO, 2023)	The organization's specific needs require significant customisation of the GRC tools which leads to increased cost

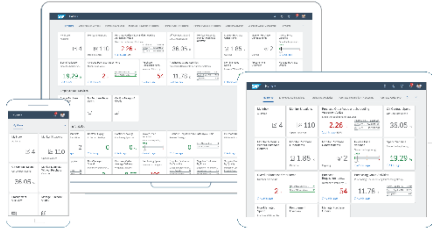
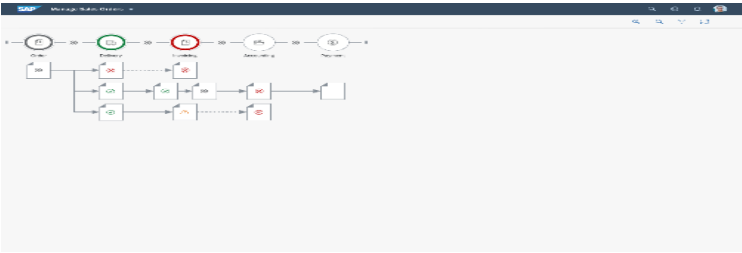
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Traffic Management System	Real-Time Traffic Monitoring: SAP can integrate with IoT devices to provide real-time data on traffic conditions	Allows for continuous data collection from road sensors, cameras, and other smart devices, provides real-time traffic data (Zhang & Huang, 2020; CIO, 2023)	Requires integration with available traffic infrastructure investment and expertise
	Data Analytics: SAP's analytics tools analyse traffic patterns and predict future trends	Enables cities like Metroville to analyze traffic patterns, detect bottlenecks, and predict future trends	Heavy dependance on data quality and computational resources

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

			
Environment/Sustainability Monitoring	Environmental Compliance Management: SAP helps businesses monitor and report on environmental regulations by offering solutions to guarantee compliance.	Reliable tools for monitoring sustainability and ensuring regulatory compliance	May need third-party extra alternatives for comprehensive monitoring
	With SAP Fiori apps optimized for mobile, city officials and environmental managers can access real-time data 	Providing quicker decision-making and increased responsiveness (SAPinsider, 2023)	Requires consistent internet access; poor connectivity can impede real-time data access.
Customization	User Interface Adjustments: Modify the interface to enhance user experience and efficiency.	Increase user engagement and satisfaction by making browsing simpler and user-friendly.	Over-customization can lead to complexity as well as difficulties in upgrades and maintenance

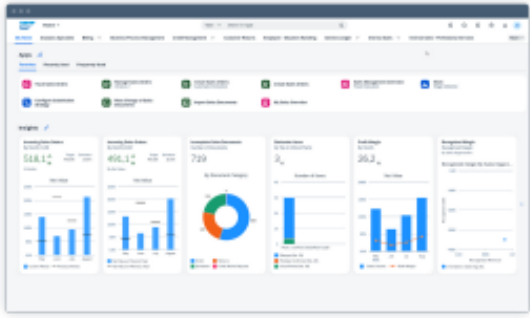

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

				
		<p>Workflow Modifications:Customize workflows to match specific business processes.</p> 	<p>Alignment with Business Processes, improving operational efficiency (Pushpakumar et al., 2023)</p>	
		<p>Environmental Compliance Management:Customizing compliance tracking to meet specific regulatory requirements.</p>	<p>Customising compliance tracking to meet regulatory requirements helps organisations meet local, national, and international standards.</p>	<p>Custom solutions may require continuous updates and maintenance to keep pace with changing regulations</p>
Real-Time Data Analytics		<p>SAP IoT capabilities enable real-time data collection and processing from connected devices and sensors</p>	<p>Allows organizations to collect and process data from connected devices and sensors in real-time</p>	<p>Integrating IoT solutions with existing systems and technologies can be challenging.(Eigner & Stary, 2023)</p>

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	SAP HANA: An in-memory database that processes large volumes of data in real-time, enabling fast analytics and reporting.	Allows for the processing of large volumes of data in real-time, enabling fast analytics and reporting (Jimenez Partearroyo & Medina, 2024)	Risk of information-overload
	SAP Data Intelligence: Provides tools for processing and transforming data in real-time	Provides robust tools for processing and transforming data in real-time	The implementation of SAP Data Intelligence can be complex, requiring specialized skills
Fast Response Time	Instant access to critical data for operational decisions as well as streamlined operations, which are essential for cities like Metroville managing large volumes of data across various departments.	Enhances public service delivery through time-consuming information	Needs high level infrastructure to ensure consistent performance
Administrative System	Manage Workflows: allows administrators to manage various HR-related workflow	Improve workflow and reduces redundancy in data handling	The initial configuration may require significant time and money.
	SAP ERP (Enterprise Resource Planning): Integrates core business processes, including finance, HR, procurement, and logistics, into a unified system.	Integrates core business processes, including finance, HR, procurement, and	May involve significant costs related to software licensing, infrastructure, and training (Menon, Muchnick, & Butler, 2019)

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

		logistics, into a unified system	
	<p>SAP SuccessFactors: Optimises administrative tasks by managing HR functions including hiring, onboarding, performance management, and payroll.</p> 	<p>Improves administrative tasks by managing HR functions, including hiring, onboarding, performance management, and payroll, resulting in increased HR efficiency. (Menon, Muchnick, & Butler, 2019)</p>	<p>Some users may find the system complex, posing challenges in adoption and utilisation across the organisation. (Bolanle, Keown, & Chriss, 2024)</p>

8.2 Recommendation regarding its business requirement

An in-depth analysis of SAP S/4HANA's suitability for Metroville City is conducted for Metroville to proceed with the SAP S/4HANA upgrade. This recommendation stems from a thorough case study evaluation and an assessment of Metroville's unique challenges and requirements, as outlined in the table below:

Requirements	Recommendation	Justification
System Scalability	Upgrade to SAP S/4HANA with a focus on cloud capabilities, leveraging SAP's Cloud Platform for increased scalability, and implementing load balancing solutions.	Upgrading to SAP S/4HANA on the cloud allows Metroville to scale resources as its needs grow, accommodating more data, users, and functionalities without requiring major infrastructure changes (Ali & Miller, 2017). Load balancing will efficiently distribute resources, reducing system overloads and improving performance during peak demand periods, which is critical for Metroville's growing urban environment (SAP, 2023).
Compliance	Implement SAP's Compliance Management Tools, which include automated workflows for reporting, tracking, and regular updates, as well as compliance alert configuration.	SAP's integrated compliance tools improve Metroville's regulatory tracking across departments by automating routine compliance checks and ensuring timely regulatory updates. Automated alerts shorten response times, reducing the risk of violations and penalties in a highly regulated urban management environment (Menon et al., 2019; NetSuite, 2024).
Traffic Management System	Integrate SAP with IoT-enabled traffic management solutions like SAP Connected Vehicle, allowing real-time data analysis and signal timing optimization.	Metroville's IoT integration provides real-time traffic information, allowing for predictive traffic signal adjustments and reduced congestion. SAP's Connected Vehicle solutions analyse traffic patterns and optimise signal timing, which is critical to Metroville's goal of reducing delays and improving emergency response times in congested areas (Khan et al., 2020).

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Environment/ Sustainability Monitoring	Implement SAP's Environmental, Health, and Safety (EHS) Solutions, including sustainability dashboards for emissions tracking, and establish KPIs for environmental metrics.	SAP EHS provides early environmental monitoring and centralised sustainability reporting, which are critical for Metroville's goal of meeting urban sustainability targets. Dashboards and KPIs help departments stay on track with emission reduction targets and make faster decisions about resource allocation and environmental policies (Bashiir, 2024; SAP, 2022).
Customization	Use SAP's Flexible Architecture for modular custom applications; develop custom apps with SAP Fiori for tailored user interfaces that meet city-specific needs.	Metroville's need for specialised features, such as traffic or environmental monitoring, is met by its flexible architecture. SAP Fiori's customisable interfaces enhance the user experience for city employees, ensuring that the system meets Metroville's operational requirements and operates effectively with high user engagement (Lee et al., 2017; Sullivan, 2022).
Real-Time Data Analytics	Use SAP HANA's in-memory computing for real-time analytics; create live dashboards and predictive analytics to visualise and forecast trends.	SAP HANA's in-memory capabilities enable immediate data processing, which is critical for Metroville's real-time decision-making in crisis or high-demand situations. Live dashboards provide real-time insights, while predictive analytics assist the city in forecasting future challenges, such as traffic bottlenecks and environmental concerns (CIO, 2023; SAP, 2023).
Fast Response Time	Use SAP Data Hub to improve data integration and flow across departments; automate data collection processes.	The Data Hub's streamlined integration capabilities reduce data transfer delay time, allowing Metroville to obtain faster, more accurate insights across departments. Automated data collection allows for faster updates and responses, which is essential for public safety and efficient resource management (Khan et al., 2020; Sullivan, 2022).

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

Administrative System	Centralize operations using SAP Workflow Management to standardize processes and increase administrative efficiency.	Workflow Management streamlines administrative tasks, reducing redundancy and increasing operational transparency across departments. This centralised approach enables Metroville's staff to more effectively respond to resident needs while also reducing service request processing times (Ali & Miller, 2017; SAP, 2021).
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8.3 Recommendation regarding identified vendor selection criteria

Considering Metroville's requirements and the vendor selection criteria identified for SUMS, SAP S/4HANA presents itself as a strong candidate. Its capabilities in customization, scalability, data integration, cybersecurity, and post-implementation support closely align with Metroville's urban objectives.

Requirements	Recommendation	Justification
Customisation and Flexibility	Use a flexible implementation strategy when integrating new technologies with SAP S/4HANA such as on- premise, cloud and hybrid, Upgrade to a cloud-based SAP S/4HANA solution that offers scalability and modernization of city services.	The city can choose an approach that aligns with their needs, budget, and infrastructure capabilities among various options. Moreover, it can intergraed for faster adaptation to technological changes, keeping the city innovative and efficient (Aslam & Raza, 2022). The cloud infrastructure will enhance operational efficiency and reliability, improving public safety and services (Babu & Desai, 2023). Real-time analytics will improve decision-making during crises, allowing the city to allocate resources more effectively (Aslam & Raza, 2022).

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	Implement SAP S/4HANA's real-time analytics features for immediate data processing and insights.	
Scalability	Leverage SAP S/4HANA's Scalable Architecture to support the integration of additional IoT devices, AI-powered services, and data analytics tools.	<p>SAP's scalability will allow Metroville to integrate more with:</p> <p>IoT devices: traffic sensors or environmental monitors- for monitoring real-time data from multiple sources and allow for quicker data-informed decisions.</p> <p>AI Predictable data analysis helps Metroville to be proactive in planning and processing operations like predict energy use or traffic.</p> <p>Data analytics for processing large volumes of data efficiently which enhancing city's urban planning strategies, contributing to Metroville's long-term goals.</p> <p>Overall, without a significant overhaul, SAP's architecture allows easy scaling across multiple environments which is easier for managing the rapid population growth and technological expansion anticipated in Metroville.</p>
Data Integration Capabilities	Utilize SAP S/4HANA's integrated traffic management systems to monitor and control urban traffic.	<p>Smart traffic solutions can reduce congestion, improving quality of life and resource allocation (Dreiling & Vögele, 2021). By centralizing traffic data, SAP S/4HANA empowers Metroville to gather real-time insights on traffic patterns, congestion hotspots, and peak hours, facilitating timely adjustments to improve traffic flow.</p> <p>A centralized system will minimize redundancy and enhance communication (Sullivan, 2022). Unified data fosters a collaborative environment where all departments work with a common</p>

INF20030- CLOUD APPROACHES FOR ENTERPRISE SYSTEMS

	Upgrade SAP S/4HANA's integration capabilities to unify data across departments.	understanding of the city's needs and resources, ultimately providing better, more cohesive services to its residents.
Cybersecurity and Compliance	Use SAP S/4HANA's compliance features: Audit trails and automated regulatory	SAP S/4HANA's security framework is equipped with robust data protection measures, including certifications like ISO 27001 and CSA STAR, which help ensure data integrity and regulatory compliance. Not only SAP /4HANA help to simplify compliance processes and reduce administrative costs but also help Metroville minimizes manual compliance efforts and reduces the risk of non-compliance due to outdated information by aligning with the latest industry standards and government regulations (Dreiling & Vögele, 2021). Furthermore, the capabilities of audit trail would help Metroville in monitoring track of changes across operations (SAP, 2024).
Post-implementation Support	Leveraging SAP's Customer Interaction Center (CIC)- direct access to experienced SAP advisors (SAP, n.d.).	With SAP's support, this can help Metroville ensure that SUMS remains up-to-date and adaptable, allowing the city to avoid obsolescence and costly system reimplementations. Through the CIC, SAP advisors offer customized scalability planning, helping Metroville to scale SUMS without the costly disruptions associated with system overhauls (SAP, n.d.) . This includes assessing current and projected data loads, advising on infrastructure adjustments, and implementing SAP S/4HANA's best practices for managing increased demand. Furthermore, CIC support can assist in identifying and deploying new system functionalities or enhancements as Metroville's urban management needs evolve (SAP, n.d.). By utilizing SAP CIC for scalability guidance, Metroville will ensure SUMS is consistently equipped to handle future growth, safeguarding both the city's investment and the long-term effectiveness of the system.

II. CONCLUSION

This report has thoroughly examined Metroville City's journey toward becoming a smart city, identifying its strengths and primary challenges. Our evaluation of Metroville's operational landscape emphasizes the importance of aligning business challenges with strategic priorities, revealing significant potential for SUMS solutions to address these issues effectively. Through this analysis, we outlined eight core business requirements crucial for Metroville's success, alongside tailored selection criteria to guide the city in choosing a vendor capable of delivering a SUMS solution suited to its unique needs. Moreover, the report explored change management strategies employed by Metroville in navigating the transformational SUMS implementation, evaluating these approaches through the lens of Kotter's model. The necessity of contingency planning for both pre- and post-go-live phases was underscored to ensure operational continuity and manage risks throughout the implementation process. Finally, an assessment is conducted about the prospective impact of SUMS on Metroville's operations, specifically considering an upgrade to SAP S/4HANA. Our comprehensive analysis of SAP S/4HANA's capabilities, strengths, and limitations indicates that this upgrade would strategically position Metroville to align with industry best practices. To conclude, upgrading to SAP S/4HANA is recommended in Metroville as a decisive step toward achieving its smart city vision.

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