TITLE & UNIVERSITY

Digital Transformation in Science and Higher Education:

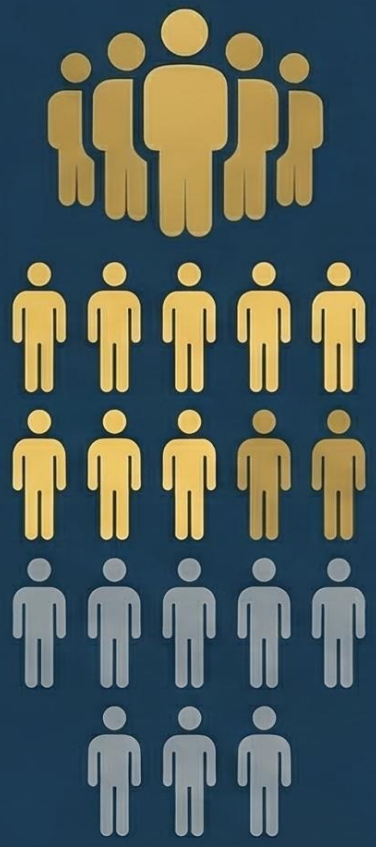
A Multi-Method Study of the Caucasus Context

Nino Karkadze

Samtskhe-Javakheti State University, Georgia

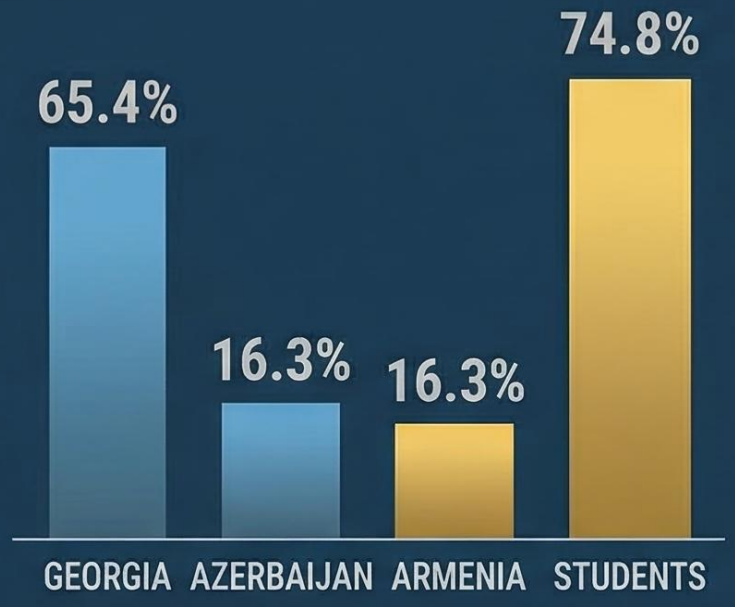
METHODOLOGY OVERVIEW

A Multi-Method Approach (Quantitative + Qualitative)



Quantitative Data:

1,146 Respondents

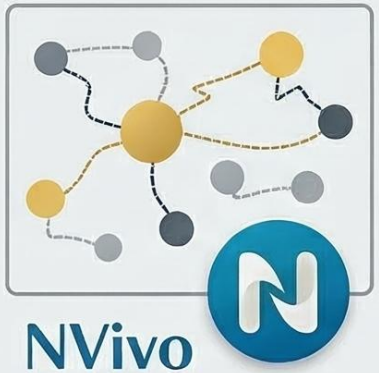


Qualitative Insights:

24 Semi-structured Interviews

> “Findings reveal a significant opemess – underscoring.”

> “Thematic map, stretching miman impvovoitan, based on any thematic – Thematic map.”

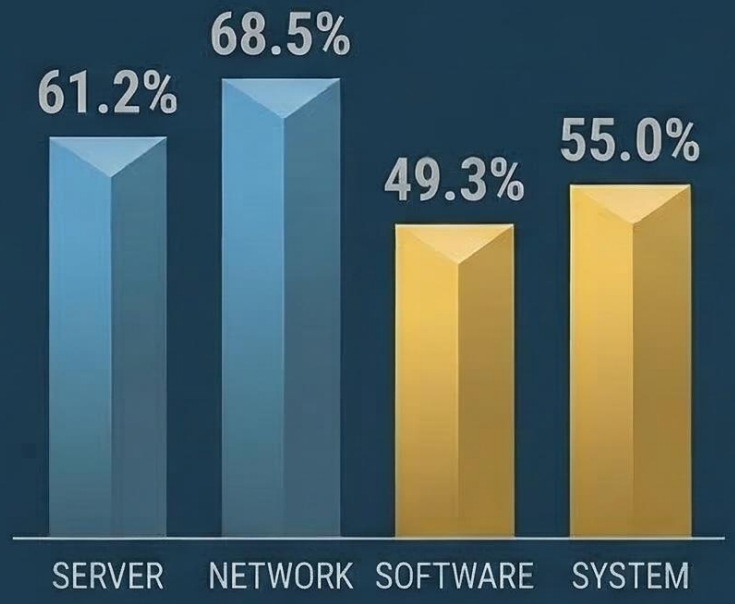


INFRASTRUCTURE SATISFACTION (3.29/5.00)

TRAINING PROGRAM EVALUATION (3.20/5.00)

Quantitative Data:

1,146 Respondents

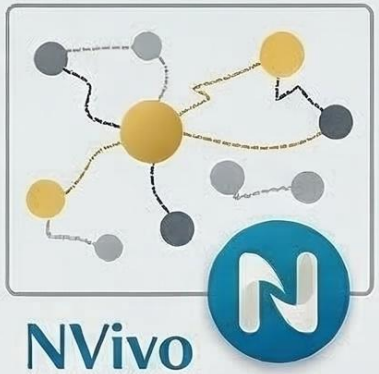


Qualitative Insights:

18 In-depth Participant Feedback Sessions

> “Participant Training Feedback”

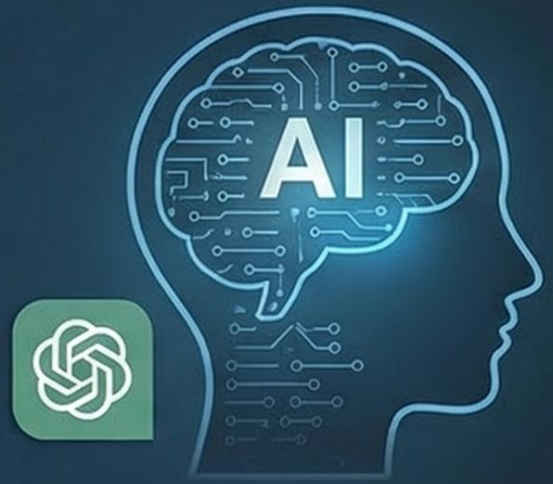
> “Key focus was placed on enhancing training program content and expanding practical application”



THE AI PARADOX

AI as a Cognitive Partner vs. A Threat

AI Adoption for Science

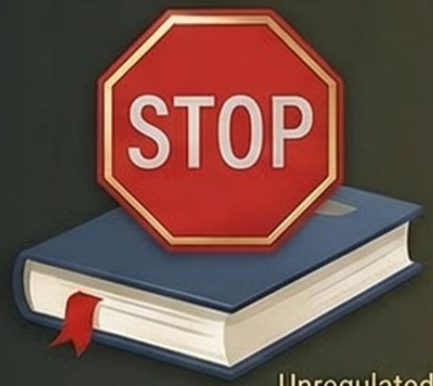


61.0%

Bottom-Up Adopters

TRANSITIONARY FRICTION

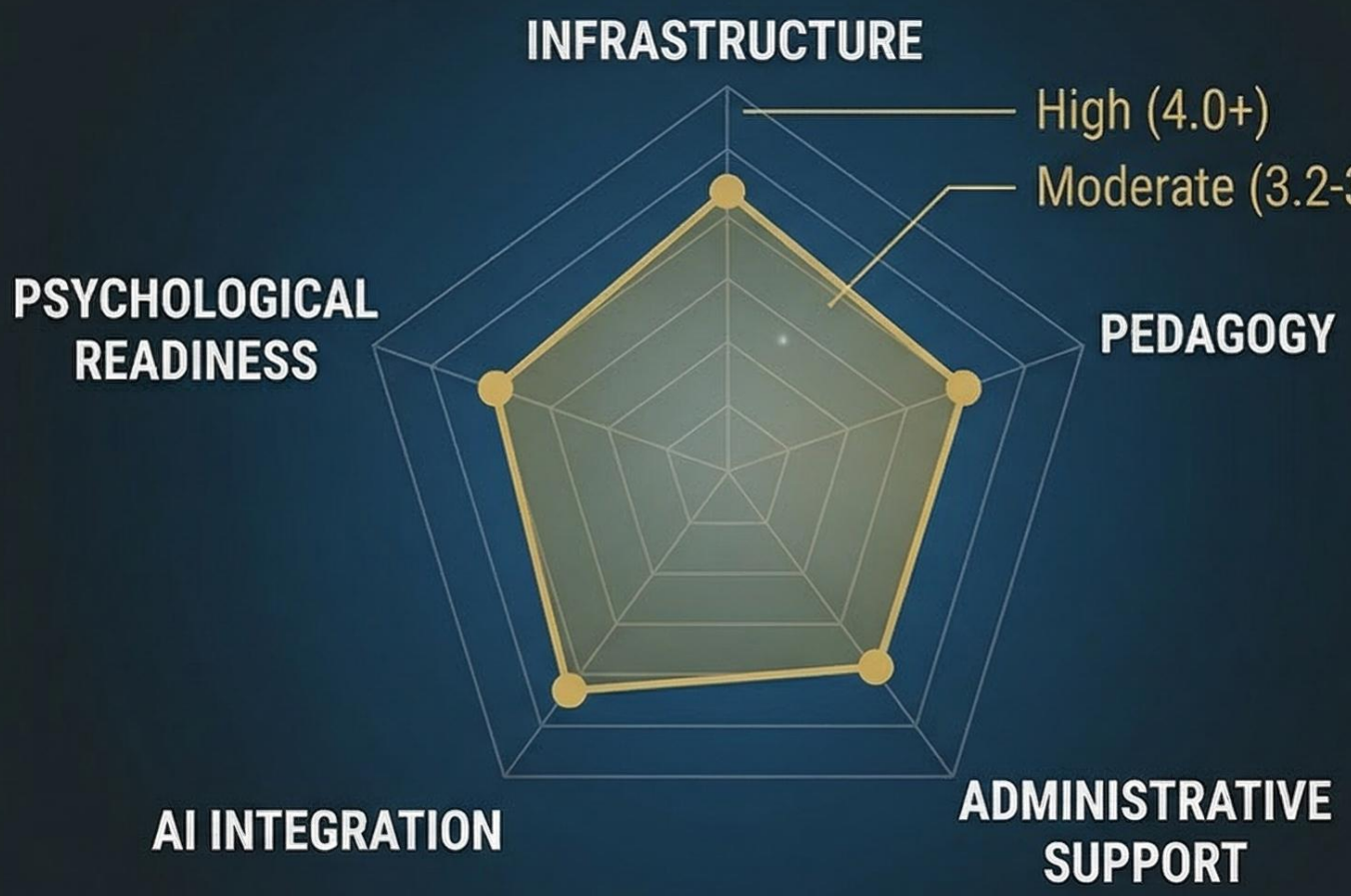
Institutional Resistance



Unregulated
Critical Thinking
Plagiarism
Unregulated

Top-downskeptics

DIGITAL MATURITY ASSESSMENT



Measuring Institutional Digital Evolution across 5 Dimensions

(Mean Scores: Infrastructure 3.29, Pedagogy 3.31)

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EDUCATIONAL PLATFORMS USABILITY

MOODLE

ZOOM

MS TEAMS

High Proficiency for Moodle, Zoom, & Teams (52.2% User Proficiency)

Persistent Technical Barriers
(32.3% for Authentication/Stability)

Mean Score: 3.31/5.00

EDUCATIONAL PLATFORMS USABILITY

MOODLE

ZOOM

MS TEAMS

High Proficiency for Moodle, Zoom, & Teams (52.2% User Proficiency)

Persistent Technical Barriers
(32.3% for Authentication/Stability)

Mean Score: 3.31/5.00

ACCESS TO SCIENTIFIC DATABASES

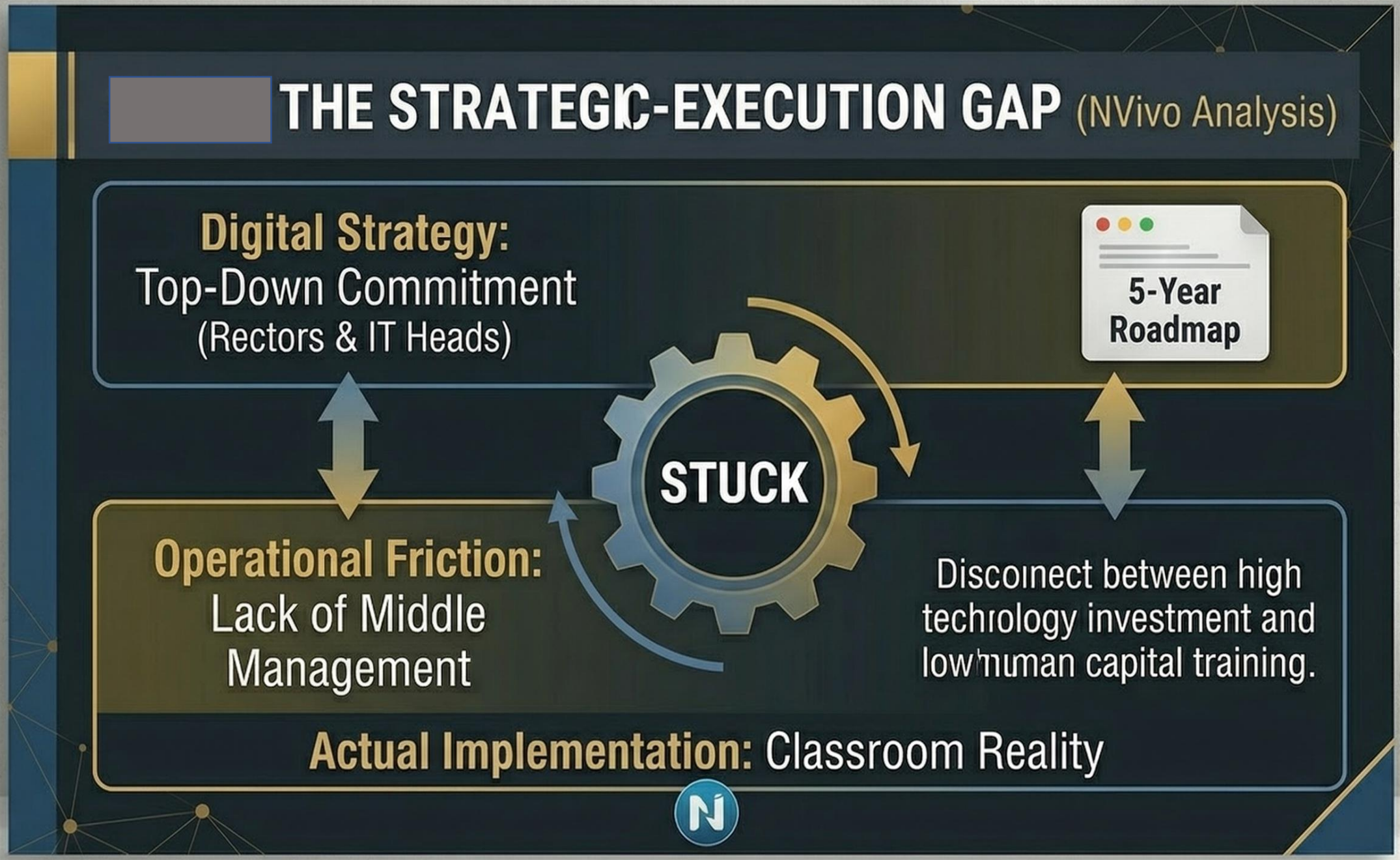
54.5%

Active Access to Scopus/ScienceDirect

Highest Satisfaction Area (Mean Score: 3.37)

VPN

Access Solutions (Mean Score 3.37)


THE STRATEGIC-EXECUTION GAP (NVivo Analysis)
Digital Strategy:
Top-Down Commitment
(Rectors & IT Heads)
5-Year
Roadmap
STUCK
Operational Friction:
Lack of Middle
Management
Disconnect between high
technology investment and
low human capital training.
Actual Implementation: Classroom Reality

STEM EDUCATION TRANSFORMATION

From Labs to Technology-Enhanced Environments

Physical Science Lab

- Transitioning traditional science environments to digital.
- Focus on student engagement via simulations.
- Empirical validation of learning outcomes.

STEM Student Engagement Impact: Measured

Found a significant increase in STEM adoption among faculty (from 15% to61%).

GENERATION Z vs. FACULTY

Digital Proficiency Gap

Z Generation (Students)

- Reported: Increased proficiency and reliance on digital tools.

Senior Faculty Member

- Reported: Digital adoption anxiety and resistance to new methods.

- Shared Insight: Need for specialized pedagogical training for all cohorts.

REGIONAL vs. METROPOLITAN BARRIERS

Localized Digital Evolution in the Caucasus

Samtskhe-Javakheti State University, Georgia (SJSU)

54.5% Infrastructure Satisfaction (Mean: 3.29/5.00)

Specific resource gaps in regional HEIs

Access solutions (VPN / Scopus / ScienceDirect)

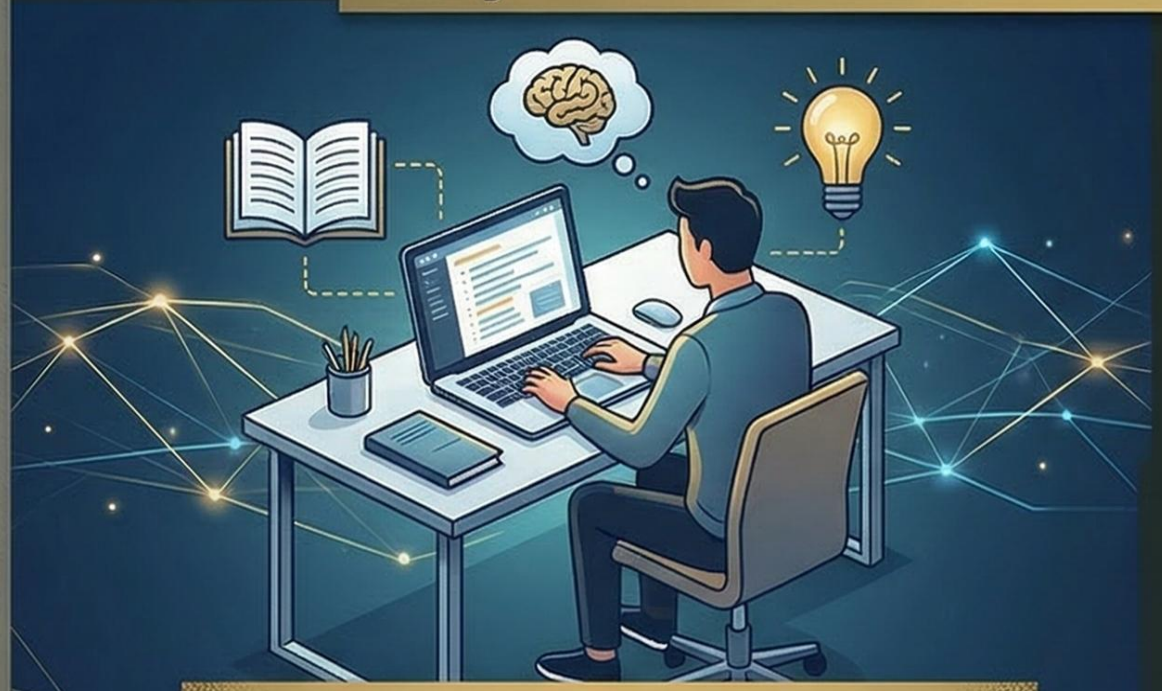
Specific resource gaps in regional HEIs

SJSUs as a Case Study: Bridging the Divide

- Technology is a tool, not a substitute for pedagogy.
- Found a significant increase in STEM adoption among faculty (from 15% to 61%).
- Disconnect between high technology investment and low human capital training.

DIGITAL LITERACY & PEDAGOGY

Beyond Hardware: The Role of Digital Literacy

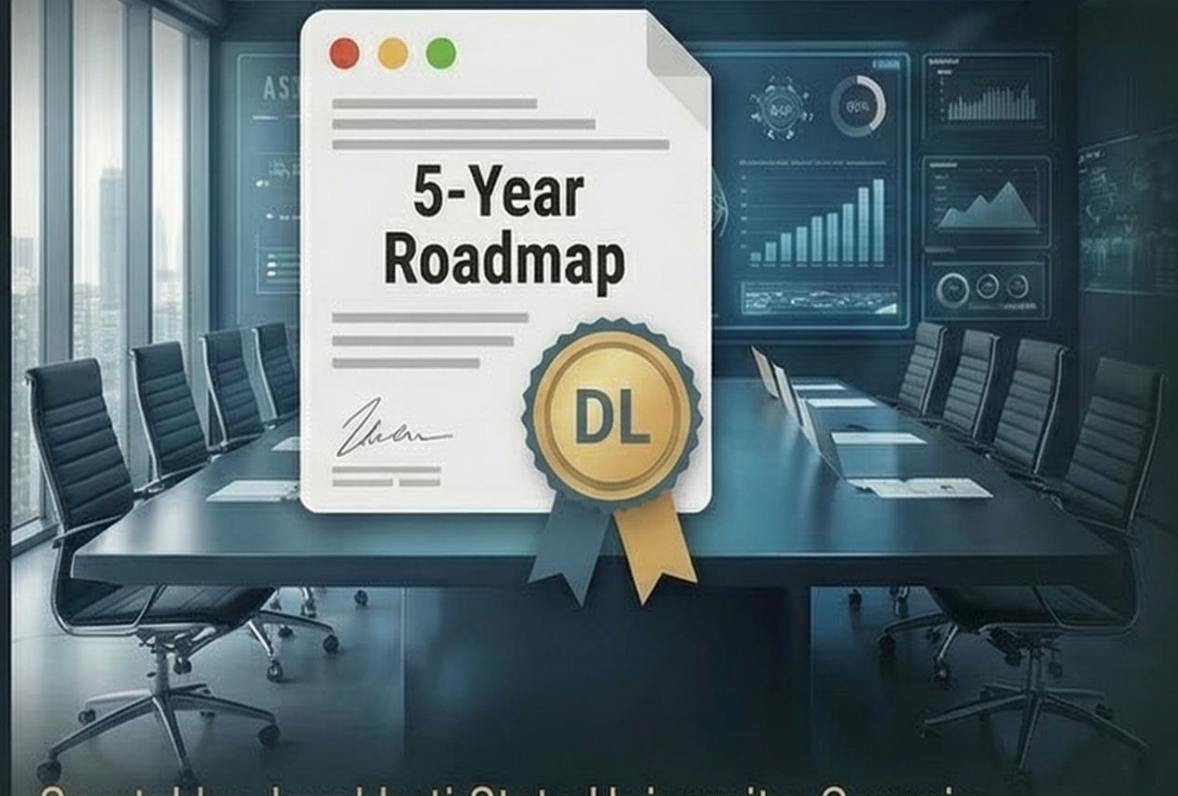


Self-Assessments: Need for critical skill reinforcement

- Technology is a tool, not a substitute for pedagogy.
- Access solutions
  - Certifications / Competency Frameworks / Digital Modules
- Shift from passive learning to digital exploration.
- Disconnect between high technology investment and low human capital training.
- Core competency for modern researchers.

THE STRATEGIC LEAP (Policy Analysis)

OPERATIONALIZING THE DIGITAL VISION



Key Points

- Bridging the gap from policy to implementation.
- Need for dedicated Digital Transformation Officers.
- Investing in sustained human capital development (Training Mean: 3.20).

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AI ETHICS & GOVERNANCE

ESTABLISHING CLEAR INSTITUTIONAL AI GUIDELINES.

Key Points

- Creating AI Ethics Commit for academic integrity.
- AI as a Cognitive Partner vs. A Plagiarism Tool.
- Regulatory frameworks to address unregulated usage.

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INNOVATION HUB: THE 'EDUXCELL' INITIATIVE

PROPOSING A CENTRAL FOR DIGITAL EXCELLENCE (EduXcell).

Key Points

- Targeted support for specialized pedagogical training (STEM).
- Fostering continuous research & development.
- Ensuring sustainable funding for digital ecosystems.

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RESEARCH SUSTAINABILITY MODEL

Fostering Long-Term Research & Development

Key Points

- Investing in continuous human capital development.
- Targeted support for specialized pedagogical training (STEM).
- Fostering continuous research & deveiopment.
- Ensuring sustainable funding for digital ecosystems.

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Regional & Cross-Border Collaboration for Success

Key Points

- Establishing joint digital initiatives (e.g., Caucasus Digital Hub).
- Fostering continuous research & development across nations.
- Addressing localized resource gaps.
- Fostering regional digital equity.

: AI & PEDAGOGY TRANSFORMATION

Revolutionizing Teaching Methods (AI Pedagogy)

Key Points

- Integrating generative AI as a cognitive partner.
- Targeted support for specialized pedagogical training (STEM).
- Developing continuous research & development.
- Shifting from passive learning to digital exploration.

: FUTURE OUTLOOK & CAKE-TO-ACTION

FUTURE ROADMAP: Digital Transformation as an Ongoing Journey.

Key Points

- Longitudinal study on digital literacy & employability.
- Measuring continuous research & development.
- Ensuring sustainable funding for digital ecosystems.
- Technology empowers, but people transform.