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Developing the Stakeholder Lifecycle Model (SLM) for Data Architecture in Higher Education: The Case of Philippine Normal University

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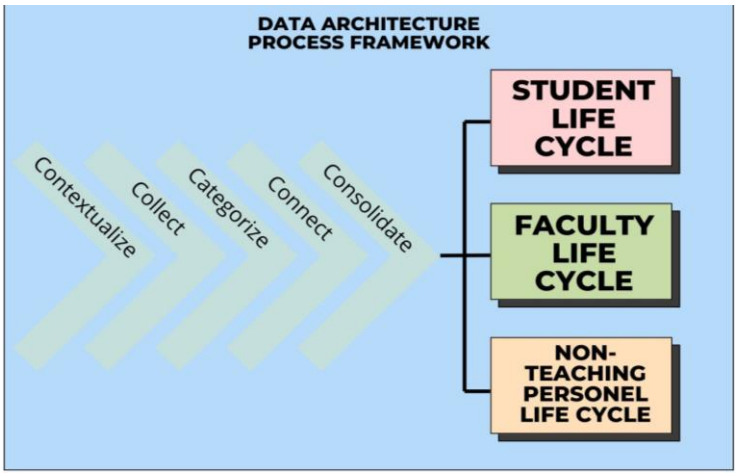

Source: Aggarao et al., 2024

As digital ecosystems develop, more colleges and universities are adopting integrated digital platforms for data management. Data serves as the foundation of information, and when effectively processed, it becomes a crucial asset for generating knowledge that informs evidence-based decision-making (Aggarao et al., 2022). The strategic importance of data in modern organizations is underscored by Smith et al. (2021), who describe data as "the new oil," emphasizing its role in shaping competitive advantage.

While higher education institutions transition into digital ecosystems, this study introduces the Stakeholder Lifecycle Model (SLM) as a conceptual framework for designing data architecture in higher education, using Philippine Normal University (PNU) as a case study. By aligning data architecture with the lifecycle stages of key stakeholders—students, faculty, and staff—the SLM offers a structured approach to strengthening data governance, improving institutional processes, and enhancing strategic decision-making. The model is designed to support scalable and interoperable data systems that effectively cater to both academic and administrative functions.

Furthermore, this study examined the institutional data landscape of the Philippine Normal University, intending to develop a student-centered data architecture model. The findings reveal that effective data governance in higher education requires a lifecycle-based approach—one that recognizes the student not merely as a data subject but as a stakeholder whose experience unfolds across distinct, interconnected stages. By aligning institutional data practices with the key phases of the student journey, the university can improve its ability to track performance, monitor success, and inform policy through structured, contextually grounded insights.

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Introduction

In an era of rapid digital transformation, higher education institutions must integrate technological advancements to streamline operations, enhance decision-making processes, and drive institutional effectiveness. As universities continue to expand both academically and administratively, updating data management frameworks becomes essential to ensuring alignment with organizational structures and strategic objectives. A core component of this digital transformation is data architecture, which encompasses the models, policies, and standards that dictate how data is gathered, stored, organized, integrated, and utilized within an institution.

Universities that adopt data-driven strategies gain a significant edge in areas such as policy development, program design, and strategic planning. Effective data management ensures that institutional decisions are based on accurate, timely, and contextually relevant information (Aggarao et al., 2022).

In this modern period where data drives decision-making, higher education institutions must move beyond fragmented systems toward intentional, ethical, and stakeholder-centered data architecture. This study responds to that imperative by proposing a transformative framework that aligns data practices with institutional purpose, stakeholder needs, and long-term stewardship.

At PNU, students generate and interact with data throughout their academic journey, yet current systems often overlook these dynamic requirements. This research introduces a Stakeholder Lifecycle Model (SLM) to address this gap, offering a framework that integrates student data governance into future-ready institutional planning and efficient service delivery.

Key Issues

Despite evolving strengths, the analysis also surfaced critical gaps that hinder the utilization of data's transformative benefits. The following key issues call for strategic intervention to ensure that data acts not just institutional goals, but the emerging needs of students.

1. **Data Fragmentation Across Units**
   - · Academic and administrative offices operate in silos, using independent tools and protocols.
   - · Redundant data collection (e.g., student profiles, service usage) without shared standards.
   - · Lack of interoperability limits strategic planning and student support.

2. **Absence of Unified Data Governance**
   - ·No clear framework for data ownership, stewardship, or accountability.
   - · Roles and responsibilities around data management are undefined or inconsistently applied.
   - ·Data quality suffers due to lack of validation protocols and oversight mechanisms.

3. **Misalignment with the Student Journey**
   - · Existing data systems do not reflect the full lifecycle of student engagement.
   - · Students are treated as static data subjects rather than evolving stakeholders.
   - · Institutional decisions are often based on fragmented snapshots rather than holistic trajectories.

4. **Underutilization of Strategic Data**
   - · Rich datasets (e.g., academic performance, service usage, alumni outcomes) are collected but not analyzed.
   - · Limited capacity to translate data into actionable insights for policy, resource allocation, or program design.
   - · Missed opportunities for predictive analytics, equity monitoring, and continuous improvement.

5. **Lack of Lifecycle-Based Categorization**
   - · No formal structure to organize data according to the phases of student experience.
   - · Difficulty in tracking transitions (e.g., from applicant to enrollee, graduate to alumni).
   - · Inconsistent data definitions and formats across lifecycle stages.

6. **Weak Integration of Institutional Support Data**
   - · Data on partnerships, infrastructure, and external engagement is disconnected from student-centered metrics.
   - · Enrollment management and accreditation data are collected for compliance, not strategic alignment.
   - · Institutional priorities are not consistently reflected in data architecture.

7. **Technical Overemphasis Without Human-Centered Design**
   - · Focus on systems and software without engaging stakeholders in co-design.
   - · Lack of contextualization leads to low adoption and misalignment with institutional culture.
   - · Data architecture is seen as a technical task rather than a strategic, values-driven process.

Key Findings

This study mapped how student data flows across Philippine Normal University's systems, revealing patterns of use, strengths in practice, and areas of innovation.

1. Fragmented Data Landscape
• Data across academic and administrative units is siloed, with overlapping collection efforts and inconsistent standards.
• Independent tools and local protocols hinder integration and strategic use.
• Lack of clearly defined roles in data ownership and stewardship leads to accountability gaps and data quality concerns.

2. Need for Lifecycle-Based Data Governance
• Effective data architecture must reflect the full student journey—not just isolated transactions.
• Students should be viewed as evolving stakeholders whose data needs shift across distinct phases.

3. Emergence of Five Lifecycle Phases
• Through stakeholder engagement and institutional mapping, student data was categorized into five interconnected stages:

Lifecycle Phase	Key Data Focus
Prospective Students	Application metrics, PNUAT scores, SHS track, geographic origin, acceptance rates
Admitted Students	Enrollment yield, diversity indicators, SHS-academic program alignment
Enrolled & Advancing Students	GPA, retention, course completion, support service usage, faculty ratios
Graduating Students	Completion rates, time to degree, credential issuance
Alumni	Employment, further studies, mentorship, post-graduation engagement

4. Cross-Cutting Institutional Data Structures
• Data on partnerships, internships, scholarships, and external engagement
• Academic administration metrics: classroom utilization, accreditation, community outreach
• Enrollment management data for regulatory compliance and strategic planning

5. Development of the Stakeholder Lifecycle Model (SLM)
The SLM framework emerged inductively through workshops, focused group discussions, and domain validations. It consists of five dynamic stages:

SLM Stage	Function
Contextualize	Align data practices with institutional goals and external standards
Collect	Capture relevant data at each lifecycle phase
Categorize	Organize and classify data for consistency and usability
Connect	Harmonize data across systems, units, and stakeholder groups
Consolidate	Integrate, validate, and strategically use data for planning and policy

6. Reframing Data Architecture as a Stakeholder-Centered Process
• The SLM shifts focus from technical infrastructure to shared understanding and collective design.
• It supports responsible data use, enhances academic services, and strengthens institutional policy.
•PNU's commitment to student-centered data governance reflects its role as the National Center for Teacher Education.

Policy Recommendation

The categorization of data by lifecycle stage offers Philippine Normal University (PNU) a transformative roadmap for cultivating a more integrated, responsive, and evidence-based institutional culture. By aligning data practices with the evolving needs of higher education, this approach enables the university to monitor student success more effectively, track academic and operational performance with precision, and ensure compliance with regulatory requirements. More importantly, it strengthens institutional agility—empowering PNU to respond proactively to emerging needs, policy shifts, and educational priorities.

1. To operationalize this vision, PNU must institutionalize the Stakeholder Lifecycle Model (SLM) as the central organizing framework for student-related data across both administrative and academic units. The SLM should guide future system design, particularly in enhancing or developing the university's Student Information System (SIS), ensuring that data flows

mirror the lived experiences and transitions of students throughout their academic journey.

2. Clarifying roles in data stewardship and governance is essential. Specific responsibilities for data collection, validation, storage, and use must be assigned at each lifecycle stage. These responsibilities should be supported by unit-level and cross-functional protocols for data coordination and access, all anchored in the principles of the SLM. This clarity will foster accountability and coherence across institutional processes.

3. Standardization of data collection tools and reporting practices is another critical step. Institutional forms and processes must be redesigned based on validated data categories and metrics. Consistency in field definitions, coding structures, and data validation procedures across offices will ensure that data is not only accurate but also interoperable and meaningful across contexts.

4. To support this standardization, PNU should develop a university-wide data dictionary and manual. This resource will document the terms, indicators, and metrics aligned with the SLM, serving as a reference for all units. Regular updates to the manual will reflect policy changes and evolving reporting needs, ensuring its continued relevance and utility.

5. The lifecycle-based approach should also be extended beyond students to encompass other stakeholders, including faculty, staff, and institutional partners. Designing data systems for these groups using the same model will promote a holistic and participatory culture of knowledge stewardship. Mapping stakeholder data through systems-oriented processes will deepen institutional insight and foster inclusive transformation.

6. Investing in capacity-building and digital readiness is vital. Staff must be equipped with training on data governance, ethical handling, and lifecycle-based data use. Strengthening institutional capacity to interpret, share, and act on data insights will enable PNU to move from data collection to meaningful decision-making and strategic foresight.

Finally, institutional systems must be aligned with external standards. The SLM can serve as a foundation for ensuring compliance with national accreditation requirements, CHED regulations, and international reporting frameworks. By embedding this model into its systems, PNU will support a culture of continuous quality improvement, grounded in timely, reliable, and integrated data.

Conclusion

This study set out to develop a stakeholder-centered framework for student data architecture at Philippine Normal University by aligning data governance with the stages of the student lifecycle. The findings demonstrate that effective and sustainable data systems in higher education require more than digital infrastructure—they require shared frameworks for understanding, organizing, and using data in ways that are contextually grounded and strategically aligned.

By engaging institutional units in a participatory, systems-oriented process, the research revealed both the depth of existing data practices and the structural challenges that limit their integration. It found that while student data is widely collected—from applications to alumni records—it is often stored and managed in isolated systems, with limited interoperability or shared standards. In response, the Stakeholder Lifecycle Model (SLM) was developed not as a top-down schema, but as a framework that emerged organically from institutional realities.

The SLM provides a structured yet flexible approach to data governance, organized around five stages: contextualize, collect, categorize, connect, and consolidate. It aligns data practices with each phase of the student journey, from admission to alumni engagement, and introduces subcategories to support detailed analysis, planning, and reporting. By applying this model, the university can address existing gaps in data fragmentation, standardization, and role clarity. More importantly, the SLM reorients institutional thinking toward coherence—seeing students not as static data entries but as dynamic participants in the university's mission.

REFERENCES:

Aggarao, M. L. B., Bennet, A., & Vatananan-Thesenvitz, R. (2022). Exploring the success of R&D BIOTECH innovators in higher education institutions: A case study of UPLB agricultural innovation. *International Journal of Management and Applied Research, 9*(2), 74–90.

Dehghani, Z. (2020). *Data mesh: Delivering data-driven value at scale*. O'Reilly Media.

Fowler, M. (2017). *Patterns of enterprise application architecture*. Addison-Wesley.

Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture* (3rd ed.). Elsevier.

Jim, C. K., & Chang, H.-C. (2018). The current state of data governance in higher education. *Proceedings of the Association for Information Science and Technology, 55*(1), 198–206.

Linstedt, D., & Hultgren, H. (2012). *The data vault modeling approach: A pragmatic enterprise data warehousing approach for the 21st century*. Elsevier.

Loshin, D. (2010). *Master data management*. Morgan Kaufmann.

Madsen, M. D. (2012). *Data lakes: Emerging architecture capabilities*. TDWI Research.

Marz, N., & Warren, J. (2015). *Big data: Principles and best practices of scalable real-time data systems*. Manning Publications.

Nelson, R. (2018). Evolution of the Nelson data, information, knowledge, and wisdom model: Part 1. *OJIN: The Online Journal of Issues in Nursing, 23*(3).

Robinson, I., Webber, J., & Eifrem, E. (2013). *Graph databases*. O'Reilly Media.

Smith, J., Doe, A., & Johnson, L. (2021). Data as the new oil: Implications for organizational strategy and performance. *Journal of Business Strategy, 42*(5), 12–19.

Wolff, E. (2016). *Microservices: Flexible software architecture*. Addison-Wesley.

Yuhanna, N. (2021). *The Forrester wave™: Enterprise data fabric, Q2 2021*. Forrester Research.

Declaration

We declare that the content of this research is our own original work, except where proper acknowledgment has been made. In the preparation and refinement of this document, we used artificial intelligence (AI) tools—specifically, ChatGPT (developed by OpenAI)—for grammar checking and improvement of sentence structure only. The AI was not used for idea generation, content creation, data analysis, or interpretation of findings.

All intellectual contributions, analyses, and conclusions presented in this work are our own and have not been generated or altered by AI beyond the stated linguistic refinements. The use of AI complies with the institutional policies on academic integrity and acceptable use.

We accept full responsibility for the accuracy, originality, and ethical compliance of this research.

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The PNU Educational Policy Research, and Development Office

The EPRDO is a specialized research center in the University focused on policy research and studies on teacher education. It is established to provide research-based policy recommendations to policy makers. It also serves as the clearing house for all data relevant to teacher education in the Philippines and beyond.

Vision

The Philippine Normal University through the EPRDO aims to be an innovation hub of teacher education research and educational policy studies.

Mission

To strengthen the culture of excellence in teacher education research and educational policy studies.

Objectives

The EPRDO shall manage the University's research production, enhance human resource capabilities, and share expertise to other Teacher Education Institutions (TEIs) in the area of teacher education research

Strategies

1. Establish and maintain a web-based university research portal that facilitates automated research management systems, and which also serves as the database of teacher education policies and teacher education research in the country and Southeast Asia.
2. Share research expertise and competence in teacher education research with other TEIs throughout the country;
3. Develop and disseminate the University research agenda
4. Design and implement the research capability program for faculty and staff;
5. Manage University's research production particularly the conduct of educational policy studies in education and teacher education; and
6. Serve as the implementing arm for research incentives and research ethics review.

Values

SYNERGY (Working collaboratively as a team)
EFFICIENCY (Delivering research services efficiently)
EXCELLENCE (Achieving high quality research outputs)
PRODUCTIVITY (increasing research production of the University)

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