Implementing a New Identity Governance and Administration System

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Abstract

This report presents a comprehensive system proposal for an Identity Governance and Administration (IGA) framework designed for NeuroComputing Corp. (NCC). It outlines the strategic alignment of the system with corporate objectives, including emphasizing enhanced security, operational efficiency, and cost-effectiveness. The document elaborates on the system's feasibility by detailing technical, economic, and operational viability, alongside a thorough analysis of system requirements and data models. This proposal serves as a pivotal blueprint for advancing the company's identity management capabilities, ensuring robust security, and fostering a streamlined operational environment.

***Keywords*:** Identity Governance and Administration (IGA), system design, system requirements, data modeling, feasibility analysis

NeuroComputing Corp. (NCC), a fictional national consumer electronics corporation, is developing a new Identity Governance and Administration (IGA) system. The demand for this system is necessitated by the limitations of the existing architecture, especially as NCC gears up for global expansion. Current operational inefficiencies, instabilities in the system, and the increasing complexities of safeguarding sensitive data have become paramount concerns. These issues not only pose immediate operational hurdles but also hinder the system's capacity to meet the corporation's evolving business requirements. This project is on a moderately short timeline and has high visibility throughout the organization. A comprehensive and well-structured planning effort is essential to ensure the successful implementation of the new system.

Project Initiation

NCC is embarking on a strategic endeavor to develop a new IGA system, under the guidance of the Chief Technology Officer, Jordan Lee. The dedicated Project Manager (PM) has been tasked with spearheading this initiative. The PM’s immediate responsibilities include generating a comprehensive system request, developing an in-depth project plan, and conducting a thorough feasibility study.

System Request

The journey to the new IGA starts with a system request. This document describes the business reasons for building a system and the value that the system is expected to provide. The system request is displayed in Table 1 and contains information regarding the project sponsor, business need, business requirements, business value, and special issues or constraints.

System Request – IGA Enhancement Project
Project sponsor: Jordan Lee, Chief Technology Officer, NeuroComputing
Business Need: This project is initiated to create a new IGA for NCC. As the corporation expands globally, there is an urgent need to develop a more robust, efficient, and scalable IGA solution to effectively manage employee access and safeguard sensitive data. This project is critical in transitioning to a system that can support international operations and evolving cybersecurity challenges.
Business Requirements: ● The new IGA system will be cloud-compatible, enabling global accessibility and scalability. ● It should integrate seamlessly with existing systems like Active Directory, Azure, and AWS, and incorporate advanced security protocols including Zero Trust architecture. ● The system will also feature automated processes for user access management and real-time monitoring capabilities.
Business Value: The new IGA system is anticipated to significantly improve operational efficiency and data security across the organization. Expected tangible and intangible benefits include: ● A reduction in system-related inefficiencies by 30%, translating to increased productivity. ● Enhanced data security measures, aiming to reduce the chance of security breaches. ● Cost savings of approximately $160,000 annually in IT maintenance and infrastructure support. ● Return on Investment (ROI): 100% (~$500,000) ● Net Present Value (NPV): ~ $292,353
Special Issues or Constraints: The implementation of the new IGA system is essential for NCC's strategic plan for global expansion and digital transformation. The project is time-sensitive, aligning with the company's roadmap for entering new international markets. As a result, progress on this project is highly visible.

Table 1: System Request – IGA Enhancement Project

(Balaouras, n.d.), (Dennis et al., 2021), (del Sol & Ghemawat, 1999), *&* (Stobierski, 2020).

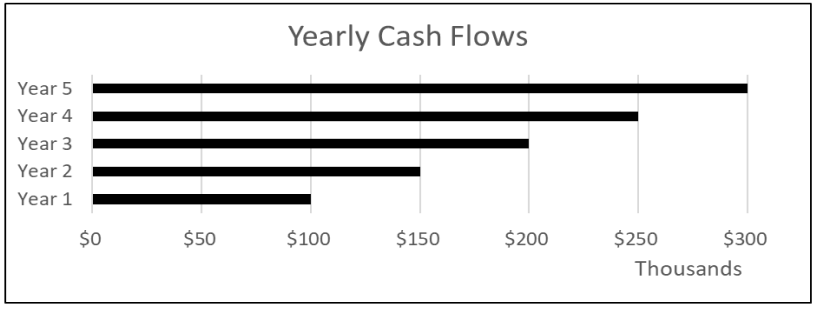
Business Value Explained

The five statements in the business value section of the system request in Table 1 fall into the following categories: productivity, data security, cost savings, and revenue.

- ***Productivity*** – The 30% productivity gain was calculated from the delta of the current team's velocity during a sprint versus the proposed system's proof of concept.
- ***Data Security*** – Understanding the current authentication and authorization tooling, implementing Zero Trust (ZT) can enhance a firm's security posture while enabling them to accelerate deliveries (Balaouras, n.d.).
- ***Cost Savings*** – The projection of $160,000 is based on NCC's current infrastructure costs as compared to that of the Platform-as-a-Service (PaaS) provider's fees.
- ***Revenue*** – Return on Investment (ROI) and Net Present Value (NPV) forecasts are based on the calculations in Figure 1. Considering the given assumptions, the NPV of the IGA system project is approximately $292,353, and the ROI is 100% (del Sol & Ghemawat, 1999). These financial metrics suggest that the project is a profitable investment for NCC, with the NPV indicating a positive return above the cost of capital and the ROI showing that the benefits are twice the costs over the project's duration (Stobierski, 2020).

ROI & NPV Calculation & Assumptions

- Initial Investment: $500,000
- Discount Rate: 7% or 0.07



ROI = (Total Benefits - Total Costs) / Total Costs * 100%
ROI = (($100k + $150k … + $300k) - $500k) / $500k * 100%
ROI = 100%

NPV = ∑((Cash Flow at Year(n) / (1 + Discount Rate)^n)) − Initial Investment
NPV = ($100k / (1 + 0.07)^1) + ($150k / (1 + 0.07)^2) + … + ($300k / (1 + 0.07)^5) − $500k
NPV = ~$292,353

Figure 1: ROI & NPV Calculation & Assumptions
(del Sol & Ghemawat, 1999) & (Stobierski, 2020).

Project Planning

NCC's project selection steering committee has given its full support to initiate this project. The PM must now begin the planning process, which involves several critical considerations. Several key variables need to be defined to inform subsequent planning efforts. These include the clarity of user requirements, familiarity with technology, system complexity, system reliability, project timeline, and schedule visibility. Once these factors are thoroughly understood, the PM can make informed decisions about the most effective project methodology. Finally, the PM will need to develop a staffing plan to estimate the required resources and define their hierarchical alignment within the project structure.

Project Plan Variables

Table 2 displays the components, assumed results, and an anecdotal rating that the PM will use in determining the project plan.

Component	Assumed Results	Rating
Clarity of User Requirements	The project has identified a Minimal Viable Product (MVP) that will need to be deployed incrementally and with possible changes in requirements as the system matures.	Indeterminate
Familiarity with Technology	System architects have had sufficient time to familiarize and upskill the development team on the new tooling and development methods.	Familiar
System Complexity	Much of the complexity of the system is in the standardization of the input data and not the system itself.	Low
System Reliability	This system will need to be available during retail business hours. This puts some additional focus on redundancy and the ability of the application to recover from unexpected outages.	High Availability
Project Timeline	The project timeline is relatively short. The team will have 12 months to deliver the MVP and delays to the implementation will have fiscal impacts.	Expedited
Schedule Visibility	The project's milestones will be highly visible to both the senior management and customer cohorts. Completing work on time will be a marker of success.	Highly Visible

Table 2: Project Plan Variables (Dennis et al., 2021) *&* (Watson, 2007).

In summary, with the project variables defined, the following comprehensive assessment can be formulated: The new IGA system's full requirements are yet to be fully determined; the project team has familiarity with the technology; the system design will aim for low complexity; it must ensure high availability, particularly during business hours; the timeline is expedited; and the schedule will be highly visible to stakeholders and customer groups.

Methodology Selection

NCC has been utilizing Agile project delivery for many years, making it a standard practice. Agile emerged from a crisis in the 1990s, marked by a significant lag between business needs and product development (McQuade et al., 2019). Like many modern companies, NCC has embraced the benefits of Agile, investing substantially in upskilling its workforce to understand its nuances and implementation techniques. Within the Agile framework, NCC is familiar with three popular methodologies: Scrum, Extreme Programming (XP), and Kanban. The pros and cons of these frameworks are examined in Table 3.

Framework	**Pros**	**Cons**
Scrum	Promotes organized development with regular sprints and clear roles.	Can be rigid due to its structured sprints and roles, limiting flexibility.
Extreme Programming (XP)	Highly emphasizes customer satisfaction and adapts well to changing requirements.	Requires frequent meetings and close collaboration, which can be challenging for distributed teams.
Kanban	Offers flexibility with continuous delivery and no prescribed roles.	Can lead to overburdening team members without the strict timeboxes found in other frameworks.

Table 3: Agile Framework Examination

(Dennis et al., 2021).

The team supporting the existing IGA operates as a Scrum team. The PM has concluded that this approach is suitable for this project, given the indeterminate requirements and the need for a short, yet visible, delivery schedule. To enhance development quality, the developers will employ techniques from XP, such as pair programming, to help minimize errors (Balijepally et al., 2009). Additionally, the team's Agile tooling software includes a Kanban board feature, which will be utilized to visualize workflow

and manage work-in-progress limits (Dennis et al., 2021). This integration of Kanban principles will complement the Scrum framework by encouraging the team to focus on completing existing tasks before undertaking new features, ensuring a balanced and efficient workflow.

Risk Analysis

All projects come with inherent risks, and NCC's project to build a new IGA system is no exception. Based on a thorough analysis at this stage of the project plan, the PM has identified three primary risks: scope creep, resource management, and technological compatibility. These risks, critical to the project's success, have been further evaluated and detailed in Table 4.

Risk Factor	Description	Risk Rating	Mitigation Strategy
Scope Creep	Risk of expanding beyond the original scope due to MVP delivery.	Medium	Implement strict change control, define MVP clearly, and regularly review project scope.
Resource Management	Challenges in resource distribution due to the short timeline, affecting deliverables.	High	Develop a detailed project plan with realistic timelines, prioritize tasks, and maintain flexible resource management.
Technological Compatibility	Compatibility issues when integrating the Proof of Concept (POC) with production systems and standardizing existing data.	High	Conduct compatibility testing in a simulated environment, engage with vendors, and plan for contingencies.

Table 4: Risk Analysis & Mitigation Strategies
(Dennis et al., 2021).

Acknowledging the full spectrum of risks, including lower severity and external risks such as staff training, vendor stability, and technical defects, is crucial for comprehensive project planning. The insights gained from these risk assessments are instrumental in guiding the PM and ensuring that all potential challenges are adequately addressed.

Staffing Plan

In the development of a comprehensive staffing plan for the IGA system project, optimal allocation of human resources will be a key focus. With the project demanding 100 person-months of effort over a 12-month timeline, an average of 8 full-time staff members is required (Dennis et al.,

2021). This allocation is planned to be dynamically adjusted across different project phases, catering to varying requirements from analysis and development to quality assurance and documentation. As depicted in Figure 2, the staffing plan details the specific distribution and roles of team members, ensuring the project's objectives are met efficiently and effectively.

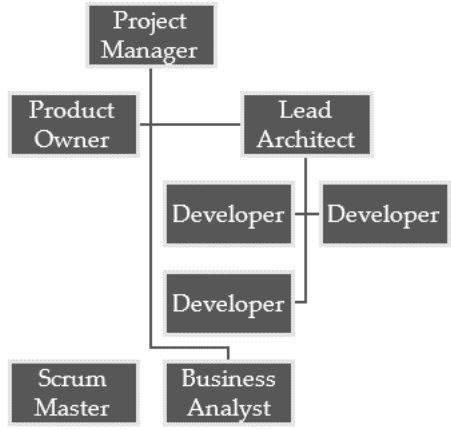


Figure 2: IGA Project Team Hierarchy
(Scaled Agile Framework, n.d.).

The development of the staffing plan was significantly aided by the availability of historical velocity data from the team. The PM will communicate the project vision, collaborating with the Product Owner (PO) and Lead Architect to prioritize work. The Scrum Master will facilitate Scrum ceremonies (including a team charter), ensuring smooth progress and establishing team norms. Meanwhile, developers and business analysts will collaborate to deliver features, steering the new IGA system through its critical milestones (Scaled Agile Framework, n.d.).

Standards & Documentation

The PM has tasked the PO and Lead Architect with collaborating with the team to agree upon standardized procedures. These procedures encompass key artifacts generated throughout the project, including required test cases, communication templates, coding standards, system architecture blueprints, and Agile process guidelines (Dennis et al., 2021). These standards and documentation guidelines have been published in Table 5.

Standard	Description	Recommended Standard
Required Test Cases	Document outlining the specific scenarios and conditions under which the IGA system must be tested.	Use industry-standard testing frameworks like International Software Testing Qualifications Board (ISTQB)[1] guidelines, focusing on security and functional testing.
Communication Templates	Predefine formats for project communication to ensure consistency.	Adopt templates from the Project Management Institute (PMI)[2] standards, customized for Agile environments. Include formats for status updates, meeting agendas, and reports.
Coding Standards	Guidelines for writing code to ensure readability, maintainability, and security.	Follow industry best practices such as Open Web Application Security Project (OWASP)[3] for secure coding and GitHub's coding guidelines for style and structure[4].
System Architecture Blueprints	Detailed diagrams showing the IGA system's architectural design, including integrations and data flows.	Utilize Unified Modeling Language (UML)[5] for comprehensive and standardized architectural visualization.
Agile Process Guidelines	A set of procedures for implementing Agile methodologies in the project.	Reference the Scrum Guide for Scrum practices[6] and supplement with XP[7] practices for development work.

Table 5: Standards and Documentation for IGA System Project

These standards are robust and represent thoroughly practiced strategies, enabling the IGA team to spend more time focusing on delivering value to the stakeholders. For additional details on the standards listed, refer to Footnotes 1 through 7.

Feasibility Study Results

Several aspects of the project's feasibility have already been evaluated. As Dennis et al. (2021) explain, "feasibility analysis guides the organization in determining whether to proceed with the project." These authors further categorize this analysis into three main areas: technical, economic, and organizational feasibilities. Using methods described in chapter 1 of "System Analysis and Design," the assessment of these factors can be extrapolated based on previous explorations in this report.

Technical Feasibility: "Can We Build It?"

Given the analyses conducted, the technical feasibility of the new IGA system is affirmative. The team has assessed the system's technical requirements and confirmed compatibility with existing technologies at NCC. The project leverages the team's familiarity with Agile frameworks (Scaled Agile Framework, n.d.) and integrates with current systems, ensuring that the technical aspects of the new IGA system are well within the capabilities of the organization.

Economic Feasibility: "Should We Build It?"

The economic feasibility of the IGA system is supported by a comprehensive cost-benefit analysis. The projected ROI of 100% and the positive NPV of approximately $292,353 indicate favorable long-term financial implications (Stobierski, 2020) & (del Sol & Ghemawat, 1999). Details of this analysis can be explored in Table 6, which includes development costs, annual operating costs, and annual benefits.

Category	Description	Estimated Cost	Basis of Calculation	Source
Development Costs				
Personnel	Project team and staff	~$300,000	100 person-months over a 12-month timeline for ~8 staff members	U.S. General Services Administration (2024)
Technology	Software and hardware costs	~$100,000	Amazon Web Services pricing guide	Amazon Web Services (2024)
Materials & Other	Discretionary budget for unexpected costs	~$50,000	Discretionary budget for emergencies and additional costs	Project Management Discretion
Annual Operating Costs				
Personnel	Labor and personnel costs	~$100,000 – $300,000	Costs decrease post-MVP completion	Project Estimates
Technology Maintenance	Licensing and cloud service fees	~$20,000	AWS service fees	Amazon Web Services (2024)

Other Operational	Ongoing training and certifications	~$10,000	Discretionary budget for continuous training and flexibility with compute services form AWS	Project Management Discretion
Annual Benefits				
Cost Savings	Efficiency improvements	~$130,000	Workflow automation savings in IT & engineering	Workato (2022)
Additional Revenue	Potential revenue increase	~$100,000	Projected revenue growth of global expansion	Project Forecasts

Table 6: Detailed Cost Estimate

(Amazon Web Services, 2024), (U.S. General Services Administration, 2024), *&* (Workato, 2022).

Intangible Benefits:

- ***Improved Security Posture*****:** Enhances the organization's overall security framework by providing robust access control and monitoring.
- ***User Experience*****:** Streamlines user access, resulting in improved satisfaction and productivity for both employees and IT staff.
- ***Risk Management*****:** Reduces the likelihood of data breaches and other security incidents, thereby safeguarding the company's reputation with tools like Zero Trust (Balaouras, n.d.).
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With substantial cost savings, enhanced operational efficiencies, and a proactive response to scaling needs, the system is poised to offer substantial economic benefits over its lifespan, justifying the initial and operational investment.

Organizational Feasibility: "If We Build It, Will They Come?"

The organizational feasibility is promising, considering the positive impact on the company's structure and culture. The project aligns with NCC's strategic goals for global expansion and digital transformation. Stakeholder analysis has shown strong buy-in (del Sol & Ghemawat, 1999), and the implementation of the IGA system is expected to streamline operations and

enhance data security (Balaouras, n.d.), aligning well with the organizational objectives and culture.

Project Requirements

For the development of NCC's IGA system, it is essential to define requirements that align the system's functionality with both organizational goals and user expectations. This involves identifying business needs to pinpoint the strategic objectives the IGA system is designed to meet, user requirements to ensure a positive daily interaction experience, functional requirements that specify the exact actions the software is to perform, non-functional requirements that outline the operational characteristics of the system, and system requirements that detail the technical specifications needed for construction. By adopting this structured approach to defining requirements, we can ensure clarity in the system's objectives throughout the Software Development Life Cycle and lay a solid foundation for its successful implementation. The forthcoming sections will delve deeper into each category of requirements, providing a comprehensive understanding of their significance.

As-Is State

NCC operates with an IGA system characterized by complex integrations and outdated technologies, leading to significant development and testing efforts for new feature implementations. The current system requires extensive interfacing by customers for various business needs, contributing to delays and inefficiencies within the value stream. This system, while functional, struggles to keep pace with the demands of global expansion and evolving cybersecurity challenges, indicating a pressing need for a modernized approach to manage employee access and safeguard sensitive data effectively.

To-Be State

The envisioned IGA system for NCC aims to be a robust, efficient, and scalable solution, as it is fully cloud-compatible to enable global accessibility. It is designed to integrate seamlessly with existing systems (e.g. Active Directory, Azure, and AWS) and to incorporate advanced security protocols, including a Zero Trust architecture. The system will feature automated processes for user access management and real-time monitoring capabilities, significantly improving operational efficiency and data security across the organization. This forward-looking system is aligned with NCC's strategic goals for global expansion and digital transformation, ensuring the company remains agile and secure in a rapidly evolving digital landscape.

Functional Requirements

These requirements capture the critical functionalities and information the IGA must offer to support user tasks effectively. By engaging closely with business users, NCC delineates both the process-oriented and information-oriented demands, ensuring the IGA system comprehensively meets user needs and facilitates their tasks. The preliminary functional requirements have been illustrated in Table 7.

Requirement Type	Description	Requirement Detail
Process-Oriented	Specifications for actions the system must perform to support user tasks.	1. Automation of user account creation, modification, and deletion. 2. Role-based access controls are enforced.
Information-Oriented	Details on the information the system must manage or provide.	3. Generate compliance reports for audits. 4. Provide real-time alerts on unauthorized access attempts. 5. Provide event-driven suggestions to suggest review of existing entitlements for an employee transfer.
Combined	Requirements involving both actions and information handling for comprehensive support.	6. Allow user access requests and profile management via a self-service portal. 7. Secure password management and policy enforcement.

Table 7: Functional Requirements for NCC's IGA

(Dennis et al., 2021).

Non-functional Requirements

To address the development of NCC's IGA system effectively, it is critical to consider not just what the system will do (functional requirements), but how it will operate within its environment (non-functional requirements). These encompass the operational context, performance expectations, security protocols, and adherence to cultural, political, and legal standards which ensures the system's reliability, efficiency, and compliance (Dennis et al., 2021). Exploration of these requirements are detailed in Table 8.

Requirement Type	Description	Requirement Detail
Operational	System's required operational and technical environments.	1. Must run on various operating systems, including mobile operating systems. 2. Should integrate with existing systems like active directory. 3. Must be compatible across all web browsers.
Performance	Expectations for the system's speed, capacity, and reliability.	4. User interactions should be processed within 2 minutes. 5. System updates within 24 hours of status changes. 6. Supports 300 simultaneous users during peak times.
Security	Access controls and protections against unauthorized use or cyber threats.	7. Access to sensitive records limited to authorized roles. 8. Advanced protections against malware and data breaches utilizing Zero Trust.
Cultural, Political, and Legal	Requirements driven by cultural, political, and legal considerations.	9. Support for multiple currencies.10. 10. Compliance with data protection laws and company policies on vendor relationships.

Table 8: Non-Functional Requirements for NCC's IGA

(Dennis et al., 2021).

Business Requirements

While functional and non-functional requirements are of great significance at the tactical level, understanding the organization's business requirements is immensely important at the strategic level. This understanding aligns the workstreams, providing the background leading to the decision to develop a new or modified system in the first place (Young & Grumman, 2002). This insight ensures that project initiatives are closely aligned with the organization's overarching goals and operational needs. For the NCC IGA project, key business needs include requirements around

security, operational efficiency, scalability, and risk mitigation as detailed in Figure 3.

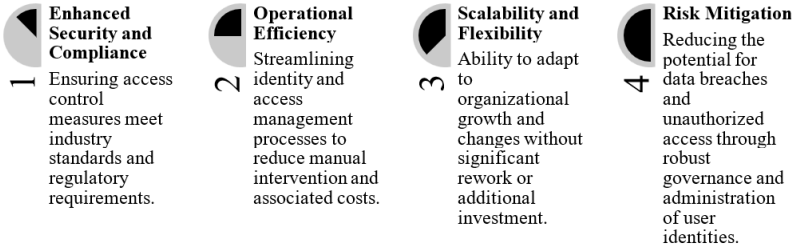

Figure 3: Business Requirements for NCC's IGA
(Dennis et al., 2021) *&* (Young & Grumman, 2002).

System Requirements

To ensure the NCC IGA project aligns with both operational goals and development standards, the system requirements encapsulate key elements essential for its construction and deployment. These requirements integrate technical specifications with development methodologies to guide the project from conception to launch.

- **Adoption of Agile Methodology**: For iterative development and flexibility in accommodating changes.
- **Microservices Architecture**: For ensuring scalability and ease of maintenance.
- **Continuous Integration/Continuous Deployment (CI/CD)**: For automated testing and deployment processes.
- **Comprehensive Documentation**: For system architecture, user guides, and Application Programming Interface references.

User Requirement

User requirements for the NCC IGA system are designed to delineate the specific functionalities and tasks the users will perform. As made evident by Maguire and Bevan (2002), "Understanding user requirements is an integral part of information systems design and is critical to the success of interactive systems." The requirements, as detailed in Figure 4, are pivotal in shaping a system that is intuitive, secure, and capable of meeting the diverse needs of its users, thereby enhancing productivity and compliance across the organization.

Self-Service Password Reset: Users must reset their passwords independently.
Access Request Submission: Users should submit requests for access to applications and data.
View Access Rights: Users need to view their current access permissions.
Approval Workflow Participation: Managers must approve or deny access requests.
Role-Based Access Control: Users should access resources based on their roles.
Multi-Factor Authentication Setup: Users must set up additional authentication methods.
Audit Trail Review: Audit personnel need to review logs of access and changes.
Report Generation: Users should generate reports on access patterns and compliance.
Profile Management: Users must update their profiles with relevant changes.
Security Alert Response: Users should receive and respond to security alerts.

Figure 4: User Requirements for NCC's IGA

(Maguire & Bevan, 2002).

The requirements outlined for the NCC IGA system cater to diverse needs—ranging from user functionalities to system build and operational standards—ensuring a robust framework for security and efficiency. This holistic approach by integrating each requirement type sets a solid foundation for developing a system that not only meets today's needs but is scalable for future demands.

Joint Application Development (JAD) Session

Given the geographical dispersion of colleagues and stakeholders, NCC's IGA project will benefit from an e-JAD session approach. This method facilitates inclusive and efficient collaboration across different locations, leveraging digital tools to gather requirements effectively. As Dennis et al. (2021) highlights, "Initial research suggests that e-JAD can reduce the time required to run JAD sessions by 50–80%." This efficiency gain underscores the

value of adopting an e-JAD approach for the NCC IGA project, ensuring that despite the geographical spread of participants, the process remains both inclusive and productive.

Information Gathering Techniques

To ensure comprehensive and dynamic participation, e-JAD sessions will incorporate digital brainstorming tools to capture innovative ideas in real time, such as whiteboards. Surveys will be distributed during sessions to gather initial insights and expectations. Several breakout rooms are planned as well to incorporate smaller, more robust conversations. In these breakout rooms, a facilitating analyst will interview stakeholders to obtain relevant details.

Interview Techniques

Utilizing digital collaboration software, the main facilitator will initiate the breakout sessions. Once in the sessions, analysts can interview various stakeholders to confirm and align on the presumed requirements. Despite this virtual environment, the core goal of the JAD interview is the same, to enable "…users with relevant knowledge to work together to accomplish tasks such as effectively deriving quality requirements" (Davidson, 1993).

Questionnaires

With the usage of web-based questionnaires, NCC can establish a baseline sentiment toward several aspects of the "as-is" system and the ~~system~~ "to-be" system. This can be done prior to the e-JAD session, but since this session is being planned, the survey can be initiated and completed during the session while the information and context has been examined universally. Questions that will be included are documented in Figure 5.

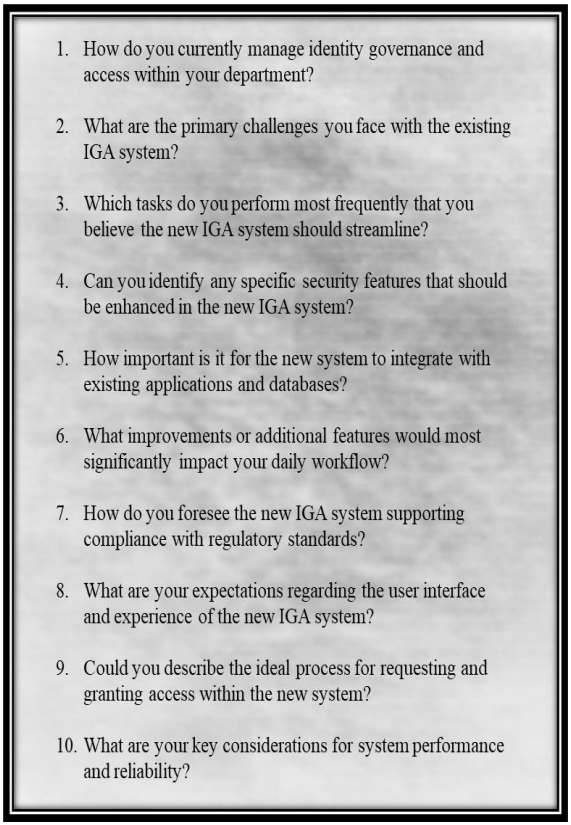

Figure 5: e-JAD Session Questionnaire
(Davidson, 1993) *&* (Dennis et al., 2021).

Proposed Format & Facilitation

By emphasizing the structured facilitation of e-JAD, the sessions will utilize specialized software to support anonymous idea submission and collaborative decision-making. The meetings will be hosted in collaboration software and participants will be encouraged to use video technology when applicable. The lead facilitator will be experienced in both group dynamics and the technical aspects of the IGA system. Additional attendees and roles will include analysts, users, executives, observers, and scribes. An agenda has been established, and it is the role of the facilitator to enforce adherence. This agenda has been published in Table 9.

Time	Agenda Item	Duration	Description
9:00 AM	Welcome and Introduction	15 mins	Briefing on the goals and structure of the e-JAD session.
9:15 AM	Background and Context	30 mins	Overview of the existing IGA system and the need for change.
9:45 AM	Stakeholder Expectations	45 mins	Discussion on individual and departmental expectations from the new IGA system.
10:30 AM	Functional Requirements Gathering (Breakout Sessions)	1 hour	Interactive deep dive into desired system functionalities.
11:30 AM	Non-Functional Requirements Discussion (Breakout Sessions)	45 mins	Examination of requirements related to performance, security, and other standards.
12:15 PM	Lunch Break and Informal Networking	1 hour	Casual interaction period for participants. Lunch budget provided by vendor to hybrid and remote staff.
1:15 PM	Review of Gathered Requirements	1 hour	Consolidation and validation of the day's findings.
2:15 PM	Next Steps and Closing	15 mins	Summary of discussions, action items assignments, and scheduling of next meetings.
2:30 PM	Informal Networking & Remote Cocktail Hour	2 hours	Hybrid locations will have in-person event spaces. Remote staff will be able to join a digital lounge for games and socializing. Participation is optional.

Table 9: NCC's e-JAD Session for the IGA System
(Dennis et al., 2021).

Use Cases

Use cases are vital in identifying and validating functional requirements. They provide a scenario-based technique to capture the specific functions the system must perform, helping to clarify the system's intended behavior from the user's perspective (Dennis et al., 2021). This detailed

understanding of user interactions guides the development process and ensures that the design aligns with user expectations and business needs.

Use Case 1: Request Role or Entitlement

At NCC, employees often encounter situations where they require access to new systems or need elevated privileges to fulfill their job responsibilities. The "Request Role or Entitlement" use case outlines the process through which employees can request additional access in a controlled and auditable manner. This process is a critical component of the IGA system, necessitating approval before any role or entitlement is granted. Figure 6 illustrates this use case.

Use Case Name: Request Role or Entitlement	**ID:** UC-1	**Priority:** High
Actor: Employee/User		
Trigger: Employee requires additional system access or entitlements for job responsibilities.		
Type: ☑ External ☐ Temporal		
Preconditions: 1. The employee is authenticated through the IGA system portal. 2. The Role and Entitlement Management module is available and operational.		
Normal Course: 1.0 Request additional system access. 1. The employee logs into the self-service portal. 2. The employee navigates to the 'Request Access' section. 3. The employee searches and selects the necessary role or entitlement. 4. The employee submits the request with a justification for the access requirement. 5. The system routes the request to the appropriate manager or authority for approval. 6. Upon approval, the system updates the employee's access rights.		
Postconditions: 1. The employee's access rights are updated to include the new role or entitlement. 2. Audit logs are updated with the transaction details for compliance tracking.		

Figure 6: Request Role or Entitlement Use Case

(Dennis et al., 2021).

Use Case 2: Responding to a Security Alert

In responding to security alerts, the ability to act swiftly and effectively is paramount for protecting NCC's assets. The "Respond to

Security Alert" use case details the protocol for NCC's security analysts to address alerts generated by the IGA system. It outlines the system's capabilities not only in detecting potential security incidents but also in providing a clear, step-by-step mechanism for response, ensuring incidents are managed promptly and in accordance with established security procedures. Figure 7 captures these details.

Use Case Name: Responding to a Security Alert	**ID:** UC-2	**Priority:** High
Actor: Security Analyst		
Trigger: The IGA system generates a security alert.		
Type: ☑ External ☐ Temporal		
Preconditions: 1. Security Analyst is authenticated and has access to the security incident dashboard. 2. The Real-Time Alerting and Response system is functional.		
Normal Course: 1.0 Handling a security alert. 1. The Security Analyst receives an alert notification. 2. The Security Analyst reviews the alert details to assess the situation. 3. If the alert is a false positive, the analyst marks it as such and documents the reason. 4. If the alert is valid, the analyst escalates the incident to the incident response team. 5. The analyst follows the incident response protocol to mitigate any immediate threats. 6. The incident is logged, and post-incident analysis is initiated to prevent future occurrences.		
Postconditions: 1. The incident is resolved, mitigated, or escalated for further action. 2. The security incident log is updated with all relevant details.		

Figure 7: Responding to a Security Alert Use Case
(Dennis et al., 2021).

Test Plan

The development of test cases is a critical phase in software engineering, ensuring that a product meets its requirements and behaves as expected. Test cases can be derived from use cases, which describe the system's functionality from the user's perspective (Heumann, 2001). Each use case is broken down into scenarios, from which individual test cases can be identified. These test cases outline specific conditions required to execute a scenario and include data values for thorough testing. Utilizing use cases for generating test cases not only improves the testing process but also integrates

it more closely with the entire software development lifecycle (Heumann, 2001). As use cases define the system's requirements and outline sequences of actions to achieve an observable result, they also inform stakeholders about the product's functionality.

Example Test Case

A potential test case for the "Request Role or Entitlement" use case has been crafted to demonstrate the intersection of functional and security testing realms, incorporating ISTQB guidelines for structured testing. This test case underlines the procedural divergence when conditional approvals come into play. Test cases are just one element of the test plan. Additionally, considerations include the management of test artifacts, scheduling, hardware setup for testing, error tracking, and the careful balance of manual and automated testing to enhance efficiency without overextending resources (Shi, 2010). The details of this test case can be found in Figure 8.

Figure 8: Test Case for Request Approval Flow (Heumann, 2001) *&* (Shi, 2010).

Post-Hoc Analysis of Use Cases

In the exploration of system design through specific use cases, Figures 6 and 7 demonstrate examples of the workflow and critical sequences of actions within the IGA. The first use case, “Request Role or Entitlement,” details the process from an employee's initiation of a request to the culmination of access rights, emphasizing the seamless operational interplay between automated system evaluations and conditional approvals. Conversely, the second use case, “Responding to a Security Alert,” reveals the procedural response to security alerts, highlighting the essential roles of security analysts in mitigating threats. These use cases not only underline the relationship between user interactions and system responses, but also necessitate comprehensive test planning to ensure the alignment of system functionalities with user needs and security imperatives.

Process Models

This section introduces the various process models that will be utilized to represent and analyze NCC’s IGA system. Process modeling is a critical component of system design, providing a visual representation of the system's components and their interactions (Dennis et al., 2021). The first of these models is a Level 0 or context Data Flow Diagram (DFD), which offers a bird’s-eye view of the entire system encapsulated as a single process, interacting with external entities and data flows (Ibrahim & Yen Yen, 2010). Following this Level 0 DFD is a Level 1 DFD which decomposes the system into its fundamental processes, showcasing detailed interactions. Additionally, an Entity-Relationship Diagram (ERD) will detail the system’s data structure. Lastly, a data dictionary will be provided to define the data elements within

the models. Together, these artifacts will serve as the blueprints for the development, offering clarity and direction for the project.

Level 0 Data Flow Diagram

The Level 0 DFD serves as a fundamental representation of the system's initial point of interaction with various external entities (Ibrahim & Yen Yen, 2010). This diagram offers a high-level overview, illustrating the essential interactions with Employees, Approvers, Security Analysts, and External Identity Provider entities. The data flow articulates the exchange of information, encompassing entitlement requests, security alerts, approval communications, and access rights updates. These elements are visualized in Figure 9.

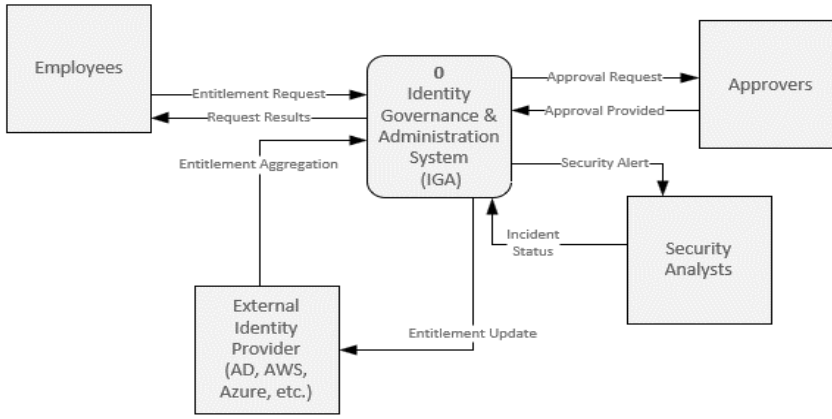

Figure 9: IGA Level 0 DFD
(Dennis et al., 2021) *&* (Ibrahim & Yen Yen, 2010).

Level 1 Data Flow Diagram

In Figure 10, the Level 1 DFD provides a view of the IGA system's top-level system processes, expanding upon the foundational overview presented in the Level 0 DFD. This diagram shows the data flows and processes integral to the IGA's operation and illustrates the interactions between the external entities (Dennis et al., 2021). It specifies the pathways for entitlement requests, the mechanisms for security alert handling, the processes for approval transactions, and access provisioning.

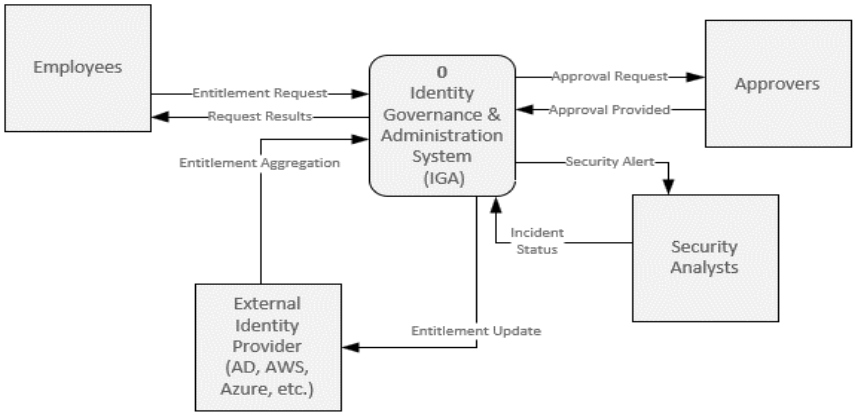

Figure 10: IGA Level 1 DFD

(Dennis et al., 2021).

Entity-Relationship Diagram

The ERD outlines the key components of the IGA system's architecture, highlighting the relationships between users, their access requests, and the approval mechanisms in place. It details how entitlements are managed, the role of identity providers in integrating system components, and the monitoring function of security alerts within the system's framework. The diagram in Figure 11 captures the flow from request initiation to approval, provisioning of access rights, and the oversight of security protocols.

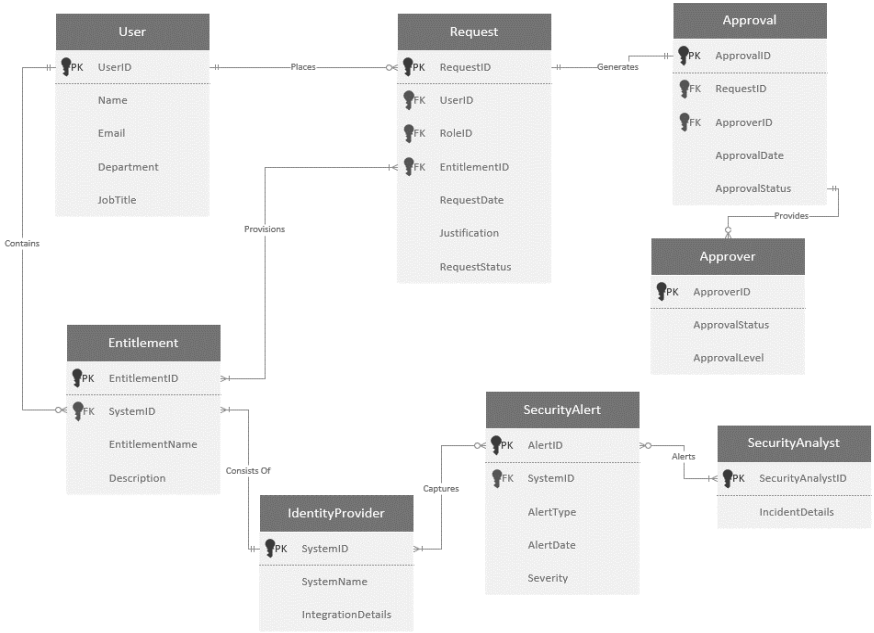

Figure 11: IGA ERD
(Dennis et al., 2021).

Data Dictionary

A comprehensive semantic data dictionary is important for the clear definition and categorization of data elements within the IGA system. This data dictionary serves as a semantic framework that not only defines the attributes and relationships of data elements but also ensures consistency and clarity in data handling practices (Rashid et al., 2020). By providing an authoritative reference, the data dictionary aids in the accurate interpretation of the IGA system's data structures, facilitating better communication among developers, analysts, and administrators and promoting data quality and integrity throughout the system's lifecycle. The fields in this data dictionary display the data elements, field size, data types, a description, and an example. This data dictionary has been drafted and displayed in Table 10.

Data Element Name	Size	Data Type	Description	Example
UserID	7	char	Unique identifier for a user, following the pattern User initials followed by a [5-Digit Number].	JD12345
FirstName	50	string	The user's first name. Must be non-empty and capitalized.	JANE
LastName	50	string	The user's last name. Must be non-empty and capitalized.	DOE
UserName (Composite Element)	101	string	Represents the full name of a user, combining the first name and the last name with a space in between. This is a composite element derived from concatenating **FirstName** and **LastName**.	JANE DOE
UserEmail	50	string	Email address of the user in standard email format with ncc.org as the domain and the first and last names concatenated with a period.	jane.doe@ncc.org
User Department	25	string	Department where the user works, capitalized.	SALES
JobTitle	20	string	The user's job title within the system, capitalized.	MANAGER
RequestID	8	char	Unique identifier for a request, following the pattern REQ[5-Digit Number], in ALL CAPS.	REQ12345
RequestDate	10	date	Date when the request was placed, in the format YYYY-MM-DD.	2024-01-01
RequestStatus	30	string	Status of the request, with possible values such as PENDING, APPROVED, or DENIED, in ALL CAPS.	APPROVED

Data Element Name	Size	Data Type	Description	Example
ApprovalID	7	char	Unique identifier for an approval, following the pattern AP[5-Digit Number], in ALL CAPS.	AP12345
Approval Date	10	date	Date when the request was approved or denied, in the format YYYY-MM-DD.	2024-01-01
Entitlement ID	15	char	Unique identifier for an entitlement, following the pattern ENT[5-Digit Number], in ALL CAPS.	ENT12345
Entitlement Name	60	string	Name of the entitlement, capitalized. Formatted in NCC standard NCC-<app>-<role>	NCC-IGA-Developer
Entitlement Description	100	string	Detailed description of what the entitlement allows or restricts.	Developer access to IGA
Security AlertID	8	char	Unique identifier for a security alert, following the pattern ART[5-Digit Number], in ALL CAPS.	ART12345
AlertType	30	string	Type of security alert, with possible values such as SYSTEM, ACCESS, NETWORK, etc., in ALL CAPS.	SYSTEM
AlertDate	10	date	Date when the alert was triggered, in the format YYYY-MM-DD.	2024-01-01
Security AnalystID	7	char	Unique identifier for the security analyst, following the pattern SA[5-Digit Number], in ALL CAPS.	SA12345

Data Element Name	Size	Data Type	Description	Example
Incident Details	2000	text	Comprehensive description of the security incident, including the nature and impact of the incident.	Issue: Orphaned entitlement Priority: High Notes: Received alert and reached out to Jane Doe in sales for details

Table 10: IGA Data Dictionary
(Rashid et al., 2020).

The IGA system's data dictionary is pivotal for ensuring unambiguous data interpretation and consistent application across the platform. It reinforces data quality, aids in system scalability, and supports secure operations. Drawing on the principles of semantic clarity outlined by Rashid et al. (2020), the data dictionary serves as a fundamental tool for developers, analysts, and administrators, promoting a shared understanding and facilitating accurate data governance. Through this essential documentation, the IGA system is equipped to handle the dynamic demands of data management with precision and integrity.

Conclusion

The system proposal for NeuroComputing Corp's new Identity Governance and Administration system has been evaluated for feasibility, with positive outcomes across technical, economic, and organizational aspects. Technically, the system is well within the company's capabilities, integrating with existing technologies and aligning with the Agile framework. Economically, the detailed cost-benefit analysis, showing a robust ROI and a positive NPV, supports the system's financial viability, with clear projections outlined in Table 6, including development and operational costs versus anticipated savings and revenue enhancements.

The system's requirements are detailed and encompass a wide array of functional specifications. These include automated user account management and real-time security monitoring, alongside non-functional requirements ensuring system performance and security protocol adherence.

Notably, the requirements detail the integration with existing systems such as Active Directory and Azure, enhancing operational effectiveness and security. Furthermore, data models play a crucial role, with the Level 0 and Level 1 Data Flow Diagrams providing a macro and micro view of the system's processes, and the Entity-Relationship Diagram detailing the system's data architecture. The data dictionary further complements these models by defining data elements clearly, ensuring consistency and clarity across the system's lifecycle. Incorporating the insights gathered, this report conclusively affirms the strategic, operational, and technological viability of the proposed system.

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Endnotes

[1] "ISTQB is the leading global certification scheme in the field of software testing." https://istqb.org/about-us/what-we-do

[2] "PMI is the world's leading authority on project management." https://www.pmi.org/about

[3] "The Open Worldwide Application Security Project (OWASP) is a nonprofit foundation that works to improve the security of software." https://owasp.org/about/

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[5] "A specification defining a graphical language for visualizing, specifying, constructing, and documenting the artifacts of distributed object systems" https://www.omg.org/spec/UML/

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[7] "Extreme Programming is successful because it stresses customer satisfaction." http://www.extremeprogramming.org/