
Leveraging Employee Digital Skills to Accelerate Digital Transformation and Achieve Organization Competitive Advantage (An Empirical Study on Digital Capability Assessment Across Early Childhood, Primary, Junior, and Senior High School Levels)

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Abstract

Digital transformation in education has become an urgent necessity in the post-COVID-19 era, as remote learning accelerated large-scale technology adoption. Yet, digital skill gaps among education employees remain a critical barrier, particularly in Indonesia with its limited infrastructure. This study aims to assess the digital skills of 824 employees in XYZ Educational Organization, spanning early childhood to senior high school levels. Using an adapted UNESCO Global Framework of Reference on Digital Literacy Skills, five core competencies are measured. Data were collected via surveys and analyzed to identify gaps across educational levels. The findings are expected to provide milestone-based recommendations to accelerate multi-level digital transformation, improve collaboration, enhance data management efficiency, strengthen cybersecurity, and boost school competitiveness in the digital era.

Keywords: Digital Skill, Educational Technology, Information Security Awareness, Privacy Awareness, Digital Literacy

1 INTRODUCTION

Digital transformation in education has become an urgent need in the post-COVID-19 era, when distance learning forced schools to adopt technology widely. Globally, UNESCO notes that the pandemic sped up the digitalization of education but also increased gaps in access and digital skills, especially in developing nations. In Indonesia, the pandemic caused over 530,000 schools to close in 2020, leading to a quick move to online learning that highlighted reliance on digital infrastructure (UNICEF, 2021). This shift not only changed teaching methods but also stressed the importance of digital skills among education workers, like teachers and staff, as a key factor in institutional competitiveness. According to the World Bank (2021a), only 30% of rural schools in Indonesia have reliable internet, which hampers technology use and worsens educational inequalities.

The urgency of this research stems from how digital skills can transform education, from individual employees to entire organizations, thereby boosting schools' competitiveness in the digital age. Post-pandemic studies indicate that digital transformation in Indonesian education has advanced rapidly since 2012, especially after COVID-19, with an emphasis on online platforms and learning. Innovations (Fuadiy et al., 2025) However, without sufficient digital skills, educational institutions risk falling behind in curriculum innovation, data management, and global collaboration. Frameworks like the Resource-Based View (RBV) suggest that digital skills as internal resources can become a competitive advantage, allowing schools to attract more students, improve graduate

quality, and adapt to technological changes change (Barney, 1991). In the Indonesian context, digitalization of education is essential to support Sustainable Development Goal (SDG) 4 on quality education, where technology acts as a catalyst (UNESCO, 2018).

Despite these advancements, there are significant gaps in digital skills among teachers and education staff in Indonesia. Research indicates that teachers' digital literacy is at a "fairly good" level, but variations across provinces and education levels remain high, with key factors including lack of infrastructure, training, and educational focus. According to International Labour Organization (2022), Indonesia faces a shortage of 15,000-20,000 ICT specialists in creative sectors, including education, which impedes technology adaptation. Additionally, only 30% of students achieve minimum proficiency in reading, which indirectly affects the development of teachers' digital skills (Smeru Research Institute, 2022). The lack of training support during the digital transition post-pandemic has further exacerbated this issue, where teachers often struggle to integrate technology into teaching (World Bank, 2021b).

In the XYZ Educational Organization, which oversees various levels of primary and secondary education with a total of 1,157 employees, similar issues have been observed during initial assessments: uneven digital skills across different levels (e.g., TK/PAUD lower than SMA/SMK), which hampers multi-level digital transformation. This causes inefficiencies in collaboration, data management, and cybersecurity, ultimately reducing the organization's competitiveness in attracting students and fostering innovation.

The aim of this research is to evaluate the digital skills of XYZ employees to support multi-level digital transformation, from fundamental abilities to organizational competitiveness. The method used is a modification of the UNESCO Global Framework of Reference on Digital Literacy Skills, which includes seven core competencies such as device operation, information literacy, communication, content creation, safety, problem-solving, and career skills, adapted into five main competencies tailored to the XYZ context. This research plan includes assessment instruments tailored to the organization's needs, data collection through questionnaire distribution, data analysis to determine the value of digital capabilities and to identify competency areas that need to be improved, and formulation of recommendations for a 5-year sustainable program to make employee digital capabilities a competitive advantage for the organization.

2 LITERATURE REVIEW

This research utilizes the Digital Literacy Framework proposed by UNESCO (2018) as its main conceptual foundation for evaluating respondents' digital capabilities. The framework consists of 7 competency areas from those in areas numbered 0 to 6. This study uses 5 of the 7 proposed competency areas, namely areas 0 to 5 as described in the methodology section. In addition, this study also adjusts the sub-competency section in each competency to the context or needs of the XYZ organization which is the location of the case study. Before going into the details of the adjusted competencies and sub-competencies, this Literature Review section will first describe the competency areas proposed by UNESCO as follows:

- Area 0 - Device and Software Operation. This section delves into the user's fundamental ability to manage essential hardware and software required for their work.
- Area 1 - Information and Data Literacy. This focus ensures individuals possess the skills to locate, assess, and manage information effectively within online platforms.
- Area 2 - Communication and Collaboration. This area examines the potential to work together with others via digital means, fostering the exchange of ideas, coordinating tasks, and achieving shared objectives.
- Area 3 - Digital Content Creation. Here, the emphasis lies on the ability to develop and adapt digital material, with a keen understanding of copyright and licensing considerations.

- Area 4 - Safety. This aspect addresses the capacity to protect devices, data, personal information, and privacy within digital settings.
- Area 5 - Problem Solving. This area explores the skill to identify needs and challenges, tackling conceptual difficulties and real-world digital scenarios, while leveraging tools to improve processes and outcomes.
- Area 6 - Career Related Competencies. This focus highlights the aptitude to apply advanced digital technologies and to understand, evaluate, and analyze specialized data and content relevant to a specific field.

Considering these competencies as interconnected rather than isolated abilities, the UNESCO framework provides a broad perspective on digital literacy, blending technical expertise with the ethical and mindful use of digital tools. Within this study, the framework serves as a foundation for setting measurement standards and steering the evaluation process, allowing for adaptations that reflect the organization's practical needs and goals.

3 RESEARCH METHODOLOGY

This study followed a structured methodology consisting of six interrelated stages, as illustrated in Figure 1. The process began with the identification of digital capability standards for employees and concluded with the preparation of the final research report. In addition to outlining the research stages, this section explains the scope of the study, the instruments developed, and the data analysis techniques applied. The six research stages are as follows:

1. Research on Employee Capability Standards

At this stage, our main objective was to determine which indicators could best capture an individual's level of digital skills. To support this effort, we referred to the UNESCO Global Framework of Reference on Digital Literacy Skills, a model that identifies seven broad areas of competence (discussed further in Chapter 2). We selected this framework because of its strong international reputation and its ability to encompass the diverse dimensions of digital literacy. By grounding our work in a globally recognized standard, we were able not only to ensure the credibility of our approach but also to position our results in relation to international benchmarks. The insights gathered during this stage became an essential foundation for the development of the assessment tool in the next phase of the study, ensuring that the instrument would be both comprehensive and contextually meaningful.

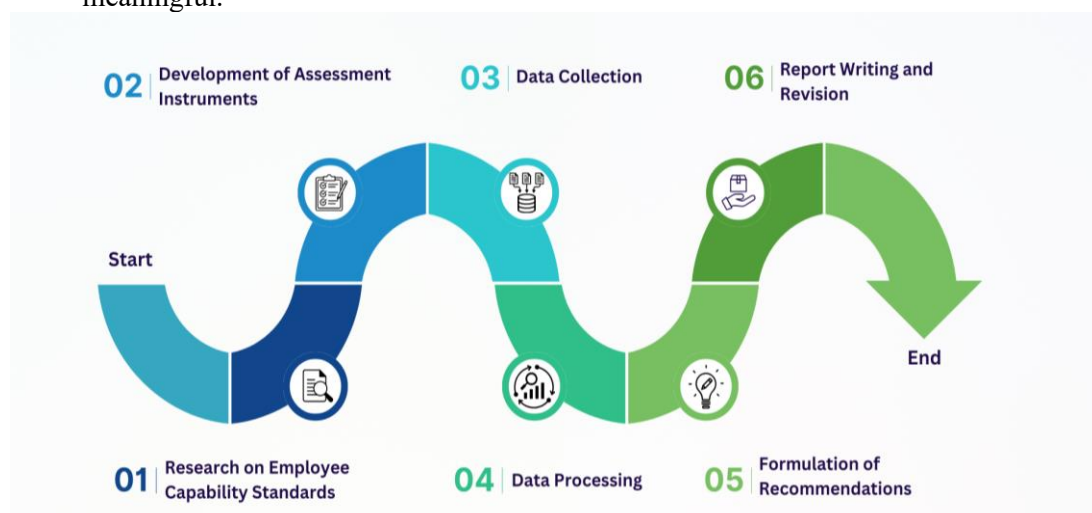


Figure 1. Research Stages

2. Development of Assessment Instrument

In the second stage, we worked on designing an instrument to assess employees' digital competencies in a way that was both structured and practical. The instrument was organized into a series of indicators, each supported by guiding questions that could capture different aspects of digital literacy. At the outset, we drew inspiration from UNESCO's Global Framework of Reference on Digital Literacy Skills (2018), which identifies seven broad areas of competence (see Chapter 2 – Literature Review). While this served as a valuable reference, we also recognized that not every element of the framework was fully aligned with the organization's immediate context. After several rounds of internal discussions and a review of the organization's strategic objectives, we agreed to exclude two areas—Problem-Solving and Career-Related Competences. These domains, although important in a broader sense, were judged to be less applicable to the current digital environment of the organization. By narrowing the scope in this way, we ensured that the instrument would remain focused, relevant, and directly supportive of the organization's ongoing digital initiatives, rather than introducing measures that might not yield meaningful insights at this stage. Consequently, we focused on five main areas: Devices and Software Operations, Information and Data Literacy, Communication and Collaboration, Digital Content Creation, and Safety & Privacy.

Moreover, the specific sub-competencies associated with these areas were not taken directly from UNESCO's framework. Instead, we tailored and redefined them to better reflect the unique digital skills necessary for our organization. This customization was based on qualitative feedback gathered from interviews with both our IT and Education units, ensuring the sub-competencies accurately represented the operational context and skill needs. We included a mapping in Table 1 that shows the relationship between the original UNESCO competencies and our adapted sub-competencies used in this study.

I created the assessment tool by developing questions that align with the various indicators of each sub-competency I mentioned earlier. This preparation was crucial to make sure that when we move on to collecting data, we can accurately and consistently measure the digital competencies of the respondents.

Table 1. Proposed Instrument Digital Competencies

Core Competency (UNESCO, 2018)	Proposed (Sub-Competency)
Devices and software operations	Connecting to the internet
	Connecting speakers and webcams
	Downloading applications
Information and Data Literacy	Searching for information on Google
	Evaluating the credibility of information
	Identifying online scams
	Downloading documents
	Performing copy-and-paste operations
Communication and Collaboration	Using email
	Creating meeting links
	Using collaborative applications
	Crediting authors appropriately
	Posting job-related content
Digital Content Creation	Creating presentation materials
	Processing data
	Writing reports
	Storing files
	Understanding content licensing

Core Competency (UNESCO, 2018)	Proposed (Sub-Competency)
Safety & Privacy	Using character combinations for passwords
	Managing account passwords
	Identifying unreliable sources
	Sharing personal data securely

3. Data Collection

The data collection stage involved determining the research population and selecting an appropriate sample size to ensure representative results. The population in this study comprised all employees of the Basic and Secondary Education Institution within Organization XYZ, totaling 1,157 individuals. To determine the minimum sample size required, the Slovin's formula (Slovin, 1960) was applied:

$$n = \frac{N}{1+N(d)^2} \quad (1)$$

where:

- N = population size
- d = margin of error
- n = required sample size

Using Slovin's formula, and substituting $N = 1,157$ with $d = 0.10$ (10% margin of error), the minimum sample size was calculated as 795 participants. In practice, responses were obtained from 824 employees, surpassing the minimum requirement. This larger sample helped strengthen the reliability and accuracy of the results. The sampling approach was designed to include perspectives from personnel across all schools under the management of Organization XYZ, providing a broad and representative overview of their digital capabilities.

4. Data Processing

- Validity Test

To verify that the questionnaire effectively measured the intended constructs (Sekaran & Bougie, 2016), Pearson's Product-Moment correlation was applied using the formula shown below:

$$r_{XY} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}} \quad (2)$$

Decision criteria:

The instrument is deemed valid if the computed r value exceeds the r table value, where the r table is determined according to Pearson's correlation table based on the sample size.

- Reliability Test

Reliability was examined to determine the internal consistency of the questionnaire. Cronbach's Alpha (Sekaran & Bougie, 2016) was applied using the formula shown below:

$$r_{11} = \left[\frac{k}{k-1} \right] - \left[1 - \frac{\sum ab^2}{at^2} \right] \quad (3)$$

Decision criteria:

An instrument was judged reliable when its Cronbach's alpha was at least 0.70.

- **Digital Literacy Level Calculation**
Respondents' digital literacy levels were determined by calculating the average of their responses on a Likert scale, defined as follows:
1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree
For each indicator, we summed all individual scores and divided by the number of respondents to obtain a mean; higher means indicate stronger digital literacy within the group.
5. **Formulation of Recommendations**
At this stage we drafted targeted program proposals to strengthen employees' digital competencies. The design was guided by the analysis results so that the actions address observed skill gaps, support adaptation to technological change, and encourage a culture of continuous learning. The recommendations are intended to help staff use current digital tools effectively while preparing for future developments.
 6. **Report Writing and Revision**
The final step was to assemble the research report by integrating findings and analyses from the preceding stages. We iteratively reviewed and edited the manuscript to improve clarity, accuracy, and coherence. This process ensured that the final document aligned with the study objectives, was accessible to the intended audience, and was ready for submission to relevant stakeholders.

4 RESULTS AND DISCUSSIONS

4.1 Instrument Validity and Reliability

The validity check encompassed all questionnaire items administered at every educational stage, ranging from kindergarten and early childhood programs to senior high and vocational schools. Using Pearson's correlation coefficient, all items achieved calculated R values higher than their respective R table thresholds, confirming that the instruments effectively measure the intended constructs of digital capability. This demonstrates that each question item is statistically valid and suitable for use in the assessment. Reliability testing was conducted through Cronbach's Alpha, with 0.700 set as the minimum acceptable coefficient. The results show that every educational level recorded values above this standard, ranging from 0.786 in primary schools to 0.894 in senior high/vocational schools. These results indicate a high level of internal consistency across the instrument, reinforcing its dependability for evaluating digital capability within the organization.

4.2 Digital Capability Conditions of Employees

The measurement results of employees' digital capabilities in organization XYZ, as illustrated in *Figure 1*, indicate that of the five competency levels assessed, four fall into the Good category (score ≥ 4.00) and one is in the Moderate category (3.00–3.99). This assessment involved a total of 824 respondents, representing 72% of the overall employee population across educational levels.

Level 1 (Basic Computer and Software Operation) achieved the highest average score at 4.45, followed by Level 2 (Information and Data Literacy) with 4.34, Level 4 (Digital Content Creation) with 4.20, and Level 3 (Communication and Collaboration) with 4.11—all within the Good range. Although Levels 3 and 4 meet the Good category threshold, several sub-competencies within these levels remain in the Moderate range, indicating uneven mastery across certain skills. Level 5 (Security and Privacy) recorded a score of 3.81, placing it in the Moderate category and highlighting the need to strengthen awareness and practices regarding data protection and privacy. Overall, *Figure*

I reflects that while core digital capabilities are generally satisfactory, targeted initiatives in security and privacy are essential to supporting the organization’s digital transformation objectives.

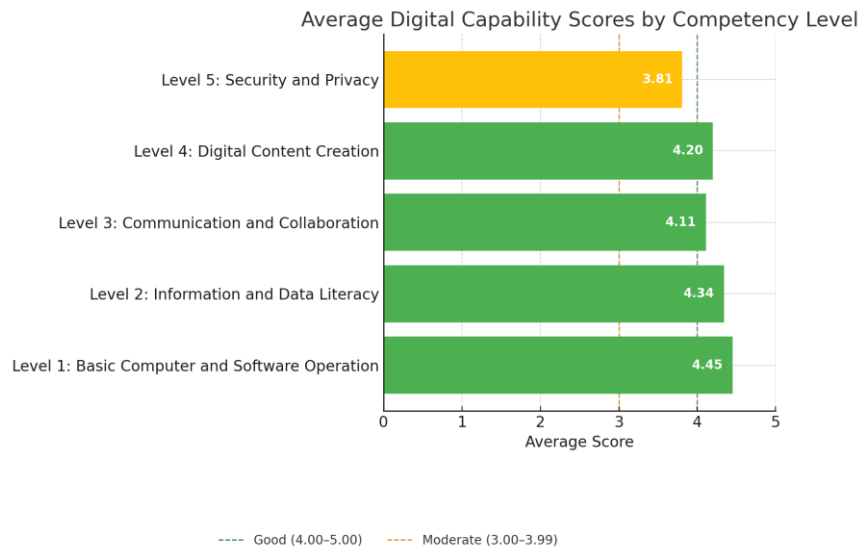


Figure 2. *Digital Capability Conditions of Employees Based on Five Competency Levels*

4.3 Average Digital Capability by Education Institution Levels

Figure 3 presents the average digital capability scores across four educational levels within organization XYZ, based on responses from 824 employees (72% of the total population). Primary school employees achieved the highest average score (4.34), closely followed by senior high/vocational school employees (4.32) and junior high school employees (4.27), all within the *Good* category (≥ 4.00). Kindergarten/early childhood education employees scored lower at 3.77, placing them in the *Moderate* category (3.00–3.99).

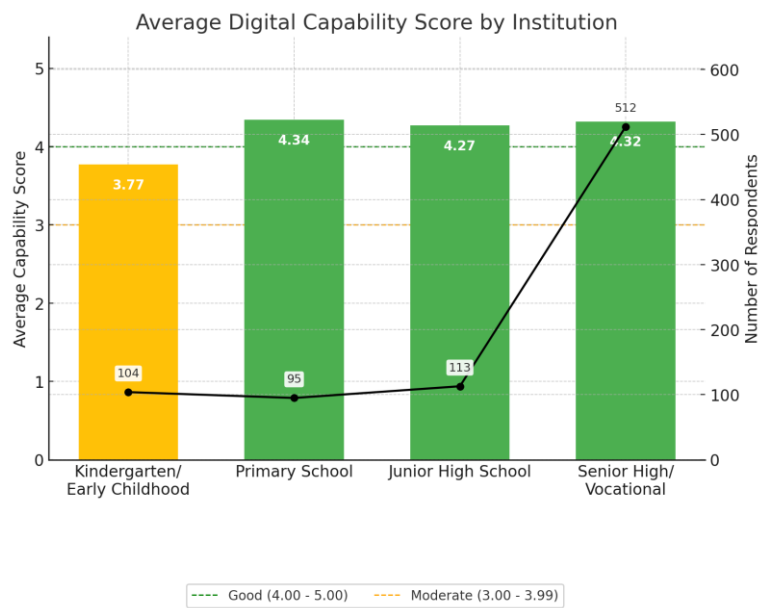


Figure 3. *Average Digital Capability and Respondent Distribution by Education Institution Levels*

The higher scores at the primary, junior high, and senior high/vocational levels suggest greater familiarity with digital tools, potentially due to more frequent integration of technology in daily work processes and job requirements. Conversely, the lower score in kindergarten/early childhood education may reflect limited exposure to advanced digital applications, as the teaching context and operational needs often prioritize face-to-face interaction and basic administrative tools over more complex digital systems. These variations highlight the need for differentiated digital capability development programs. Specifically, targeted training for kindergarten/early childhood staff could help bridge the gap, ensuring consistent competency levels across all educational stages. Addressing this disparity will support a more balanced and cohesive digital transformation across the organization's diverse institutions.

4.4 Detailed Digital Capability by Competency Level and Institution

The detailed breakdown of digital capability scores by competency level and institution, as shown in *Table 2*, reveals notable variations across educational levels in organization XYZ. In Level 1 (*Basic Computer and Software Operation*), all institutions perform in the *Good* category, with primary schools achieving the highest score (4.67), followed by junior high schools and senior high/vocational schools (both 4.54), and kindergarten/early childhood education at 4.05. For Level 2 (*Information and Data Literacy*), primary schools again lead with 4.51, closely followed by senior high/vocational schools (4.45) and junior high schools (4.44), while kindergarten/early childhood education scores 3.95 (*Moderate*).

In Level 3 (*Communication and Collaboration*), primary schools (4.24), junior high schools (4.26), and senior high/vocational schools (4.32) remain in the *Good* category, whereas kindergarten/early childhood education is at 3.62 (*Moderate*). A similar pattern appears in Level 4 (*Digital Content Creation*), with primary schools scoring 4.52, senior high/vocational schools 4.33, junior high schools 4.32, and kindergarten/early childhood education 3.62. Scores for Level 5 (*Security and Privacy*) are relatively lower across all institutions, ranging from 3.67 in kindergarten/early childhood education to 3.99 in senior high/vocational schools, placing them in the *Moderate* category. Overall, *Table 2* demonstrates that while core digital competencies (Levels 1–4) are well-developed across most institutions, there is a clear need for targeted improvement in security awareness and data protection where several institutions remain in *Moderate* or *Poor* categories.

Table 2. Digital Capability Scores by Competency Level and Institution

Competency Level	Kindergarten / Early Childhood Education (TK/PAUD)	Primary School (SD)	Junior High School (SMP)	Senior High / Vocational School (SMA/SMK)
Level 1: Basic Computer and Software Operation	4.05	4.67	4.54	4.54
Level 2: Information and Data Literacy	3.95	4.51	4.44	4.45
Level 3: Communication and Collaboration	3.62	4.24	4.26	4.32
Level 4: Digital Content Creation	3.62	4.52	4.32	4.33
Level 5: Security and Privacy	3.67	3.78	3.82	3.99

4.5 Milestone-Based Recommendations for Digital Capability Development

The milestone frameworks for each educational level in organization XYZ provide a strategic roadmap for progressively enhancing digital capabilities over a five-year period. *Figure 4 illustrates the milestone for kindergarten/early childhood (TK/PAUD), beginning with Building Foundation Skills in Year 1, progressing through Strengthening Foundation Skills in Year 2, and achieving Digital Creator status by Year 3. In Years 4 and 5, the focus shifts towards Initiating Digital Literacy for Competitive Advantage and fostering a Digital Mindset, which is essential for adapting to emerging technologies and preparing for advanced competencies.*

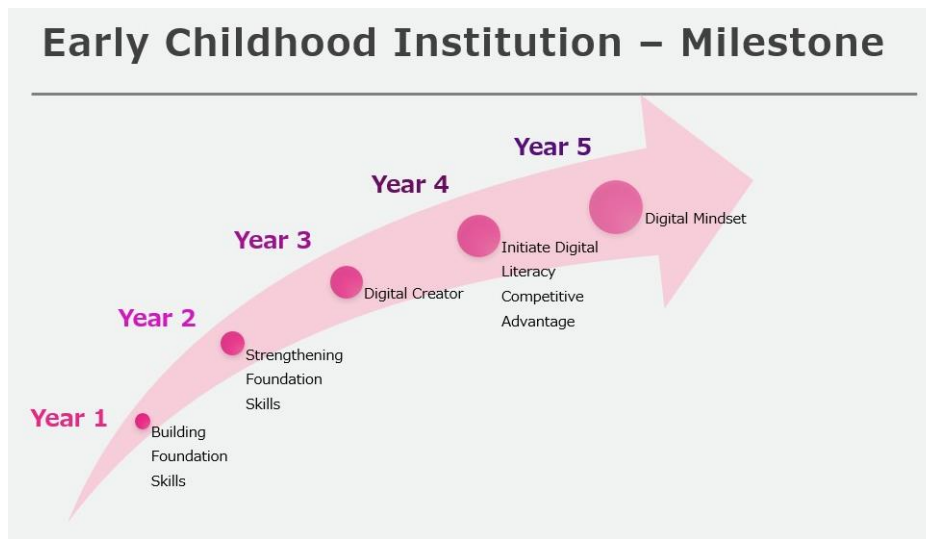


Figure 4. *Early Childhood Institution Digital Capability Milestone*

Similarly, *Figure 5 presents the milestone path for primary school, junior high school, and senior high/vocational institutions. Here, the journey starts with Strengthening the Basics in Year 1, moving to Specialization and Growth in Year 2, and advancing to Initiating Digital Literacy for Competitive Advantage by Year 3. By the fourth year, the emphasis shifts toward cultivating a strong digital mindset, setting the stage for attaining mastery and driving innovation in the fifth year. This planned progression is intended to equip the institution with a competitive advantage, allowing it to stand out and maintain relevance within the education sector.*

Drawing from these milestones, the development of digital capabilities should follow a structured, multi-stage plan aligned with the outlined framework. In early childhood education, emphasis needs to be placed on building essential operational competencies, followed by the gradual integration of creative and collaborative activities. At the primary, junior high, and senior high or vocational stages, development efforts should prioritize building deeper areas of specialization, encouraging a culture of innovative thinking, and strengthening the ability to solve complex problems within digital contexts. Each stage should be supported by clearly defined key performance indicators (KPIs) to facilitate systematic tracking and ensure that progress remains consistent with both short-term objectives and long-term strategic goals.

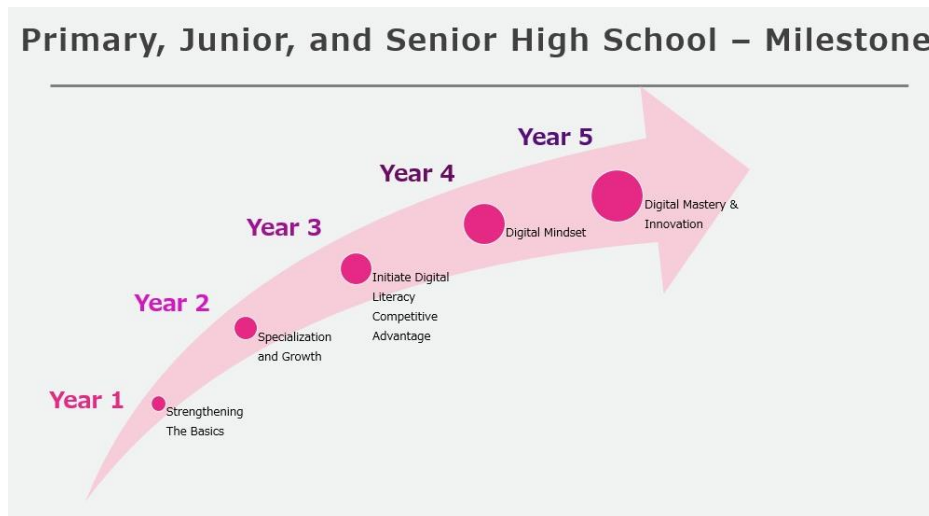


Figure 5. Primary, Junior, and Senior High School Digital Capability Milestone

5 CONCLUSIONS

The evaluation of employees' digital capabilities in organization XYZ shows that four of the five assessed competency levels are classified as Good, while one falls into the Moderate category. Foundational skills such as basic computer operations, information and data literacy, communication and collaboration, and digital content creation are generally well-developed across most educational levels. In contrast, competencies related to security and privacy show notable weaknesses. The gap is most evident in kindergarten/early childhood education, where the overall capability score is lower.

These findings indicate the need for a structured, phased development strategy that reflects the distinct needs of each educational level. For early childhood education, the primary focus should be on building a solid foundation in essential digital skills, followed by the gradual integration of creative and collaborative competencies. At the primary, junior high, and senior high/vocational levels, the emphasis should be on specialization, innovation, and advanced problem-solving, alongside the cultivation of a digital mindset.

The implementation of these recommendations should be guided by clearly defined key performance indicators for each milestone stage, as outlined in the proposed development roadmap. Continuous monitoring and evaluation will be essential to ensure that progress remains aligned with the organization's operational needs and long-term strategic vision. Strengthening weaker domains, particularly in technical management and security, will be critical to achieving a balanced and sustainable digital capability framework across all educational levels.

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