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Preliminary Phase

Task-1. Describe the scope of your Enterprise (Baseline Architecture) for the EA work using a rich picture (use MS Visio) and textual descriptions. The scope description should contain the main aspects (including who is the main sponsor of the EA work and what main duties along the EA this sponsor has)?

Answer:

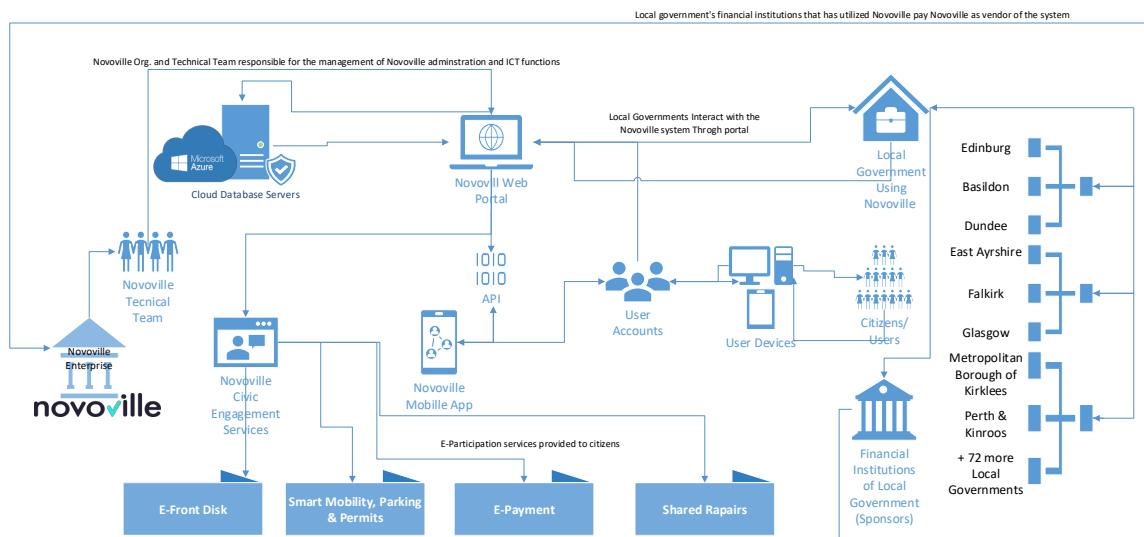


Figure 1. Baseline Architecture Rich Picture

The source file of MS Visio rich picture is accessible in the Model Artifacts folder as “**Baseline Architecture - Rich Picture.vsdx**”.

Textual Description:

Novoville is a Civic Engagement Platform that transforms the way citizens interact with local government. The platform is designed to improve the delivery of local government services and shape tomorrow's government policies, by making them more accessible, efficient, transparent and citizen centric. Therefore, the Novoville's civic engagement baseline architecture is designed to facilitate communication and interaction between local governments and citizens.

Figure 1, provide a view of the baseline architecture components, since the platform provide services to 80 different local government hence, to incorporate all the components a general but

concise and straightforward view of the baseline architecture has been provided. Furthermore, these components have been categorized into 5 components:

1. The main Sponsor: Since the platform provide services as a vendor to different local governments, hence the main source of funding come from the financial institutions of the local governments that funded the integration of Novoville within the local government systems. The main role of the sponsor is ensuring seamless integration of system and utilizing the full potential of Novoville after integration.
2. Mobile Application and Web Portal: Novoville offers mobile apps for both Android and iOS, which is connected through API with the web portal accessible through standard web browsers. These applications serve as the primary interfaces for citizens to engage with their local government. It also gives access to local governments to facilitate service provision to citizens.
3. User Accounts: Citizens can create accounts using their devices within the platform to access various features and services. These accounts allow for personalized interactions and secure access to information as shown in Figure 1.
4. Services provided by the Novoville:
 - a. **e-Frontdesk:** Manage requests, forms, incident reports and resources in one place, improving organisational visibility and efficiency.
 - b. **Smart Mobility, Parking & Permits:** Integrate data from all modes of transport & IoT sensors to create a mobility ecosystem. Manage all your parking and permit operations in a single system, improving enforcement and traffic conditions in the city.
 - c. **E-Payment:** Facilitate and manage app payments, reducing bureaucracy and transaction costs.
 - d. **Shared Repairs:** Transform the repairs & maintenance space in your locality.
5. Data Management: The platform includes a backend MS Azure cloud database to store and manage citizen data, service request details, and other relevant information securely.

Reference: Novoville official website, Retrieved from: <https://novoville.com/>

Task-2. Develop a business model canvas detailing the important aspects of enterprise scope you are focusing on.

Answer: The source file of ArchiMate business canvas model is accessible in the Model Artifacts folder as "***Business_Model_Canvas.archimate***".



Figure 2 Business Model Canvas

Reference: Novoville official website, Retrieved from: <https://novoville.com/>

Task 3. Define four architecture principles on different levels (business, data, application, technology) for your scenario using the tabular template introduced in the lecture?

Answer: Based on the evaluation of the platform baseline architecture from an Enterprise Architecture perspective, the Novoville system is analysed and designed in a way that aligns with the organization's overall business strategy, goals, and IT infrastructure. Therefore, through the below tables we are explaining the four different levels of architecture principles of Novoville scenario that include Business, data, application, and technology principles:

Table 1. Business Architecture Principle

Title	Increasing profit of <i>Novoville</i> through establishment of private cloud to removing third party vendor dependency of MS Azure while ensuring privacy of local government data
Statement	The business architecture principle focuses on understanding the Novoville's business objectives, processes, and capabilities. Hence, in our scenario, it would involve identifying the local government's specific needs, services they want to provide, and how the platform supports those requirements while maximizing their profit.
Rationale	As the main client of Novoville is local governments that are using the system, hence identifying their need, and utilizing it would reduce the cost and enhance security. We are suggesting using private cloud servers, mainly due to concern of local governments regarding hosting their citizens data on 3rd party vendor clouds such as, MS Azure. Implementation of private cloud inhouse would remove dependency to MS Azure and maximize the profit of Novoville on the long term.
Implications	<ul style="list-style-type: none"> Inhouse implementation of the private cloud server would require one time cost and will remove the vendor dependency from the current vendor – MS Azure. Additional cost would be hiring cloud professionals to implement the servers. Migration of Local governments existing data to new server. Ultimately, this will enable Novoville to generate more profit in the long run.

Table 2. Data Architecture Principle

Title	As Novoville is a E-Government/E-Participation initiative, therefore adaption of the semantic data interoperability standards
Statement	The data architecture principles define the data models, structures, and sources needed to support the Novoville platform's functionality. It includes considerations for data integration, storage, security, and privacy. Novoville is providing services to more than 80 local government and their institutions, Novoville strictly follow the General Data Protection Regulations (GDPR) and has partnership with data security companies such as, Cyber Essentials and 256 AES. But, as a E-Government platform following data interoperability standards are essential.
Rationale	<ul style="list-style-type: none"> As the Novoville has secure data protection regulation and cyber security measures, we are suggesting that it should also adapt and implement a widely accepted semantic data operability standards. While this will enable seamless transfer/migration of governments data from existing MS Azure servers. At the same time, it will also enable each local government to integrate their different local institution systems with Novoville without data format issues in an interoperable manner.
Implications	<ul style="list-style-type: none"> A widely accepted semantic data interoperability standard based on European Union or other widely used frameworks should be adapted and implemented.

	<ul style="list-style-type: none"> The new local government systems should follow the implemented standards in the integration/development phase.
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Table 3. Application Architecture Principle

Title	Human-computer interaction principles should be adapted
Statement	The application architecture involves designing the software components and services that constitute the Novoville platform. This includes mobile apps, web portals, backend systems, and integrations with existing government services.
Rationale	The Novoville Web application and Portal is the baseline of the application architecture of the platform. The portal is connected through the API with the IOS and Android based mobile application. We are suggesting the Web-portal as the base of the application architecture should be connected with the private suggested cloud and adapted to the semantic interoperability standards.
Implications	<ul style="list-style-type: none"> Human computer interaction standards should be more incorporated. Multilingual description of the interface should be added for better user experience.

Table 4. Technology Architecture Principle

Title	Cloud and Networking hardware infrastructure enhancement
Statement	The technology architecture of Novoville deals with the underlying technology infrastructure, hardware, software platforms, and cloud services that support the Novoville system. It ensures that the chosen technology aligns with the organization's IT strategy and scalability needs.
Rationale	<p>The Novoville has wide functioning technology architecture as it's proving services for more than 80 local governments all over the globe. The technology partners of Novoville include, MS Azure, HM-G Vloud Supplier, Cyber Essentials, 256 AES etc..</p> <ul style="list-style-type: none"> The suggested inhouse private cloud will require a wide hardware technology infrastructure including servers, cooling system and other relevant hardware components. Purchasing hardware infrastructure for private cloud servers will require a one-time purchase but their will be long-term return of the investment.
Implications	<ul style="list-style-type: none"> Purchasing and installing the new private cloud servers and integrating the Novoville, ultimately system of all local government clients will increase security and efficiency. The integration of new technology inhouse cloud infrastructure would facilitate adapting to a common semantic interoperability standard for the platform and clients, enhancing seamless integration and migration of systems.

To conclude, the aforementioned four architecture principles help in addressing barriers of redundancy, complexity, and lack of interoperability between different systems and services of Novoville. The above description in Table 1,2,3, and 4 tries to facilitate better decision-making by providing a clear roadmap for the Enterprise ICT investments and initiatives.

Reference: <https://pubs.opengroup.org/architecture/togaf9-doc/arch/chap20.html>

Architecture Vision Phase (AVP)

Task 4. Identify key internal and external stakeholders (at least 3) and elaborate the respective entries in the adjusted Stakeholder involvement map as presented in the lecture?

Answer:

Task 4.1.

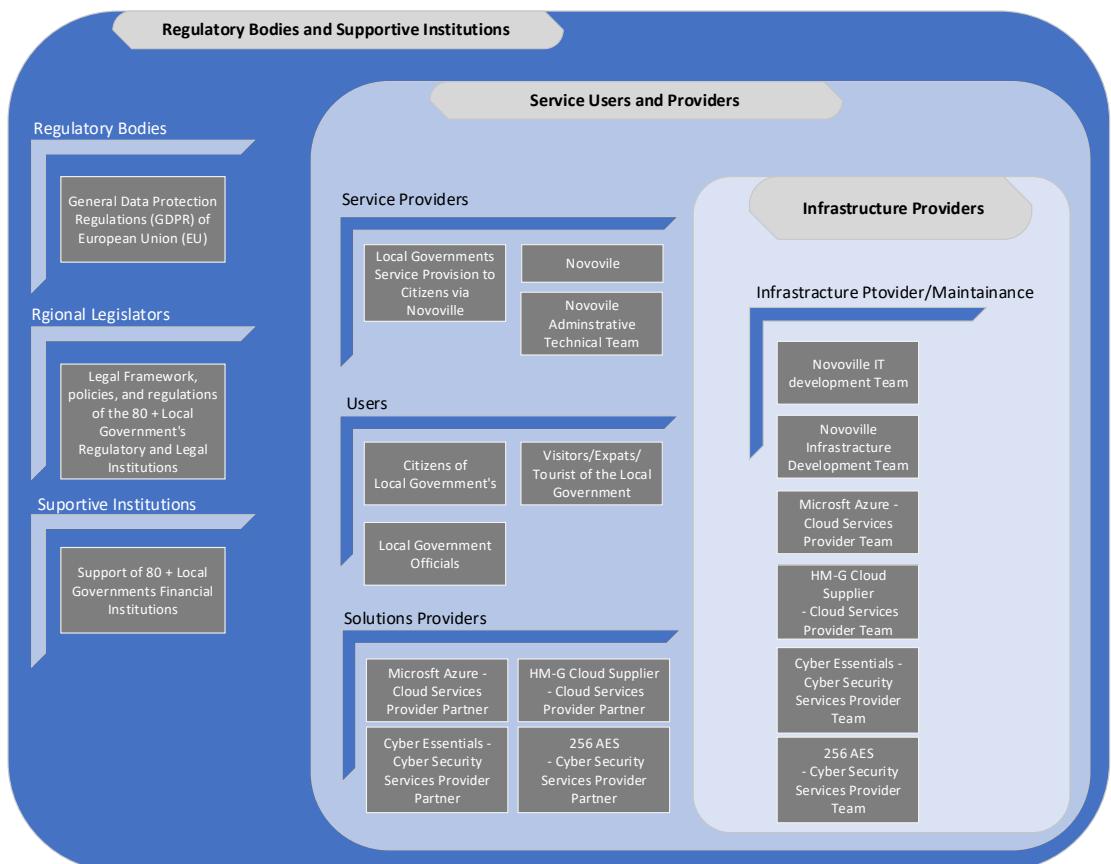


Figure 3. Stakeholder Map

The source file of MS Visio rich picture is accessible in the Model Artifacts folder as “**Task 4.1 Stakeholder Map.vsdx**”.

Task 4.2. Adjusted Stakeholder Map:

Table 2. Adjusted Stakeholder Table.

Stakeholder	Role	Involvement Description	Goals, Concerns, and Drivers	Relevant viewpoints	Kind of Involvement
Local Governments - External	Client/Customer	Partner with Novoville Platform for implementing civic engagement solutions	<p>Goals: Enhance civic engagement/ E-Participation, efficiency, and better service delivery.</p> <p>Concerns: Budget Constraints, public acceptance, or E-Participation, Data Security (Hosting of citizens data on vendor cloud such as MS Azure) and Privacy, and lack of data interoperability standards</p> <p>Drivers: Citizen Participation, Data-Driven Decisions.</p>	Citizen needs, Efficient Governance	Partnership Implementation Support, providing financial support to Novoville in return to using the platform.
Solutions Provider (MS Azure, HM-G Cloud Supplier, 256 AES, and Cyber Essentials) - External	Cloud storage, and Cyber Security services to Novoville.	<ul style="list-style-type: none"> -Collaborate with Novoville to expand product reach and enhance services, and reach -Provides the non-interrupted service to the Novoville Team. -Provision of Cloud and Cyber Security Services to Novoville. -It ensures the data security to the customer. 	<p>Goals:</p> <ul style="list-style-type: none"> -To provide secure and reliable Cloud and Data Security Services to Novoville and Partners. -Confirming data security from unauthorized access. <p>Drivers: Ensure Novoville's policy for data protection and usage during transaction and data storing.</p> <p>Concerns:</p> <ul style="list-style-type: none"> -Usability and quality of service and information. -Confirming data security from unauthorized access. - Concerns of not providing seamless and scalable services 	customer satisfaction, corporate relationship maintains, data integrity, privacy, processes, data flow, communication medium, user interface, technology, applications	Integration, Implementation, Conceptualizing, evaluating, maintaining, and Securing
Novoville IT/Development Team (Internal)	Software Development, Integration, and maintenance /system upgrade	Responsible for Development, integration, upgrade/maintenance of Novoville Platform	<p>Goals:</p> <ul style="list-style-type: none"> -Development a robust and user-friendly Novoville Platform <p>Concerns: Meeting project deadlines, ensuring system</p>	Technical expertise, system functionality, and project management	Technical software development and maintenance support in the Novoville platform and integration with local government systems.

			reliability, upgrades, and maintenance Drivers: technical support, user-friendly interfaces, and innovative solutions		
Regulatory Body (General Data Protection Regulation of EU) – External	Enforce Regulation and Data protection Standards	GDPR ensures - personal data is processed lawfully, transparently, and securely, and it grants individuals various rights over their data.	Goals: Data Protection, Privacy compliance Concerns: Data breaches and non-compliant practices Drivers: User Data, Security, and Privacy awareness	Individual Rights, Data Protection	Regulatory Compliance and Data Privacy Measures

Task 5. Identify and describe at least one internal and one external business driver that drive the architecture work.

Answer:

To ensure consistency, in this section we will be explaining one of the enhancements that I have proposed for target architecture (will be explained in detail in Task 6) and it being both an external and internal business driver that drive the architecture work.

External Driver:

As it's evident from the Table.2 in the Stakeholder Map, one of the concerns of local governments that implemented Novoville as civic engagement platform was concern of data privacy. Currently, Novoville is using the MS Azure cloud solutions, however many governments are not integrating Novoville as they don't want to store their citizens data in a United States based cloud solution such as, MS Azure.

The Novoville shall establish a private cloud in close collaboration with local government partners as this will enhance trust, insure data transparency, privacy, and protection. **As an external business driver this will enable the current involved local governments to expand their current systems. And the local government who were not using the Novoville solutions will be encouraged to integrate the platform with their governments. Ultimately, this will maximize the profit of Novoville and gain trust of partners and potential partners.**

Internal Driver:

Similarly, while establishment of a private cloud within the Novoville will gain trust of customers/local governments and encourage potential governments to integrate Novoville solutions. At the same time, establishment of inhouse cloud within Novoville will remove the vendor dependency on 3rd party cloud solution of MS Azure and HM-G Cloud Supplier. **Therefore, as an internal business driver establishment of such cloud infrastructure within Novoville will**

require a one-time investment, however it will significantly maximize the profit in the long-term and will remove vendor dependency.

Task 6. Explicitly show and explain the planned changes in the enterprise by developing the architecture vision of your Enterprise using a rich picture (use MS Visio) and textual descriptions for the main aspects for your target architecture.

Answer:

The source file of MS Visio rich picture is accessible in the Model Artifacts folder as “**Task 6. Target Architecture - Rich Picture.vsdx**”.

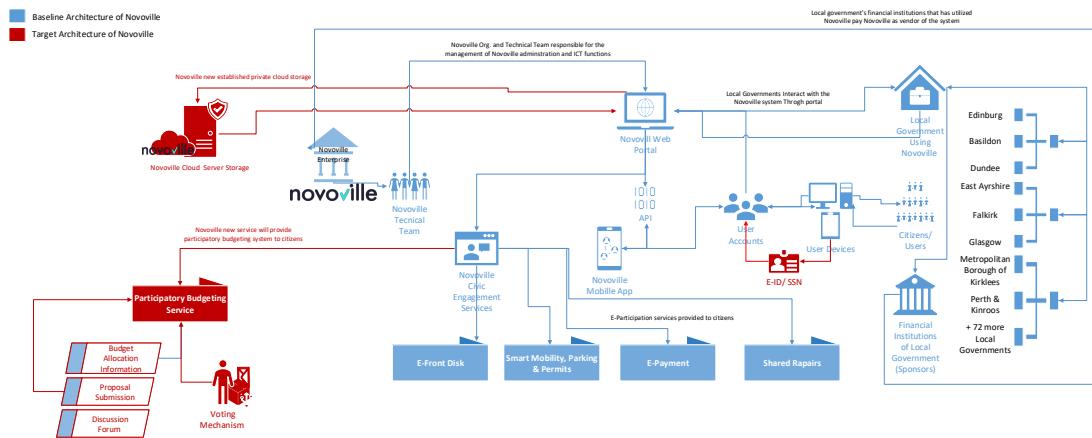


Figure 4. Target Architecture - Rich Picture

Textual Description:

The planned two changes in the architecture of Novoville has been suggested based on in-depth evaluation of baseline architecture and stakeholder concerns.

1- Electronic Participatory Budgeting (PB): Novoville is a civic engagement (E-Participation) platform, hence, to achieve the goal of Novoville, which is to make citizen voices heard, and making government services citizen-centric. **We are incorporated participatory budgeting service in target architecture in order to empower citizens to actively engage in decision-making, fostering transparency, and equity by allowing them to directly influence how public funds are allocated.** PB service will include the following components:

- Authentication using Electronic ID (eID): we are suggesting using Single Sign-On (SSO) capability to be embedded within the Novoville platform as participatory budgeting process will require active participation of actual citizens of local government using Novoville.
- Proposal Submission: Citizens can submit their budget proposals through this component. It should allow users to describe their ideas concisely and provide any necessary supporting documentation.

- c. Voting Mechanism: This component will enable citizens to vote for their preferred budget proposals. It should provide a secure and transparent voting process to ensure the integrity of the results.
- d. Budget Allocation Information: This component manages the relevant budget data, including allocations, expenditure, and available funds.
- e. Discussion Form: This component will allow citizens and government officials to discuss submitted proposals to ensure seamless communication and exchange of ideas.

2- Novoville's Cloud Infrastructure: As shown in Figure.1 Baseline Architecture rich picture, Novoville was using vendor cloud of MS Azure. However, in Figure 4. Target Architecture we are suggesting establishment of Novoville's own private cloud. In one hand, this will enhance trust of current local governments using the platform and encourage more governments to integrate Novoville civic engagement solution. On the other hand, it will remove the vendor dependency of Novoville enabling them maximizing their profit in long-term.

Business Architecture Phase (BAP)

Task 7. Outline relevant Viewpoints (at least 2) according to the stakeholder concerns (spotted in the stakeholder matrix of task 4 above) that you will consider in developing the target Business Architecture (cf. subsequent task). Thereby clearly spot the views governed by the viewpoints.

Answer:

1- For this as first viewpoints task we have selected **Novoville ICT/Development team** (internal stakeholder) concerns in developing the target Business architecture. The below-mentioned Stakeholder viewpoints in question form address different aspects of the IT/Development team's role within the Novoville platform's business enterprise architecture, providing insights into their responsibilities and contributions to the platform's success.

View:

- To mitigate data privacy concern, specifically concern of “data security from unauthorized access” from Stakeholder matrix, the Novoville ICT/Development team should establish Novoville's inhouse cloud infrastructure and remove the current vendor dependency.
- Adapting a common and widely accepted semantic interoperability standards.

Viewpoints (business enterprise architecture):

- Application Development Perspective: How does the Novoville IT/Development team handle application design, development, and maintenance for the platform, including technology selection, coding standards, and software architecture?
 - Infrastructure and Cloud Perspective: What is the role of the Novoville IT/Development team in managing the underlying IT infrastructure, including private cloud deployment, server provisioning, networking, and storage for the platform?
 - Security and Compliance Perspective: How does the Novoville IT/Development team ensure robust security measures, encryption, access controls, and compliance with data protection and privacy regulations to safeguard user data and maintain platform integrity?
 - User Experience (UX) and Design Perspective: How does the Novoville IT/Development team collaborate with UX designers to create an intuitive and user-friendly interface for both web and mobile applications, enhancing user engagement and satisfaction?
 - Performance and Monitoring Perspective: How does the Novoville IT/Development team monitor system performance, identify and address bottlenecks, optimize code, and ensure the platform's responsiveness and reliability?
 - Integration and API Perspective: What is the Novoville IT/Development team's approach to creating and maintaining APIs (Application Programming Interfaces) that enable seamless integration with third-party systems and services, promoting interoperability and extensibility?
 - Innovation and Research Perspective: How does the Novoville IT/Development team explore emerging technologies, conduct research, and propose innovative solutions to enhance the platform's features and functionality?
 - DevOps and Continuous Improvement Perspective: How does the Novoville IT/Development team adopt DevOps practices to streamline development, testing, and deployment processes, as well as their commitment to continuous improvement through feedback and retrospectives?
- 2- For the second viewpoints we have selected an **External Stakeholder - Local Governments using the Novoville solution.** The below mentioned viewpoints represent the concerns and interests of Local Governments using the Novoville platform within the business enterprise architecture. Each perspective highlights the platform's role in enhancing government-citizen interactions, streamlining processes, and improving overall service delivery.

Views:

- To enhance the viewpoints and goals of stakeholder matrix considering civic engagement, service delivery perspective, security and privacy perspective, cost and value Novoville should incorporate the following components in the platform:
 - o Discussion Forum

- Participatory budgeting
- Usage of SSO such us electronic IDs of local governments

Viewpoints:

- Administrative Perspective: How does the Novoville platform streamline administrative processes for Local Governments, improving efficiency in handling citizen inquiries, service requests, and internal operations?
- Citizen Engagement Perspective: How does the Novoville platform enhance citizen engagement for Local Governments, enabling direct communication with residents, capturing feedback, and promoting transparency in decision-making?
- Service Delivery Perspective: How does the Novoville platform facilitate service delivery for Local Governments, ensuring timely and effective responses to citizen requests, such as reporting issues, tracking service progress, and receiving notifications?
- Data and Analytics Perspective: How does the Novoville platform provide Local Governments with valuable data and analytics insights, helping them understand citizen needs, identify trends, and make data-driven decisions?
- Integration and Interoperability Perspective: How does the Novoville platform integrate with existing Local Government systems and databases, promoting interoperability and avoiding duplication of efforts?
- Security and Privacy Perspective: How does the Novoville platform prioritize data security and privacy, ensuring that citizen information is protected and compliant with relevant regulations?
- User Experience Perspective: How does the Novoville platform focus on providing an intuitive and user-friendly experience for Local Government officials, enabling easy adoption and efficient use of the platform?
- Feedback and Improvement Perspective: How does the Novoville platform gather feedback from Local Governments to continuously improve its features and functionality, aligning with their evolving needs and requirements?
- Cost and Value Perspective: How does the Novoville platform demonstrate value for Local Governments, considering cost-effectiveness, return on investment, and the platform's overall impact on citizen satisfaction and government operations?

Task 8. Develop relevant use-case diagrams or a process landscape

AND

process models showing the relevant baseline and target business processes of your scenario using UML (or process landscape) and BPMN, Event-driven Process Chain, Adonis Flow diagrams,

or ArchiMate diagrams (depending on the model kinds and tool(s) you choose). Make sure that you first provide an overview and then present the relevant processes that address the stakeholder concerns of task 7 in more detail (at least two main processes).

Answer:

The Baseline process landscape file drawn by Adonis can be found in the Model Artifacts folder as **Task 8.1 - Adonis - Process Landscape Baseline** file and the Target process landscape file **Task 8.1 - Adonis – Target Process Landscape** file.

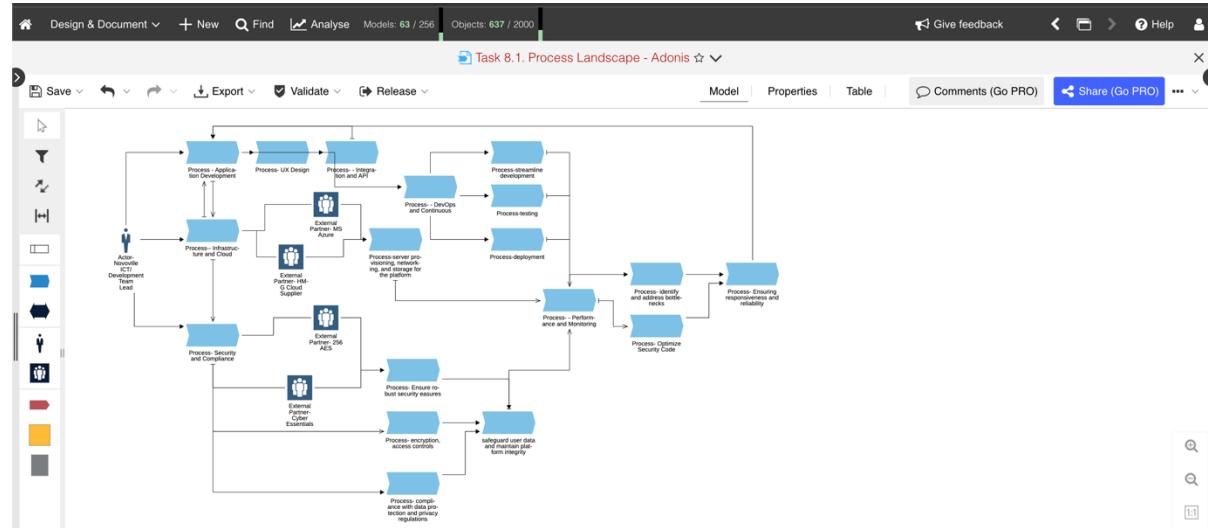


Figure 5. Adonis - Process Landscape Baseline

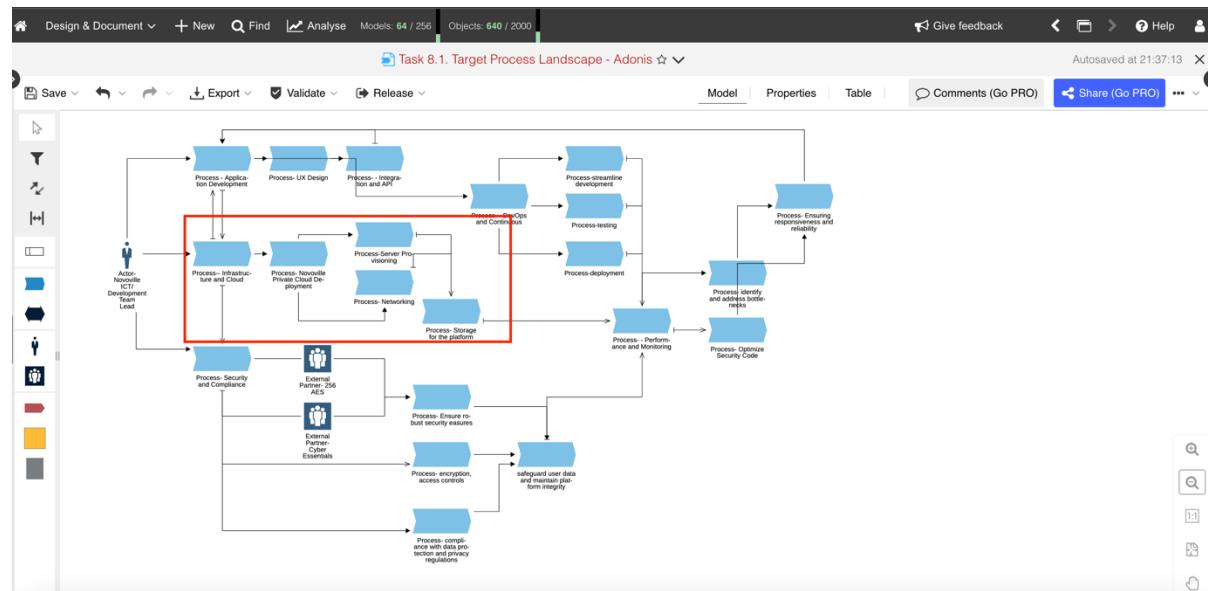


Figure 6. Target Process Landscape

As I was not able to download the .adf format of the above artefacts kindly find the pdf versions of the files in the model artifaces for better quality.

Task 9. Specify at least two functional business requirements and enter them in the requirements table of task 22 on Requirements Management.

Answer:

FR 1. Ensuring that the implementation of the Novoville private cloud infrastructure will be carried out through a smooth migration process from current MS Azure and during the implementation and migration to remove the vendor dependency and maximize business profit.

FR 2. Ensuring the integration of participatory budgeting component of the platform is discussed with relevant local governments to attract more local government and maximize profit.

Task 10. Perform a Gap Analysis by identifying specific changes (at least two) needed to achieve the target Business Architecture (based on a comparison of the baseline and target architectures)

Answer:

Table 3. Gap Analysis Business Architecture Table

Target Architecture ⇒	Novoville's inhouse cloud infrastructure to remove the current vendor dependency	Participatory budgeting component within the Novoville platform to attract more local governments use Novoville	Eliminated Services
Novoville's inhouse cloud infrastructure to remove the current vendor dependency	Missing		
Participatory budgeting component within the Novoville platform to attract more local governments use Novoville		Missing	
New			Gap: The establishment
			Gap: Establishment

			<p>of a private cloud should pave the way for agreeing upon a semantic interoperability standard by both the Novoville platform and local governments using the solution. It will also help attract more local governments to purchase and utilize the Novoville solution.</p>	<p>of participatory budgeting component within the Novoville platform will require skill professionals in the development team to deploy and align it with new standards and cyber security experts to integrate local governments Single-Sign-On (SSO)/eID within the platform.</p>	
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Reference: <https://pubs.opengroup.org/architecture/togaf9-doc/arch/chap23.html>

Task 11. To address the previously identified gaps, identify at least two major roadmap component(s) for the target business architecture and briefly describe what these components deliver and to whom.

Answer:

- 1- Based on the comparison of the baseline and target architecture for establishment of a private cloud within Novoville and adapting to an interoperability standard the following points should be considered:
 - a. For establishment of Novoville cloud the ICT/Development team should hire cloud specialist to deploy their own cloud infrastructure. Furthermore, based on the advice of the cloud specialist necessary hardware should be purchased and installed. This will a considerable one-time investment. However, it will also enable Novoville to be free from the current vendors of MS Azure and HMG-Cloud Supplier and Maximize the profit in the long run.
 - b. Furthermore, this will pave the way to re-engineer the system and adapt a common interoperability standard for Novoville. We are suggesting either widely accepted, **Open System Interconnection (OSI) model**, or as the current

target market of the Novoville is Europe, then **European Interoperability Framework (EIF)** would be ideal framework to adapt.

2- Additionally, the second specific change for gap analysis would be adding the service/component of participatory budgeting within the Novoville platform.

- a. Similarly, this will require recruitment of Software Engineers, E-Government/E-Participation Experts, Software Developers, and consultants. Ideally to implement such component it's always better to adapt it from an existing, fully function successful initiative. Therefore, we are suggesting that the participatory budgeting component should be adapted based on the existing participatory budgeting system of Porto Alegre.
- b. Hiring cyber-security experts and their close collaboration with experts from local governments are necessary to integrate SSO/eID for participatory budgeting authentication and authorization.

Information System Architecture Phase (ISAP)

Task 12. Which architecture development approach will you start with in the ISAP? Argue the best approach (Application or Data) to your specific project and provide a reasonable argumentation.

Answer:

The two main changes that we have suggested implementation of Novoville private cloud infrastructure and Participatory budgeting component require significant data migration, data management, data protection, and data flow. **Therefore, we would start with Data Architecture in the information system architecture phase.**

On the other hand, since we are suggesting integration of participatory budgeting component which widely encompasses the application architecture, but the data architecture significance is comparatively higher than application architecture in our scenario.

It's worth mentioning, that within the two broad changes in the baseline architecture that we have discussed, we will add components such as SSO/eID for authentication and authorization for security and data protection aspects, semantic data operability standards, and data migration from vendor cloud to private. **These require significant planning in the data architecture phase than software architecture.**

Task 13. Develop a baseline and target data architecture for your scenario, highlighting the changes in the target data architecture.

- a. **Outline the Viewpoints (at least 2) according to the stakeholder concerns (spotted in the stakeholder matrix of task 4 above) that you will consider in developing the target Data Architecture (cf. subsequent task). Thereby clearly spot the views governed by the viewpoints.**

Answer:

The viewpoints according to stakeholder concerns that I have selected are as follow:

- The external stakeholder – Local Governments had data protection concerns as they don't want to host their citizens data to be hosted on third party vendors cloud servers such as MS Azure.
- The other concern of the stakeholder is lack of interoperability standards among the Novoville and local government systems.

The following views are governed by the mentioned viewpoints:

1- Data Security and Privacy Concerns:

- Local Governments' Viewpoint: Local governments are responsible for handling sensitive citizen data, and they have to protect the privacy and security of that data. Storing data in a third-party cloud service, like MS Azure, may raise concerns about their control over the data and how well the data is protected against unauthorized access or breaches.
- Also, Citizens entrust their personal information to local governments, expecting it to be kept secure and private. They might be concerned about the potential risks associated with their data being stored in a third-party cloud, and they may want assurances that their data is being adequately protected.
- Hence, Novoville as the platform provider must address the data security concerns of local governments and citizens. They need to demonstrate the robust security measures in place and establish private cloud of Novoville.

2- Data Control and Sovereignty:

- Local Governments' Viewpoint: Some local governments may have policies or regulations that require them to maintain control over their data and ensure it resides within their jurisdiction. Storing data in a third-party cloud might raise concerns about data sovereignty and control.
- **Novoville address concerns related to data control and sovereignty by providing options for local governments to choose data storage locations that comply with their policies. This is done by offering on-premises deployments or using the private cloud of Novoville.**

3- Vendor Lock-In and Interoperability:

- Local governments may worry about vendor lock-in if their data is tightly integrated into a specific cloud platform. This might limit their ability to switch vendors in the future or hinder interoperability with other systems they use.
- Novoville consider offering data export capabilities and ensuring that data formats are standardized and interoperable. This gives local governments more flexibility in managing their data and reduces the risk of vendor lock-in.

- b. **Build a baseline and target Data Architecture using a UML class diagram for your major data aspects. The diagram can be one, but the target elements must be clearly highlighted. Focus on the main data elements that you need in your project.**

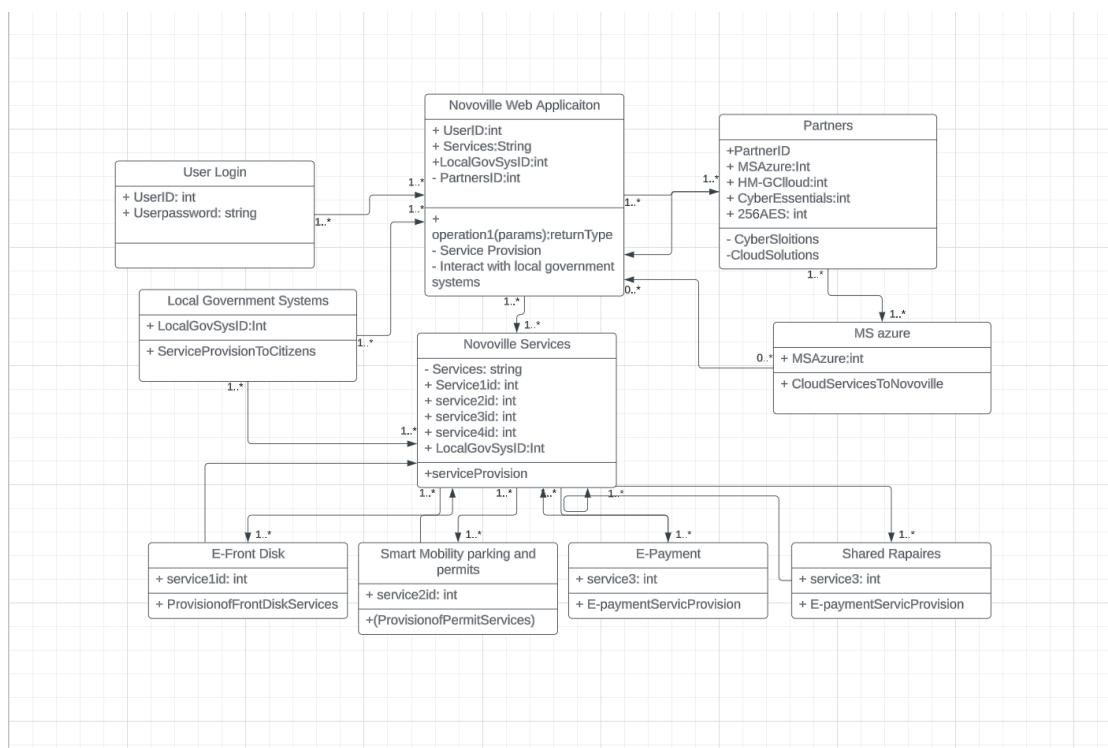


Figure 7. Baseline Data Architecture UML

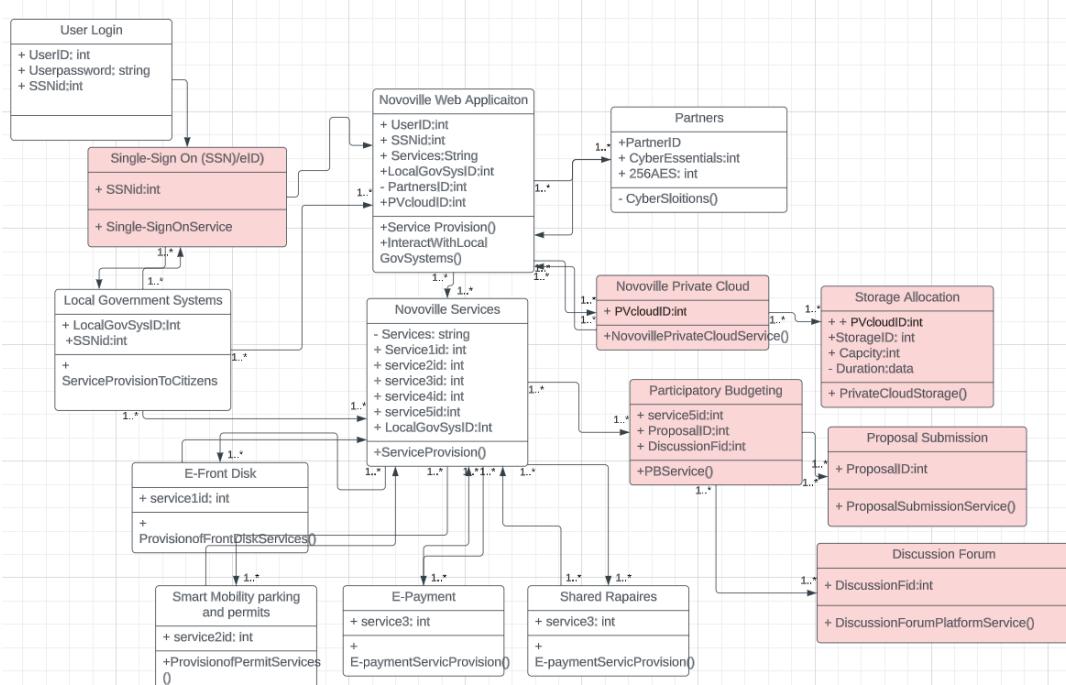


Figure 8. Target Data Architecture

Both the target and baseline data architecture source file of <https://lucid.app/> is accessible in the Model Artifacts folder as “**13.1. Baseline Data Architecture UML.svg**”.

- c. Perform a gap analysis and identify the major changes in the Data Architecture (at least two).

Table 4. Gap Analysis Data Architecture Table

Target Architectur e ⇒ Baseline Architectur e ↓	Semantic data Interopera bility standards for Novoville platform and local government systems	Data Protect ion and owners hip concer ns relevan t to storing data on vendor cloud platfor m	SSO/eID Authentica tion and Authorizat ion	Elimina ted Service s		
Semantic data Interopera bility standards for Novoville platform and local government systems	Missing					
Data Protection and ownership concerns relevant to storing data on vendor cloud platform		Missing				
SSO/eID Authentica tion and Authorizati on			Missing			
New				Gap: a new common data interopera	Gap: Private cloud should	Gap: A new SSO/eID authentica

				ability standard should be adapted.	be deployed. Because, the Data protection and ownership concern is not resolved as Novoville is using MS Azure Cloud services.	tion and Authorization component should be integrated.	
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Identified gaps are as follow:

- Lack of a common data interoperability standard.
- Data protection and ownership concerns is not resolved as Novoville is using MS Azure Cloud services.
- Lack of SSO/eID authentication and Authorization.

Note: these gaps have been explained in more details in task 13. A.

- The target data architecture shows deployment of private cloud within the Novoville to resolve data privacy and ownership concern of local governments that was due to vendor dependency of MS Azure.
 - The target data architecture has implemented SSO/eID authentication and authorization after logging in to Novoville platform which is connected to the local government systems.
 - The target architecture advises Novoville to adapt a common data interoperability standard of either **Open System Interconnection (OSI)** model, or as the current target market of the Novoville is Europe, **then European Interoperability Framework (EIF)**.
- d. Identify the major roadmap component(s) (at least two) for the data architecture and briefly describe the functionalities and features of these components:

Answer:

Roadmap 1:

A common interoperability standard should be implemented between the Novoville and Local Government systems – we are suggesting adapting **the European Interoperability Framework (EIF)**. European interoperability standards in the context of the Novoville platform refer to the set of specifications and guidelines that ensure seamless communication and integration between different digital systems and services within the European Union. These standards play a crucial role in facilitating effective information exchange and collaboration across various public administrations and services. The adoption of European interoperability standards within the Novoville platform ensures that it aligns with the broader EU initiatives, enhances its capabilities to interact with other local government public services and systems, and ultimately delivers better and more integrated services to citizens and businesses across the European Union.

Functionality:

- Data Interoperability: Ensuring that data exchanged between different systems and services follows common data formats, definitions, and structures, enabling smooth data sharing and utilization.
- Semantic Interoperability: Establishing a shared understanding of the meaning of data and information, ensuring consistency in interpreting and processing data across different platforms.
- Technical Interoperability: Defining common technical specifications and protocols to enable seamless communication and interaction between systems, regardless of their underlying technologies.
- Security and Privacy: Incorporating robust security measures and data protection mechanisms to safeguard sensitive information and ensure compliance with relevant EU data protection regulations.

Features:

- Legal and Organizational Interoperability: Addressing legal and administrative barriers to facilitate cooperation and coordination between different entities involved in providing public services.
- Service Integration: Enabling the integration of various public services and administration processes to provide citizens with a more holistic and efficient user experience.
- Cross-border Interoperability: Supporting the seamless exchange of information and services across EU member states, promoting collaboration and cooperation on a transnational level.

Roadmap 2: Implementation of Single-Sign On (SSO) through local government's eID to access Novoville local government specific services. Single-sign on (SSO) through eID implementation is a feature that enhances interoperability and user convenience in the Novoville platform, aligning with European interoperability standards.

Functionality:

Data Interoperability: SSO through eID implementation ensures data interoperability by utilizing a common identification framework. The eID (electronic identification) serves as a standardized means of user authentication, allowing users to access multiple services

- on the Novoville platform seamlessly without the need to log in separately for each service.
- Security and Privacy: The eID implementation enhances security by leveraging the robust authentication mechanisms provided by electronic identification systems. This helps to prevent unauthorized access and ensures that users' sensitive information remains protected.

Features:

- Service Integration: Implementing eID-based SSO enables seamless integration of various services within the Novoville platform. Different public services and administration processes can be integrated, offering users a more cohesive and efficient experience when accessing different services through a single eID authentication.
- e. **Specify at least two functional requirements regarding the data and enter them in the requirements table in the task 22 of Requirements Management (below).**

Answer:

FR-1: Adapting European interoperability Standard Framework both in Novoville platform, in accordance with local government systems with mutual understanding.

FR-2: Integrating the SSO – eID within Novoville platfrom from the Local Government systems in accordance to the adapted semantic data interoperability standards.

Task 14. Develop an application architecture for your scenario that addresses the baseline as well as the target architecture, highlighting the changes.

- f. **Outline the Viewpoints (at least 2) according to the stakeholder concerns (spotted in the stakeholder matrix of task 4 above) that you will consider in developing the target Application Architecture (cf. subsequent task). Thereby clearly spot the views governed by the viewpoints.**

Answer:

- 1- According to the stakeholder concerns, E-Participation/ Civic Engagement of citizens in decision making processes concern of the Local Governments is considered in developing the target architecture.
 - a. Viewpoints:
 - i. Application: what application enhancement in current Novoville system will enable citizens to participate in public-sector decision-making process?
 - ii. User Interface: does the platform adapt human computer interaction principles to engage citizens in the platform?
 - iii. Communication: does the platform has a discussion platform where citizens could engage with one another and public sector?

The reason I have selected the engagement of citizens in democratic decision making and concern of local government in e-participation is the need of a participatory budgeting service delivery

application component development within the Novoville platform. This component will allow citizens engage in public sector democratic decision-making processes and would have a voice in process of the Government. Additionally, we are suggesting development of a communication forum to enhance communication between the citizens and government officials. These two major enhancements will resolve the abovementioned stakeholder concern.

- g. Build a baseline and target Application Architecture for your project using the IT Systems model or Archi®, considering the information system services and logical application components. Clearly highlight new elements related to the target architecture.**

Answer:

The source file of ArchiMate baseline and target architecture is accessible in the Model Artifacts folder as "**Task.14.b. baseline and target Application Architecture.archimate**".

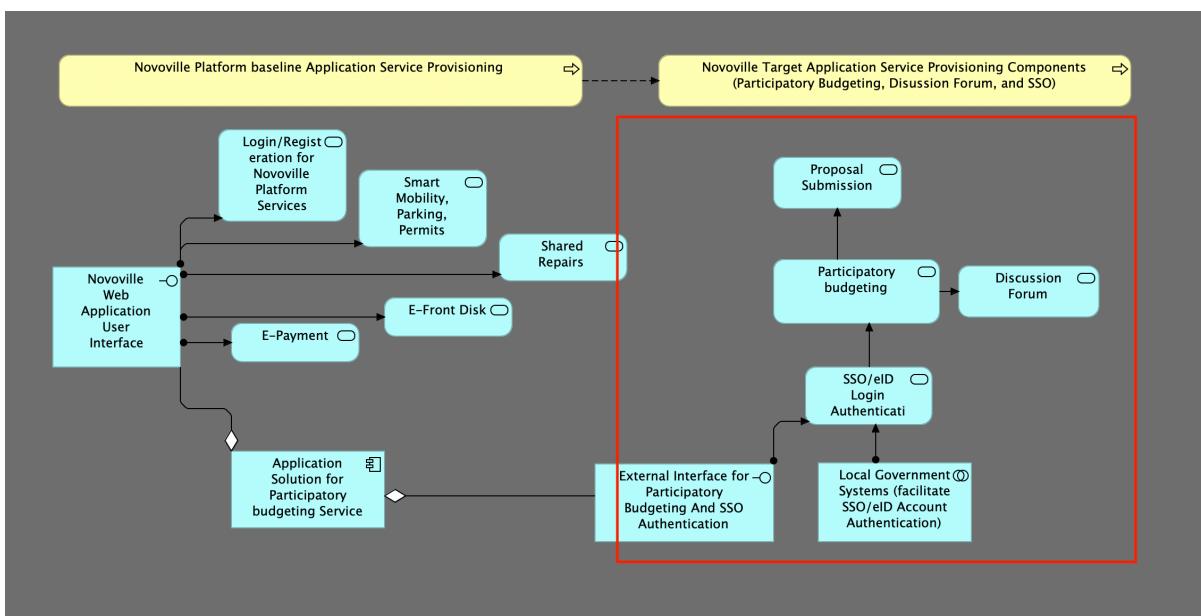


Figure 9. Baseline and target application architecture

- h. Perform a gap analysis and identify the major changes in the Application Architecture (at least two).**

Answer:

Table 5. Gap Analysis Application Architecture Table

Target Architectu re ⇒	Participat ory budgeting service	Discussi on Forum	Human compute r interacti on principle s				Eliminat ed Services
Baseline Architectu re ↓	Participat ory budgeting service						
Participat ory budgeting service	Missing						
Discussion Forum		Partially Included					
Human Computer interactio n principles			Partially Included				
New				Gap: Participat ory budgeting componen t should be establishe d or included.	Gap: Discussi on forum should be built and included .	Gap: Human Computer interactio n principles should be implemen ted.	

Ref: The TOGAF® Standard, Version 9.2 > Part III: ADM Guidelines & Techniques > Gap Analysis; <https://pubs.opengroup.org/architecture/togaf9-doc/arch/chap23.html>

- Identify the major roadmap components for the application architecture (at least two) and briefly describe the functionalities / features of these components.

Answer:

- To resolve the concern of local government's stakeholder regarding e-participation of citizens in public sector decision making, we included component of participatory budgeting within the Novoville target application architecture along with a discussion forum.
 - Features:** The participatory budgeting component of Novoville platform will enable citizens to submit their proposals, participate in annual budget allocation, and will enable them to utilize the embedded discussion forum to discuss relevant issues with citizens and government officials.

- b. **Functions:** The main function or end goal of participatory budgeting system is to give citizens a voice and power in public sector decision making and enhance democratic e-participation of citizens.
- 2- Furthermore, to resolve the concern of unauthorized access we have suggested using SSO of interoperability standard to perform authentication and authorization using the eID of local governments within the Novoville platform.
- a. **Function:** SSO through eID implementation ensures data interoperability by utilizing a common identification framework. The eID (electronic identification) serves as a standardized means of user authentication, allowing users to access multiple services on the Novoville platform seamlessly without the need to log in separately for each service.
 - b. **Features:** Implementing eID-based SSO enables seamless integration of various services within the Novoville platform. Different public services and administration processes can be integrated, offering users a more cohesive and efficient experience when accessing different services through a single eID authentication.
- j. **Specify two functional requirements concerning the application(s) and enter them in the requirements table in the task 22 of Requirements Management (below)**

Answer:

Functional Requirement 1. Developing a participatory budgeting interface for the Novoville platform in close collaboration of local governments, this interface will include functionalities such as, discussion forum, and proposal submission.

Functional Requirement 2. Developing SSO interoperability authentication and authorization capability for the participatory budgeting component.

Technology Architecture Phase (TAP)

Task 15. Develop a baseline and target Technology Architecture model using IT-Systems model or Archi® (can be one model highlighting the changes) therewith detailing the technology component(s) realising the applications defined in the Application Architecture (i.e. by expanding the IT-Systems model of the Application Architecture). Make sure that the changes for the target architecture are properly highlighted and that the connections between the technology components and elements of the application architecture are clearly identifiable! Also, for each component listed, indicate whether it is a logical or physical component.

Answer:

The source file of ArchiMate baseline and target technology architecture is accessible in the Model Artifacts folder as "**Task15. Technology Baseline and Target Architecture.archimate**".

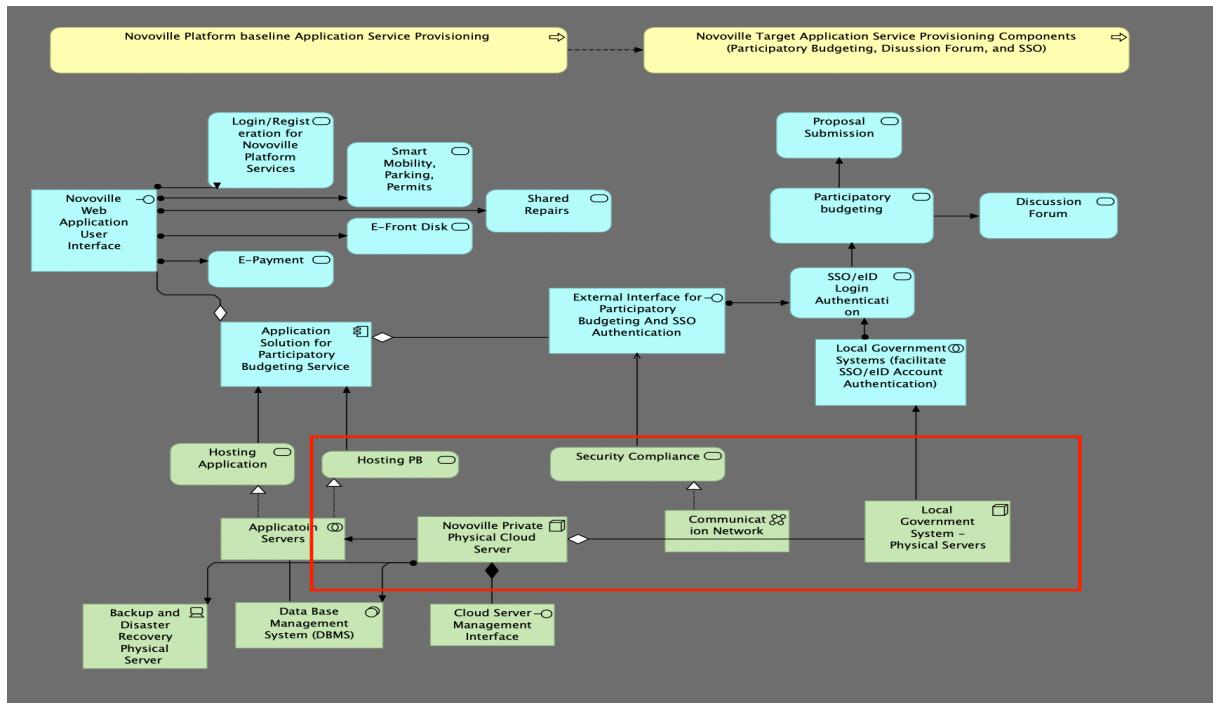


Figure 10. Baseline and Target Technology Architecture

Task 16. Perform a gap analysis and identify the major changes in the Technology Architecture (at least two)

Answer:

Table 6. Gap Analysis Technology Architecture Table

Target Architecture ⇒ Baseline Architecture ↓	Novoville's Private Cloud Servers Infrastructure	Network Connectivity with Local Government Physical Servers (for SSO)	Network Connectivity with Local Government Physical Servers (for SSO)	Network Connectivity with Local Government Physical Servers (for SSO)	Network Connectivity with Local Government Physical Servers (for SSO)	Network Connectivity with Local Government Physical Servers (for SSO)	Eliminated Services
Novoville's Private Cloud Servers infrastructure	Missing						
Network Connectivity with Local Government Physical Servers (for SSO)		Partially Included					

Authentication)					
New			Gap: Relevant hardware infrastructure Technology for Novoville Private cloud should be purchased and implemented .	Gap: The Novoville's private cloud should be connected with the local government servers to facilitate SSO authentication and Authorization.	

Gaps:

- Lack of private cloud server infrastructure to host Novoville and local governments application and relevant data.
- Lack of proper network connectivity between the Novoville platform servers and local Government servers to facilitate SSO authentication and authorization.

Task 17. Identify the major roadmap component(s) (at least two) for the technology architecture and briefly describe the functionalities / features of these components.

Answer:

- 1- The first roadmap would be deployment of Novoville's private cloud and purchasing the relevant hardware infrastructure. This will also require hiring cloud professionals.
 - a. **Features:** The hardware infrastructure required is servers, storage, networking equipment, hypervisors, virtualization hardware support, security appliances and other relevant hardware component features required for establishment of cloud infrastructure.
 - b. **Function:** The private cloud deployment together with data protection of citizens will also provide capabilities such as virtualization, resource pooling, elasticity, and scalability, high availability and redundancy, and other relevant functions for Novoville platform.
- 2- The second roadmap is connectivity of Novoville's network with the Local Government system using Novoville to facilitate SSO authentication and authorization. This requires vast network infrastructure implementation, hiring network professionals, and security specialists.
 - a. **Features:** The features include, secure network connection, API integration, Database synchronization, firewall configuration, and SSO connectivity.
 - b. **Functions:** The network connectivity will provide numerous function, however, our focus of the target technology architecture to achieve SSO authentication mentioned in the application layer.

Task 18. Specify two functional requirements regarding the technological views and enter them in the requirements table in the task 22 of Requirements Management (below)

Answer:

FR1: Acquiring/Purchasing the relevant hardware requirements (storage, networking equipment, hypervisors, virtualization hardware support, security appliances, et...) are required to deploy private cloud infrastructure for Novoville.

FR2: Acquiring all the relevant network requirement (secure network connection, API integration, Database synchronization, firewall configuration, and SSO connectivity, etc...) to establish a secure connection between Novoville platform and local government system and facilitate SSO authentication and authorization.

Opportunities and Solutions Phase (OSP)

Task 19. Create a Consolidated Gaps, Solutions and Dependencies Matrix (using the TOGAF template), containing the gaps you have identified in the previous phases.

Answer:

Reference: Consolidated Gaps, Solutions, & Dependencies Matrix; <https://pubs.opengroup.org/architecture/togaf92-doc/m/chap24.html>

Table 7. Consolidated Gaps, Solutions, & Dependencies Table

No.	Architecture	Gaps	Potential Solutions	Dependencies
1	Business	Absence of Novoville's private cloud solution and vendor dependency to MS Azure cloud services.	Deployment of Novoville's private cloud infrastructure removing the current vendor dependency and maximizing the profits. Data, Application, and Technology target architecture diagrams using Archimate to elaborate the solution deployment.	Technology 7 and Technology 8
2	Business	Absence of Participatory budgeting component within the Novoville platform	Development of participatory budgeting component/interface within the Novoville platform. Data, Application, and Technology target architecture diagrams using Archimate to elaborate the solution development.	Technology 8 and Data 3
3	Data	Semantic data Interoperability standards for Novoville platform and local government systems	The target data architecture of Novoville should adapt a common data interoperability standard of either Open System Interconnection (OSI) model, or as the current target	Technology 8 and Business 1

			market of the Novoville is Europe, then European Interoperability Framework (EIF).	
4	Data	Single sign-on SSO through local government eID Authentication and Authorization	To achieve SSO through eID a strong and secure network connectivity between Novoville server and local government servers should be established. This connectivity should be governed by the suggested semantic data interoperability standards.	Technology 8 and Data 3
5	Application	Discussion Forum	The development team should embark on development of a communication/Discussion forum within the Participatory Budgeting suggested component. Deployment of this solution will require hiring or utilizing the current application team. Also, in-depth development of application and data target architecture through ArchiMate.	Business 2
6	Application	Human Computer interaction principles	The interface of Novoville needs to adapt to a standard human computer interaction principle such as, ISO 9241 series, specifically ISO 9241-210:2019.	Business 2
7	Technology	Novoville's private server cloud hardware infrastructure	Acquiring/Purchasing the relevant hardware requirements such as, storage, networking equipment, hypervisors, virtualization hardware support, and security appliances. Hiring network professionals to establish, implement, and deploy the private cloud solution.	Business 2

8	Technology	Network interoperable connectivity with local government systems	Acquiring the relevant network requirement such as secure network connection, API integration, Database synchronization, firewall configuration, and SSO connectivity. Hiring network professionals to establish the cloud architecture in accordance with the interoperability standards.	Data 3
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Task 20. Define and describe reasonable content-wise work packages for the implementation of the target architecture you developed (project management and dissemination will not result in points for the task) – use a tabular representation. Also indicate the start month and end month per work package, and any dependencies among these work packages, if such exist.

Answer:

Reference: Phase E: Opportunities & Solutions;
<https://pubs.opengroup.org/architecture/togaf91-doc/arch/chap13.html>

Table 8. Work packages for the implementation of the target architecture

NO	Name of WP	Description of Working Package	Start month	End month	Dependency to Working Package And description
1	Coordination of Project component implementation with clients	The implementation of target business, data, application, and technology architecture require extensive collaboration with partners. For Instance, implementation of private cloud would require migration of data from current vendor cloud of MS Azure. Also, agreeing upon an interoperability standard will require extensive coordination and negotiation.	August/2023	Oct/2023	
2	Finalizing the agreement and implementation/a	To implement proposed target architectures such as	Oct/2023	Nov/2023	Dependency on WP No. 1, as before moving to adaption

	Adoption of a common interoperability standard with Local Governments	private cloud platform, it's important to agree upon and implement one of the suggested common interoperability standards.			or implementation stage - interoperability standards should be discussed among Novoville platform and local Governments.
3	Deployment of Novoville private cloud infrastructure	Deployment of private cloud infrastructure require purchasing relevant hardware, hiring cloud professionals, extensive planning and incorporating.	Dec/2023	Feb/2024	Dependency on WP No. 1 & WP No.2, as the deployment infrastructure need extensive agreement and collaboration between local government and Novoville hence WP 1, 2 is pre-request of this WP.
4	Migration of data from vendor cloud (MS Azure) to private cloud of Novoville	After deployment of a functioning private cloud within Novoville the migration phase of data from vendor cloud takes place.	Feb/2024	March/2024	Dependency on WP No.3, as a functioning private cloud is required to initiate the migration phase of data
5	Incorporating the Participatory Budgeting component within the application architecture of Novoville.	This work package has components of both application and technology architecture. The ICT team of Novoville will embark on extensive planning of the system development. This planning require close collaboration with local governments has their systems will be integrate with PB component.	March/2024	May/2024	Dependency on WP No.1, No3, and No.2, as the participatory budgeting require integration of local government systems with local government, and due to data protection concern this would be implemented only on private cloud, and after adoption of a proper common interoperability standard.
6	Integration of Single-Sign On (SSO) through local government eIDs	For participatory budgeting component and overall services of Novoville exitence of an interoperable authentication and authorization is necessary. Hence, the SSO authentication through relevant eID of	May/2024	Jun/2024	Dependency on WP No.1, No3, No.2, and No.5, as SSO cloud is could not be implemented without a proper collaboration with local government, existence of common interoperability standards,

		local government should be integrated considering the adapted interoperability standards of WP No. 2.			implementation and migration of private cloud and development of the participatory budgeting component.
7	Development of a Discussion Forum within Novoville	The ICT team will embark on development of a discussion forum within the Participatory budgeting platform. This WP will require planning, development, and implementation of application architecture. Hiring application professional or using the current ICT teams.	May/2024	Jun/2024	Dependency on WP No.3, and No.5, as establishment of Participatory budgeting component is necessary to embed the discussion forum, and this will happen after full deployment of private cloud.
8	Training internal and external stakeholders on the newly developed application features	The newly established participatory budgeting, discussion forum, and SSO authentication should be elaborated to relevant stakeholder as short training sessions.	Jun/2024	July/2024	Dependency on WP No.5, No.6, and No.7, as without the newly established participatory budgeting, discussion forum, and SSO authentication relevant stakeholder training sessions could not happen.
9	Preparation of Technical support relevant, reports documentation, and artifacts for final documentation and maintenance of the system	Preparation of Technical support reports, documentation, artifacts and deliverables preservation in architecture repository for in case of further enhancements in the maintenance phase for all the abovementioned WPs.	July/2024	August/2024	

Task 21. Please name and explain which overall Implementation and Migration Strategy you will follow for the implementation of your target architecture and why.

Answer:

Considering the target architecture that include deployment of a private Novoville cloud, we will move forward with Agile Scrum for implementation and migration strategy. Agile methodologies are designed to handle projects with evolving requirements, promote collaboration, and facilitate incremental development and continuous improvement. However, specific reasons are listed below:

- **Flexibility and Adaptability:** Implementing the Novoville private cloud and developing a Participatory budgeting component for the new target architecture involve complex and evolving requirements. Therefore, agile enables teams to be flexible and adapt to changes during development, with close collaboration of local governments, which is crucial for such projects.
- **Incremental Development:** Agile promotes iterative and incremental development, where features and functionalities are delivered in small, manageable increments. This approach enables early releases and allows stakeholders, mainly clients of Novoville (Local Governments), to see tangible progress regularly.
- **Continuous Delivery:** Agile methodologies emphasize frequent releases and continuous delivery. As a result, the Novoville ICT team can deploy and test the applications on the private cloud gradually; this will reduce the risk of large-scale failures and enable faster feedback loops.
- **User-Centric Approach:** Agile methodologies encourage close collaboration with end-users (citizens) and stakeholders (Local Governments) throughout the development process. This feature of agile methodology ensures that the private cloud and applications align closely with user needs and expectations.
- **Risk Mitigation:** Agile Scrum models, with their iterative and continuous approach, will help identify and address risks early in the development and migration process of both private cloud and participatory budgeting application components, which is crucial for complex projects like private cloud implementation.

Requirement Management Phase (RequM)

Task 22. Build up the list of functional requirements by filling in the requirements table (provided in OLAT along the exercise, including prioritisation). The functional requirements should naturally emerge from the target architecture elements defined before (points are given along the Architecture work tasks above).

Answer:

Reference: OLAT, Enterprise Architecture- Exercise 6, Retrieved from: Ref: <https://olat.vcrp.de/auth/Document/2387957>

Table 9. functional requirements table

No.	Name of the requirement	Description	Priority			Corresponding Architecture Layer
			Must-have	Should-have	Nice-to-have	
F1	General requirements regarding the functionality of the system					
F1.1	Maximizing business profit through Deployment of the Novoville private cloud infrastructure and removing the vendor dependency.	Ensuring that the implementation of the Novoville private cloud infrastructure will be carried out through a smooth migration process from current MS Azure and during the implementation and migration to remove the vendor dependency and maximize business profit	Must-have			Business Architecture Layer
F1.2	Maximizing the profit of the integration participatory budgeting component to attract more local government client.	Ensuring the integration of the participatory budgeting component of the platform is discussed with relevant local governments to attract more local government and maximize profit	Must-have			Business Architecture Layer
Fx.n						
F2	Data management (including measurable values for the amount of data)					
F2.1	Implementing a common semantic Interoperability Standard Framework	Adapting to the European interoperability Standard Framework both in Novoville platform, in accordance with local government systems with mutual understanding.		Should-have		Data Architecture Layer
F2.2	Integrating the SSO within Novoville plaftrm in accordance to the adapted semantic data interoperability standards.	Integrating the SSO through eID authorization and authentication within Novoville platfrom in collaboration with the Local Government systems and in accordance to the adapted semantic data interoperability standards.		Should-have		Data Architecture Layer
Fx.n						
F3	Process execution (including parameters for processing speed/reaction rate (average and maximum values) as well as measurable values of processing speed and processing intervals)					

F3.1	Developing a participatory budgeting interface for the Novoville platform.	Developing a participatory budgeting interface for the Novoville platform in close collaboration of local governments, this interface will include functionalities such as, discussion forum, and proposal submission.	Must-have			Application Architecture Layer
F3.2	Developing SSO interoperability authentication and authorization interface within participatory budgeting system	Developing SSO interoperability authentication and authorization interface within the participatory budgeting component.		Should-have		Application Architecture Layer
F3.n						
F4	Functional requirements concerning the co-operation of systems (including comments on leading and responsible roles in extreme and exceptional cases and parameters for interactions)					
F4.1	Acquiring hardware requirements to deploy private cloud infrastructure for Novoville.	Acquiring/Purchasing the relevant hardware requirements (storage, networking equipment, hypervisors, virtualization hardware support, security appliances, etc...) are required to deploy private cloud infrastructure for Novoville.	Must-have			Technology Architecture Layer
F4.2	Acquiring network hardware to establish a secure connection between Novoville platform and local government system.	Acquiring all the relevant network requirement (secure network connection, API integration, Database synchronization, firewall configuration, and SSO connectivity, etc...) to establish a secure connection between Novoville platform and local government system and facilitate SSO authentication and authorization.	Must-have			Technology Architecture Layer
F4.n						
					

Risk Management (RiskM)

Task 25. Perform Risk Assessment by defining four risks for your EA work (three of these risks should be related to the EA work and one should be related to the work packages you defined in task 20 of the OSP above) and filling in the risk management table provided in OLAT along the lecture 11 (slides 45-46), including the assessment of the severity of impact and the probability/liability that the risk occurs. Additionally, define risk mitigation measures to prevent the occurrence of the risks and place the risks in a 3x3 risk assessment matrix (cf. slides 48-49 of lecture 11).

Answer:

The risk management table focuses on three categorical proposed changes in target architecture of Novoville.

Table 10. Risk Management Table

Description of risk	Impact	Probability	Remedial actions
Risk Assessment for Private Cloud Infrastructure			
1- Insufficient Cloud Expertise within the Novoville ICT Team	Medium	High	This risk could be mitigated through investing in cloud training for the IT team, collaborating with experienced cloud consultants, and conduct a pilot phase to gain practical experience
2- Limited Scalability of the Private Cloud	High	Medium	To tackle the risk of limited scalability of the private cloud the ICT team could perform load testing to identify bottlenecks, design a scalable architecture with auto-scaling capabilities, and monitor resource usage and plan for future growth.
3- Data Security and Privacy Breaches	High	Low	To mitigate the data security and privacy breaches the ICT team should implement robust encryption and access controls, regularly audit, and update security measures, and comply with relevant data protection regulations.
4- Integration Challenges with Legacy Systems	Medium	Medium	To contain the integration challenges with legacy systems, a comprehensive system analysis and documentation should be conducted, standardized data formats should be used and APIs for integration. Additionally, a

			comprehensive plan should be made for gradual migration and testing of integrations.
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Risk Assessment for Participatory Budgeting Component

5- Inadequate User Adoption	High	Low	To mitigate the low rate of E-participation it's necessary to involve end-users in the development process (user feedback), conduct user training and provide comprehensive documentation, and address usability issues through iterative design.
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Risk Assessment for Adaption of Interoperability Standard

6- Lack of Standardization Awareness	Medium	Medium	To mitigate lack of standardization it's important to conduct workshops and training sessions on interoperability, provide documentation and resources about the chosen standard, and engage with local government IT teams to build awareness.
7- Technical Challenges in Implementation	Medium	Medium	To avoid the technical challenges, it's important to conduct a detailed technical analysis and feasibility study, engage with experts in the chosen standard for guidance, and develop proof-of-concept projects to identify issues early.

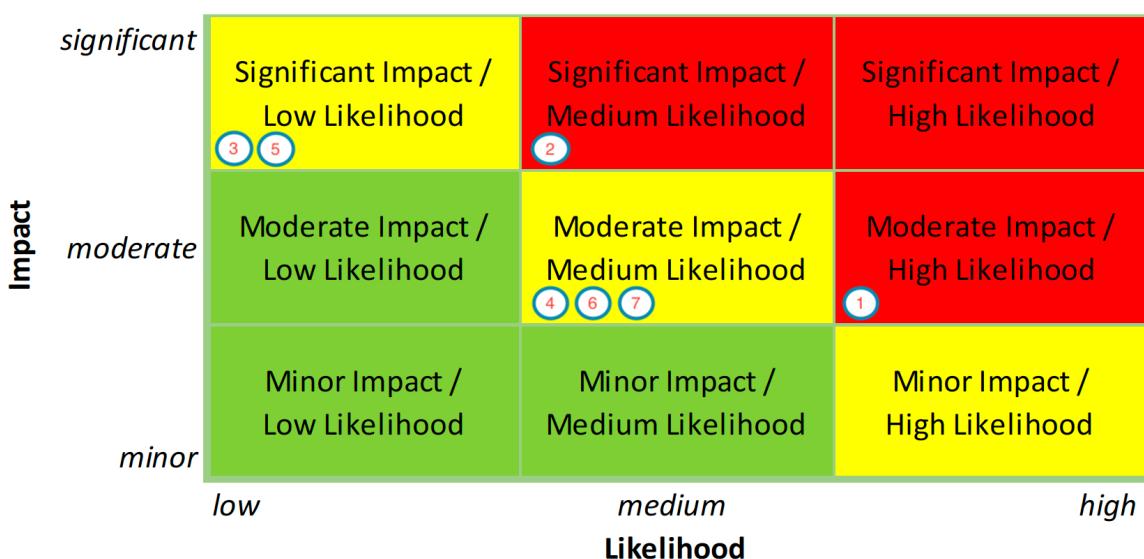


Figure 11. Risk Assessment Matrix

Architecture repository and Architecture Content Framework

Task 26. Provide an inventory (a list) of all artefacts you have developed as part of your EA work for the EA repository. Briefly describe each of the artefacts and their status and sort them along the TOGAF ADM phases.

Answer: It's worth mentioning that only the visual artefacts have been included in this table. Therefore, apart from the mentioned artefacts there are 12 tables, each table has been numbered and described using caption.

Table 11. Inventory of all artefacts developed as part of EA work for the EA repository.

No	Artifacts name	Description of Status Artifacts	TOGAF	ADM phases
1.	Baseline Architecture - Rich Picture.vsdx	It is used for describing the scope, key actors and artefacts, representation of main processes and graphical representation Novoville.	Done using MS Visio.	Preliminary phase
2.	Business Model Canvas.archimate	Novoville business model canvas used for specifying the significant business component of Novoville.	Done ArchiMate using	Preliminary phase
3.	Task 4.1 Stakeholder Map.vsdx	It is used for identifying the key stakeholders who are either internal or external.	Done ArchiMate using	Architecture vision phase
4.	Task 6. Target Architecture - Rich Picture.vsdx	It is used for clarifying the planned changes in the target architecture of Novoville which will be covered throughout the different phases.	Done using MS Visio	Architecture vision phase
5.	Baseline and Target Process Landscape diagrams, Task 8.1 - Adonis - Process Landscape Baseline and Task 8.1 -	The baseline and target landscape diagrams are used for	Done using Adonis (As I was not able to download the Adonis file –	Business Architecture phase

	Adonis – Target Process Landscape	describing the overview and the relevant processes in Novoville and the proposed changes.	Screenshots have been provided).	
6.	Baseline data architecture UML class diagram - 13.1. Baseline Data Architecture UML.svg	It is used for describing the main data elements and their relation/flow of the baseline of Novoville.	Done using Lucid (https://lucid.app/)	Information systems architecture phase
7.	Target data architecture UML class diagram - 13.1. Baseline and target Data Architecture UML.svg	The target data architecture UML class diagram elaborate the flow of baseline and target architecture.	Done using Lucid (https://lucid.app/)	Information systems architecture phase
8.	Novoville Baseline and Target Application - Task.14.b. baseline and target Application Architecture.archimate	It is used for illustrating the baseline and target application architecture bearing in mind the information system facilities and logical application components of Novoville.	Done using ArchiMate	Information systems architecture phase
9.	Novoville Baseline and Target Technology Architecture - Task15. Technology Baseline and Target Architecture.archimate	It is used for showing the technology baseline and target architecture as an extension of application architecture.	Done by using ArchiMate	Technology architecture phase

10	Risk Assessment matrix	The 3x3 matrix is used for Risk assessment with three values per assessment group.	Done using the template from Lecture 11.	Risk Management
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Task 27. Define the contractual deliverables that result from the main work packages (s. task 20) and indicate, which of the artefacts of the previous task belong to which deliverable.

Answer:

Table 12. contractual deliverables table

Del. Nr.	Name and brief description of Deliverable	WP	Artefacts part of the deliverable	Due date	Means of verification
1	Full documentation Handbook for the Novoville project that includes (quality assurance plan and risk management procedure.)	1	Artefact number 10 (risk assessment table and 3X3 matrix) Artefact Number. 1, 2, 3, and 4 (Baseline architecture rich picture, Business model canvas, stakeholder involvement map and target architecture rich picture);	Oct/2023	Refer to the Table 11.
2	Contractual agreement upon selection of Interoperability standard between Novoville and Local Governments Using the system	2	Artefact Number. 4, 5,6,7,8, and 10. (Refer to Table 11 for description);	Nov/23	Refer to the Table 11.
3	Technical and Final Report of Project	9	Relevant to all the artefacts shown in Table 11.		Preparation of Technical support reports, documentation, artifacts and deliverables preservation in architecture repository for in case of further enhancements in the maintenance phase for all the abovementioned WPs in Table. 8

Overall considerations

Task 28. System holarchy: Describe your system as the system of interest generated with enabling systems and interacting with other systems in the operational environment (use MS Visio).

Answer: The System holarchy for Novoville system drawn by MS Visio can be found in the Model Artifacts folder as 28 System holarchy.pdf file.

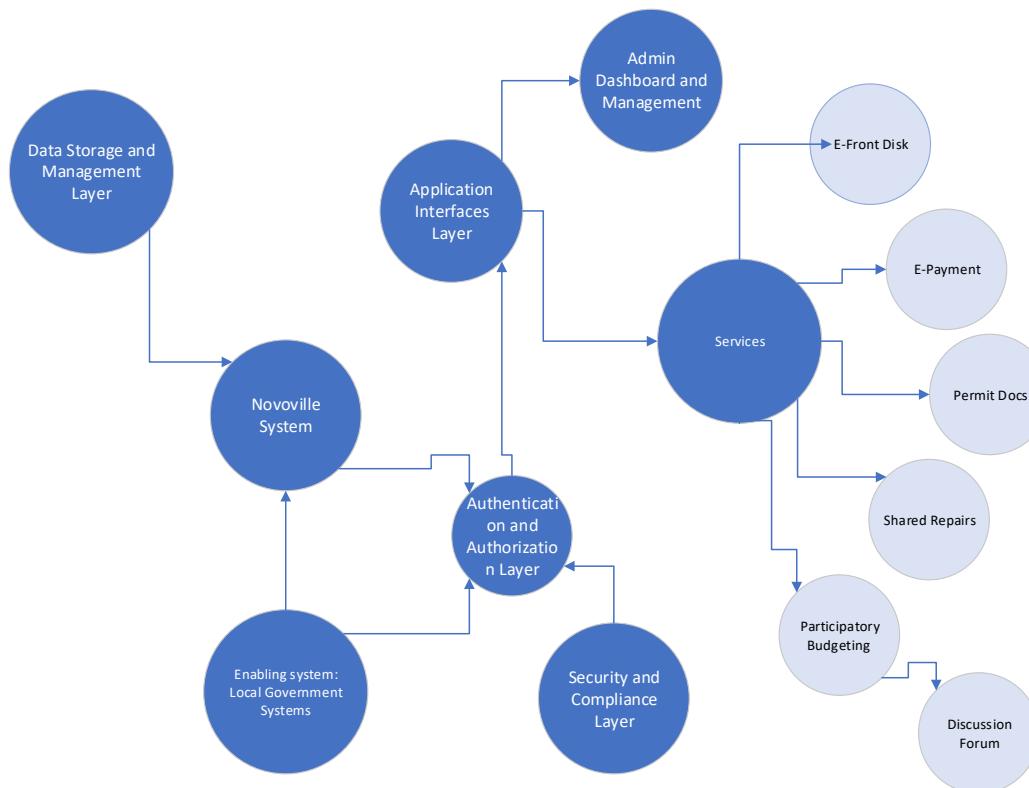


Figure 12. System Holarchy

Task 29. Compare the TOGAF Framework with another EA framework (choose among DoDAF or FEA) introduced in the lecture by arguing the main concepts in each of the frameworks, what their peculiarities are and what their strengths and weaknesses are in view of their application to your selected EA project. Conclude your comparison by stating: I recommend using <name the framework of your choice> for my project, because <line of argumentation for why you would use the named framework for your project>?

Answer:

Table 13 TOGAF vs FEA

Framework/ Methodology	TOGAF Framework	FEA
Available Set of Viewpoints	Viewpoints associated with views of Business, Data, Application and Technology	<p>Based on FEA common approach enterprise-wide architecture for a Federal Agency will include strategic, business, and technology views.</p> <p>Multiple viewpoints based on the five FEA reference models: Business, Service, Component, Technical, and Data</p> <p>Strategic, Business Services, Data and Information, Enabling Applications, Host Infrastructure, Security.</p>
Methods of Architecture Development Provided	Step by step guidance of method	The FEA provides a framework and methodology for developing enterprise architectures within the US federal government from high-level to single segment view, the process includes planning, implementation, and governance aspects.
Enterprise and Organizational Ontology or Metamodel	Affirmative, it realises content metamodel.	Aligns with ISO/IEC 42010 (Systems and Software Engineering - Architecture Description) and ISO/IEC 15288 (Systems and Software Engineering - System Life Cycle Processes) standards to ensure compatibility and consistency in architecture development.
Tool Support	Various tools available in the market that can be used to create and manage Framework artifacts, but no explicit tool is available.	FEA has its own set of tools and repositories used within the US federal government for architecture development and management.
Architecture Description Language	It has no prescribed language to use.	FEA does not mandate a specific architecture description language but supports various industry standards such as UML (Unified Modeling Language) and BPMN (Business Process Model and Notation).
Stakeholder Management / Handling Stakeholder Concerns	Facilitate Stakeholder Management processes and includes model kinds, Phase A concentration, concentrates core concepts in ADM (ex. Architecture view, viewpoint concerning stakeholder)	FEA emphasizes stakeholder engagement and incorporates stakeholder concerns through governance processes, enterprise architecture boards, and collaboration mechanisms. FEA follows the Collaborative Plan Methodology (CPM), stakeholder-centered with a focus on understanding and validating needs from stakeholders and leadership perspectives, planning for those needs, and ensuring that plans result in the intended outcomes.

Sabrina and Wimmer 2011, in their paper titled "Analysis of Enterprise Architecture Frameworks in the Context of E-participation", analyze different Enterprise Architecture (EA) frameworks, including the Zachman framework and their potential to support E-participation projects. The paper suggests that a reference framework for E-participation should be developed to support the organizational planning of E-participation projects and their incorporation into the daily routines of different stages in the policy life cycle.

Therefore, keeping this paper and the above comparative table in mind, I want to move forward with TOGAF framework, because TOGAF framework support the development my target architecture with methodological approach such as, clear detection of the stakeholders concerns and provide a step-by-step guidance of method in ADM phase for designing the business, data, application and technology architecture.

Reference:

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