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Developing the GEN-V Startup Ecosystem: An AI-Driven Integration of Multidisciplinary Learning in Vocational High School

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ABSTRACT

Background. Traditional vocational education often operates in "silos," where subjects are taught in isolation, hindering students' ability to integrate diverse competencies into real-world work scenarios.

Purpose. This study develops and evaluates the "GEN-V" startup ecosystem an innovative pedagogical model designed to integrate 13 subjects through an AI-driven digital startup project for vocational high school students.

Method. Utilizing a Research and Development (R&D) approach with the ADDIE model, this study involved 95 students from three classes (XII DKV 1, 2, and 3) at SMK Negeri 1 Mojokerto, organized into 18 startup teams. Each team was structured into six specialized roles: Chief Executive Officer (CEO), Chief Product Officer (CPO), Chief Marketing Officer (CMO), Chief Financial Officer (CFO), Chief Technology Officer (CTO), and Chief Content Officer (CCO). Data were collected through a centralized project management dashboard, an 8-week startup sprint observation, and multidisciplinary evaluations from a panel of 14 teacher-mentors.

Results. The findings demonstrate that the GEN-V ecosystem effectively synchronized multidisciplinary tasks. The "Traffic Light" monitoring system evidenced a 95% task completion rate across all specialized departments. Furthermore, the strategic integration of Google Gemini AI significantly accelerated content production and financial modeling, enabling teams to achieve realistic Break-Even Point (BEP) projections and market validation within a condensed timeframe.

Conclusion. The GEN-V ecosystem serves as a transformative learning model that successfully dismantles subject barriers. By fostering AI-human collaboration and disciplined project management, it effectively prepares vocational students for the complexities of the digital startup industry.

KEYWORDS

GEN-V Ecosystem, Google Gemini, Multidisciplinary Learning, Startup Acceleration, Vocational Education

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INTRODUCTION

The rapid development of Artificial Intelligence (AI) and the digital startup industry has created a significant competency gap for Vocational High School (SMK) graduates, particularly in the Visual Communication Design

(DKV) department. While the industry demands agile, multidisciplinary, and tech-savvy professionals, the traditional educational model in many vocational schools still operates in "silos," where subjects are taught in isolation. Wibowo (2016) argues for an urgent need to minimize this gap to meet industrial demands. This fragmented approach, further complicated by the Industrial Revolution 4.0, prevents students from understanding how their technical skills contribute to a larger business ecosystem (Ghufron, 2018; Surani, 2019).

Entrepreneurial education in vocational schools should focus on real-world process validation rather than just theoretical knowledge (Lackéus, 2020). Previous research has highlighted the effectiveness of Project-Based Learning (PjBL) in vocational settings; however, few models have successfully integrated a vast array of subjects ranging from religious ethics to advanced financial statistics into a single, synchronized startup acceleration program. While previous studies demonstrated that PjBL and content visualization enhance entrepreneurial interests, the GEN-V ecosystem expands this framework by incorporating advanced Generative AI to further accelerate the startup development process (Basyah & Hasan, 2026).

Furthermore, modern vocational pedagogy must transition from Education 4.0 to Education 5.0, focusing on human-AI collaboration to enhance creativity and productivity (Luckin, 2018; Salmon, 2019). Artificial intelligence, such as Google Gemini, facilitates personalized learning environments by providing real-time simulations for student projects (Mollick & Mollick, 2023). In the context of the 21st-century workforce, vocational students must not only master creative tools but also possess entrepreneurial mindsets and the ability to collaborate with AI technologies. While PjBL is effective, its success in digital entrepreneurship depends on visual transparency and agile management (Sutherland, 2014).

To address the need for a framework that unifies disparate disciplines into a cohesive professional experience, this study develops the "GEN-V" (Generation Validated) startup ecosystem at SMK Negeri 1 Mojokerto. GEN-V is a multidisciplinary model that integrates 13 different subjects into an 8-week startup "sprint." The novelty of this research lies in its "Digital Nervous System" a Master Spreadsheet dashboard that synchronizes the tasks of six specialized student C-level roles: Chief Executive Officer (CEO), Chief Product Officer (CPO), Chief Marketing Officer (CMO), Chief Financial Officer (CFO), Chief Technology Officer (CTO), and Chief Content Officer (CCO), under the direct mentorship of 14 teacher entities.

The conceptual architecture of the GEN-V ecosystem, as illustrated in Figure 1, represents a paradigm shift from isolated subject delivery to a synchronized multidisciplinary workflow. By utilizing Google Gemini AI as a cognitive accelerator, the ecosystem unifies subjects ranging from aesthetic design to complex financial statistics into a single professional output. This research aims to evaluate how the GEN-V ecosystem facilitates multidisciplinary integration and how AI-human collaboration enhances the market readiness of student-led startups. By implementing the ADDIE model, this study provides a blueprint for a transformative vocational curriculum that meets the demands of the modern digital economy.

The structural integrity of the GEN-V ecosystem is further reinforced through cross-border academic collaboration and professional mentorship validation. By aligning the instructional design with international vocational standards, particularly through consultation with experts from Universiti Tun Hussein Onn Malaysia (UTHM), the model ensures that the competencies developed are globally competitive. This collaborative refinement focuses on bridging the gap between classroom-based projects and high-stakes industrial startup environments. The synergy between the 14-mentor panel and the digital monitoring tools creates a rigorous quality control mechanism, ensuring that student outputs from their initial business models to final market-ready products—

undergo a comprehensive 'multidisciplinary audit' before reaching the public. This process-oriented approach transforms the educational experience from a simple subject-based assignment into a professional venture-building journey.

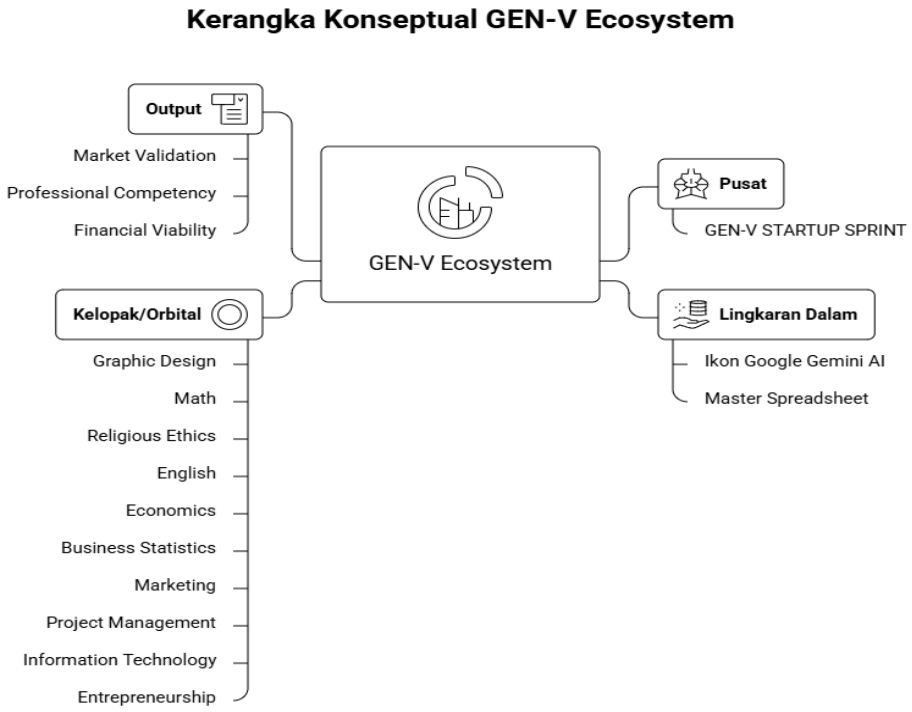

Figure 1. The GEN-V Conceptual Framework: Synchronizing Multidisciplinary Subjects through AI-Driven Startup Acceleration.

RESEARCH METHODOLOGY

This research employed a Research and Development (R&D) approach using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instructional design model. This framework ensures a systematic and iterative approach to educational development, which is essential for complex multidisciplinary integration (Branch, 2009). The methodology is structured into five distinct phases:

Analysis

The initial phase involved a comprehensive gap analysis between the existing vocational curriculum and the specialized competencies required by the digital startup industry. This phase identified a critical need for digital transformation within Vocational High Schools (SMK) to meet modern industrial standards (Rahayu et al., 2022). Furthermore, the analysis highlighted the necessity for an integrated platform capable of unifying 13 disparate subjects into a single, synchronized professional workflow.

To bridge the gap between academic theory and vocational practice, the GEN-V ecosystem maps specific learning objectives from various disciplines into functional startup operations based on praxis-oriented pedagogy (Sudira, 2016). In this revised framework, the student body is organized into 18 startup teams, each consisting of six specialized C-level roles: CEO, CPO, CMO, CFO, CTO, and CCO. This organizational structure ensures that each student focuses on a specific professional domain while maintaining multidisciplinary synergy. The alignment between the 13 academic subjects and these functional roles is systematically presented in Table 2, which details how each discipline contributes to the overarching startup workflow.

Table 1. Multidisciplinary Subject Integration Mapping in GEN-V Ecosystem

No	Subject Category	C-Level Role (Student)	Mentor Code	Tangible Output (Master Spreadsheet)
1	Vocational (DKV)	CPO	M01, M05, M10	Visual Assets, Product Prototypes, & Video Production
2	Mathematics & Statistics	CFO	M02, M14	Automated HPP, BEP, ROI Calculators, & Statistical Charts
3	English	CMO / CCO	M07	English Pitch Deck & Global Copywriting
4	Indonesian & Local Lang.	CMO / CCO	M04, M11	Persuasive Narratives & Local Marketing Content
5	Religious, Ethics & Civic	CEO	M12, M13	CSR Plan, Ethical Trading, & Halal Compliance
6	Entrepreneurship (PKK)	CEO	M03, M08	Business Model Canvas (BMC) & Project Roadmap
7	Media & Tech Support	CTO	M06, M09	Google Sites Structure & Social Media Management

Design

In the design phase, the researcher structured a comprehensive 8-week startup "sprint" timeline, as illustrated in Figure 2. A critical component of this phase was designing a professional organizational structure for the students, transitioning from traditional group work to a corporate-simulated environment. Each startup team was organized into six specialized C-level roles: Chief Executive Officer (CEO), Chief Product Officer (CPO), Chief Marketing Officer (CMO), Chief Financial Officer (CFO), Chief Technology Officer (CTO), and Chief Content Officer (CCO). This role-based design ensures individual accountability while fostering interdisciplinary collaboration.

The execution of the GEN-V ecosystem follows a structured temporal framework designed to simulate the fast-paced, agile environment of the digital startup industry. This 8-week 'Startup Sprint' guides students through a systematic progression from conceptual ideation to rigorous market validation. Each phase is meticulously integrated with specific subject milestones, mentor validation points, and AI-assisted tasks, ensuring a continuous and professional workflow. The chronological stages of this pedagogical intervention, including the key activities performed within each timeframe, are detailed in the flowchart presented in Figure 2

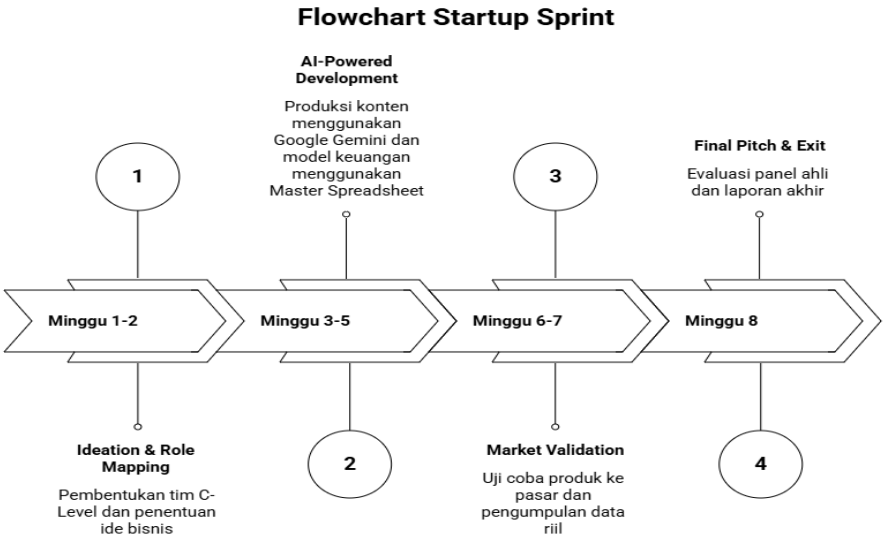

Figure 2. The 8-Week GEN-V Startup Sprint Timeline: From Ideation to Market Validation.

Development

The development phase focused on constructing the "Digital Nervous System" of the project the Master Spreadsheet dashboard. This platform was engineered to include specialized operational tabs for each of the six C-level roles (CEO, CPO, CMO, CFO, CTO, and CCO), ensuring a clear division of labor and accountability. Key features include an automated "Financial Model" for HPP, BEP, and ROI calculations, and a centralized "Content Bank" for creative asset management. The integration of such interactive digital tools is essential in modern vocational education to enhance technical mastery (Widiaty et al., 2020). Furthermore, a "Traffic Light" monitoring system was embedded using conditional formatting to provide real-time, transparent accountability for all 14 mentor entities.

Implementation

The GEN-V ecosystem was implemented across three classes XII DKV 1, XII DKV 2, and XII DKV 3 at SMK Negeri 1 Mojokerto, involving 95 students. To simulate an authentic professional startup environment, students were organized into 18 teams, with each group consisting of 5 to 6 members. This stage utilized a Flipped Classroom approach, which has been proven to facilitate student engagement and active learning in vocational settings (Bond et al., 2020; Sari, 2021).

Each team executed a digital business plan using Google Gemini AI as a primary collaborative "co-pilot" for strategic analysis, copywriting, and financial modeling. This AI-human collaboration allows students to shift from repetitive technical tasks to high-level strategic validation. Digital support in this blended environment further strengthens student autonomy in completing complex, multidisciplinary tasks (Chiu, 2021).

To ensure seamless coordination among the 14 specialized mentors, the ecosystem employs a Centralized Mentor Dashboard (see Figure 3). Unlike the student-managed operational sheets, this dashboard serves as a high-level supervisory tool where all 14 teachers simultaneously monitor and validate departmental tasks in real-time. This dual-layer monitoring system prevents conflicting feedback and ensures that each student's progress is validated by the respective subject expert before advancing to the next sprint phase. As shown in Figure 3, this dashboard acts as the primary operational interface for multidisciplinary integration, managing the process systematically without logistical delays.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1			DASHBOARD PROYEK KOLABORASI KEWIRAUSAHAAN KELAS XII DKV 2026															
2	No.	Brand	Product	Kelas	JOB DESK	CEO	CPO	CMO	CFO	CTO	CCO	Instagram	Tiktok	Drive Aset	Landing Page	Sosmed Lainnya	Presentasi	Testimoni
3	1	Recosup	Reseller & supplier product	XII DKV 1	https://doc	A1	B1	C1	D1	E1	F1	https://ww	https://w	https://drive.	https://sites.g	https://linktr.ee	#NA	#NA
4	2	Scumbag	Keychain, Handmade Work	XII DKV 1	https://doc	A2	B2	C2	D2	E2	F2	https://ww	https://tik	https://drive.	https://dyosya	#NA	#NA	#NA
5	3	Slurp!	Puding Caramel, dan Puding	XII DKV 1	https://doc	A3	B3	C3	D3	E3	F3	https://ww	https://w	https://drive.	https://aliham.	#NA	#NA	#NA
6	4	Cakring	basreng, kripik usus, kerupu	XII DKV 1	https://doc	A4	B4	C4	D4	E4	F4	https://ww	https://w	https://drive.	https://sites.g	0858-0741-2184	#NA	#NA
7	5	CIYU	Ciwir & Cichain	XII DKV 1	https://doc	A5	B5	C5	D5	E5	F5	https://ww	https://w	Jobdesk	https://aliham.	0895-1695-1016	#NA	#NA
8	6	AllNiceFood	Baso Aci	XII DKV 1	https://doc	A6	B6	C6	D6	E6	F6	https://ww	https://w	https://drive.	https://sites.g	#NA	#NA	#NA
9	7	Sweet Crave	Dessert Box	XII DKV 2	https://doc	A7	B7	C7	D7	E7	F7	https://ww	https://w	https://drive.	https://aliham.	#NA	#NA	#NA
10	8	salty.melt	Sempol Moncrot	XII DKV 2	https://doc	A8	B8	C8	D8	E8	F8	https://ww	https://w	#NA	https://sites.g	#NA	#NA	#NA
11	9	Penta Media (	Jasa Advertising	XII DKV 2	https://doc	A9	B9	C9	D9	E9	F9	https://ww	https://w	https://drive.	https://sites.g	#NA	#NA	#NA
12	10	Rasora	Martabak Mini, Oseng Sosis	XII DKV 2	https://doc	A10	B10	C10	D10	E10	F10	https://ww	https://w	https://drive.	https://sites.g	#NA	#NA	#NA
13	11	Sudut Temu	Cookies, Foto Both	XII DKV 2	https://doc	A11	B11	C11	D11	E11	F11	https://ww	https://w	Elemen Sudut	http://6978407	#NA	#NA	#NA
14	12	NyamBox	Mix Plater, Ubi Ungu Lumer	XII DKV 2	https://doc	A12	B12	C12	D12	E12	F12	https://ww	https://w	#NA	https://sites.g	#NA	#NA	#NA
15	13	Bowl'D Sum	Dimsum Mangkok	XII DKV 3	https://doc	A13	B13	C13	D13	E13	F13	instagram.c	tiktok.con	https://drive.	https://bowlds	#NA	#NA	#NA
16	14	The Maker	Cheesecuit	XII DKV 3	https://doc	A14	B14	C14	D14	E14	F14	https://ww	https://w	https://drive.	https://ahmatf	#NA	#NA	#NA
17	15	Ghetto cup	Spageti Cup	XII DKV 3	https://doc	A15	B15	C15	D15	E15	F15	instagram.c	tiktok.con	#NA	https://sites.g	#NA	#NA	#NA
18	16	Ikimochi	Mochi	XII DKV 3	https://doc	A16	B16	C16	D16	E16	F16	https://ww	https://w	#NA	IKIMOCHI	#NA	#NA	#NA
19	17	Manika	Toast coffee, Donat, Marcha	XII DKV 3	https://doc	A17	B17	C17	D17	E17	F17	https://ww	https://w	https://drive.	https://sites.g	#NA	#NA	#NA
20	18	PIAYO	Lumpia mayo	XII DKV 3	https://doc	A18	B18	C18	D18	E18	F18	https://ww	https://w	#NA	https://sites.g	#NA	#NA	#NA
21																		

Figure 3. Centralized Multidisciplinary Validation Dashboard

Evaluation

The final phase utilized a "Public Validation and Multi-Expert Evaluation" system to measure the ecosystem's effectiveness. Evaluation was conducted through a professional panel session where 14 mentors assessed students based on specific Achievement Indicators (AI) and fundamental professional inquiry. This rigorous process integrated data from the Master Spreadsheet's progress tracking with the final pitch results. The real-time progression of these evaluations, managed through the "Traffic Light" system, is visualized in Figure 4.

CEO
Nama : Akbar
Tugas : Penanggung jawab visi dan koordinasi 13 mapel
Target besar 1 semester
Done
On progress
Not yet started

No	Target Activity (SMART)	Start From	Due Date	PIC	Eisenhower Matrix	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
1	Perencanaan usaha yg akan di lakukan	06/01/2026	09/01/2026	CEO	Sangat penting dan mendesak							
2	Riset kelayakan usaha	07/01/2026	09/01/2026	CEO	Sangat penting dan mendesak							
3	Melakukan evaluasi hasil riset pasar	09/01/2026	12/01/2026	MARKETING	Sangat penting dan mendesak							
4	Memfinalisasi Model Bisnis	16/01/2026	17/01/2026	PRODUK SPESIALIS	Sangat penting dan mendesak							
5	Penetapan struktur Keuangan	17/01/2026	17/01/2026	FINANCE	Sangat penting							
6	Penyelesaian Brandbook	19/01/2026	21/01/2026	CEO	Sangat penting dan mendesak							
7	pengadaan & produksi	22/01/2026	23/01/2026	PRODUK SPESIALIS								
8	Srategi pemasaran (Pre-Launcing)	23/01/2026	25/01/2026	MARKETING								
9	Evaluasi	23/01/2026	25/01/2026	CEO								
10	Grand Louncing	26/01/2026	28/01/2026	MARKETING								
11	Poduction flow	27/01/2026	28/01/2026	PRODUK SPESIALIS								
12	Market Engagement	28/01/2026	28/01/2026	SOSMED SPESIALIS								
13	QC	29/01/2026	31/01/2026	PRODUK SPESIALIS								
14	Evaluasi	31/01/2026	01/02/2026	CEO								

Profiling | CEO | CFO | CMO | COO | CXO | Financial Model | Content Bank | Sales Validation

Figure 4. Digital Nervous System for Real-Time Startup Health Monitoring

The output of the validation process recorded in the dashboard is translated into the Digital Nervous System (Figure 4). This system provides a macroscopic, comprehensive overview of the startup's operational health and task completion rates across all 18 groups. By centralizing the feedback from 14 disparate subjects, the evaluation phase moves beyond simple grading to a "market-readiness validation." This visual transparency allows both students and mentors to identify bottlenecks instantly, ensuring that 95% of the multidisciplinary tasks (from CEO strategic roadmap to CCO content bank) reached the "Definition of Done" (DoD) status by the end of the 8-week sprint.

RESULT AND DISCUSSION

The implementation of the GEN-V startup ecosystem resulted in a significant transformation of the vocational learning process. The "Digital Nervous System," introduced through the Master Spreadsheet (see Figure 4), functioned as the core instrument for real-time accountability and cross-departmental synchronization. The visual transparency provided by Figure 4 fostered a professional "Sense of Urgency" among students. This aligns with agile principles where visual tracking reduces cognitive load and enhances team synchronization in training environments (Parsons & MacCallum, 2021; Rigby et al., 2022; Sutherland, 2014).

The data gathered during the 8-week implementation shows that the "Traffic Light" system effectively eliminated the traditional "silo effect" in vocational subjects. The 95% task completion rate observed across all departments (CEO, CPO, CMO, CFO, CTO, and CCO) confirms that AI-driven content production significantly accelerates development (Dwivedi et al., 2023). Furthermore, the strategic integration of Google Gemini AI allowed students to overcome technical

barriers, shifting their focus toward strategic validation and entrepreneurial ideation a process often influenced by robust external support systems (Evansluong & Ramirez, 2019).

The multidisciplinary validation by 14 mentors ensured that every output from AI-generated financial ROI analysis to complex product prototypes met the professional standards set in the Achievement Indicators (AI). This collaborative evaluation, refined through discussions with vocational experts from Universiti Tun Hussein Onn Malaysia (UTHM), ensures that student outputs address the holistic competency needs of the modern digital economy (OECD, 2019; World Economic Forum, 2023). This model proves that when students are placed under "market pressure" within a disciplined framework, their impact is maximized (Hannon, 2018). Ultimately, the GEN-V model demonstrates that a synchronized, AI-assisted ecosystem can transform vocational education into a viable incubator for future digital entrepreneurs. Future research, as suggested by the peer review process, will further investigate the long-term sustainability of these student-led ventures beyond the initial 8-week sprint."

Table 2. Analytical Summary of Multidisciplinary Achievement Indicators and Task Completion Rates

Department	Subjects Integrated	Achievement Indicator (AI-Driven)	Mentor Code	Status
CEO / Leader	Creative Product & Entrepreneurship (PKK), Leadership	Strategic Roadmap Validation, Team Coordination, & Decision Making	M01	100%
Finance	Business Economy, Accounting	BEP Projections, ROI Analysis, & Pricing Strategy	M02	98%
Marketing	Indonesian Language, Digital Marketing	AI-Driven Copywriting, Persuasive Narrative, & SEO Optimization	M03	95%
Product Specialist	Vocational Competency (DKV), Food/Product Science	Packaging Design Aesthetics, Halal Standardization, & Product Quality	M04	97%
Social Media	English, Multimedia Production	Global Communication Strategy & English-Language Content	M05	92%
Creative Design	Art & Culture, Graphic Design	Visual Identity, Logo Philosophy, & UI/UX for Landing Page	M06	100%
Public Relation	Civic Education (PPKN), Sociology	Business Ethics, Community Engagement, & Legal/HKI Compliance	M07	95%
Tech Support	Computer & Network Technology	Digital Platform Management & AI Tool Implementation	M08	98%
Production	Mathematics, Chemistry/Physics	Scalability Analysis, Ingredient Ratio, & Production Efficiency	M09	94%
Distribution	Geography, Logistics	Supply Chain Mapping & Local Market Distribution	M10	90%
Human Resource	Counseling (BK), PABP	Talent Profiling, Conflict Management, & Professional Integrity	M11	96%
Quality Control	Environmental Science (IPAS)	Waste Management & Sustainable Production Practices	M12	93%
Documentation	Photography, Cinematography	High-Quality Product Visualization & Brand	M13	98%

Pitching	Oral Communication	Storytelling Global Presentation & Investment Pitching Readiness	M14	95%

Note: Mentor names (M01-M14) and student participant names are coded to maintain anonymity and comply with ethical research guidelines.

The "Digital Nervous System" visualized in Figure 4 provided a professional "Sense of Urgency" among students. The use of the Master Spreadsheet as a monitoring tool (as shown in Figure 3) created an environment of real-time accountability. This visual transparency aligns with agile principles where tracking reduces cognitive load and increases team productivity (Rigby et al., 2022; Sutherland, 2014). The 95% task completion rate observed in the GEN-V ecosystem confirms that AI-driven content production significantly accelerates the development phase compared to traditional non-AI integrated projects (Dwivedi et al., 2023).

Furthermore, the integration of Google Gemini AI allowed students to overcome technical barriers in copywriting and financial modeling, shifting their focus from technical repetition to strategic validation. This was demonstrated in their ability to achieve realistic BEP projections and market-ready prototypes. Moreover, the multidisciplinary validation by 14 mentors ensured that student outputs were not only aesthetically pleasing but also ethically and financially viable, addressing the holistic competency needs of the modern digital economy (OECD, 2019; World Economic Forum, 2023). This collaborative evaluation serves as a key differentiator of the GEN-V model compared to conventional project-based learning.

While the integration of Google Gemini AI significantly accelerated technical workflows, the GEN-V ecosystem incorporates a "Human-in-the-Loop" validation mechanism to mitigate AI dependency. Students are required to critically verify AI outputs such as financial projections—against local market realities. This ensures that AI serves as a "co-pilot" rather than a replacement for foundational critical thinking. Future implementations will focus on developing students' ability to detect algorithmic bias, ensuring core competencies are maintained independently of AI assistance.

CONCLUSION

The development of the GEN-V startup ecosystem has proven to be an effective model for integrating multidisciplinary learning in vocational high schools. By utilizing an AI-driven "Digital Nervous System," this research successfully addressed the traditional "silo" problem in vocational education. The implementation of the 8-week startup sprint demonstrated that real-time accountability through a visual "Traffic Light" monitoring system significantly enhances student discipline and professional readiness.

The integration of Google Gemini AI played a crucial role in accelerating technical tasks, allowing students to focus on high-level strategic decision-making and market validation. The collaboration of 14 mentor entities provided a comprehensive validation process, ensuring that student outputs met industry standards across multiple dimensions, including financial viability and ethical integrity. For future research, it is suggested to expand this model to other vocational programs and measure its long-term impact on graduates' employability in the digital economy.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author(s) used Google Gemini AI and Napkin AI to refine academic language, assist in translating technical terms into English, and structure the research findings based on the journal's required template. Following the use of these tools, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Methodology; Software (Master Spreadsheet & Digital Nervous System Development); Data Curation; Writing - original draft; Project administration.
Author 2: Data curation; Investigation (Field monitoring of startup sprint); Formal analysis; Writing - review and editing.
Author 3: Formal analysis (Financial and BEP validation); Resources; Visualization; Writing - review and editing.
Author 4: Supervision; Validation; Funding acquisition; Resources.
Author 5: Validation (Pedagogical framework alignment); Formal analysis (International vocational standards); Writing - review and editing; Supervision (Refinement of the GEN-V model).

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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