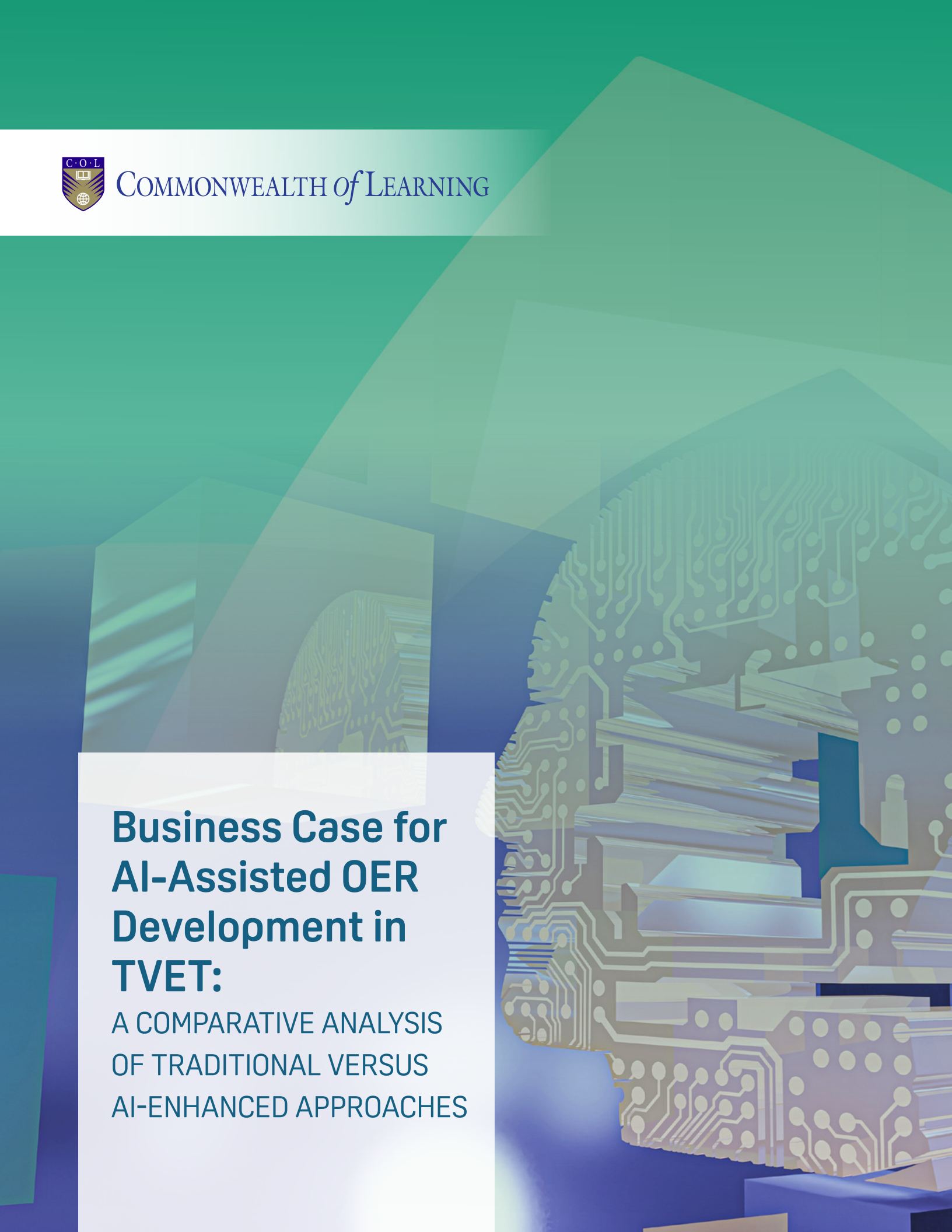

COMMONWEALTH of LEARNING

Business Case for AI-Assisted OER Development in TVET:

A COMPARATIVE ANALYSIS OF TRADITIONAL VERSUS AI-ENHANCED APPROACHES

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COMMONWEALTH of LEARNING

The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to promote the development and sharing of open learning and distance education knowledge, resources and technologies.

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Executive Summary

This business case highlights the transformative potential of Trainer-in-the-Loop AI for creating Open Educational Resources (OER) in Technical and Vocational Education and Training (TVET). The method combines generative AI tools with human oversight, significantly reducing development time and costs while enhancing quality and scalability.

Purpose:

To compare traditional OER development methods with AI-assisted approaches and provide evidence-based recommendations for adoption.

Key Findings:

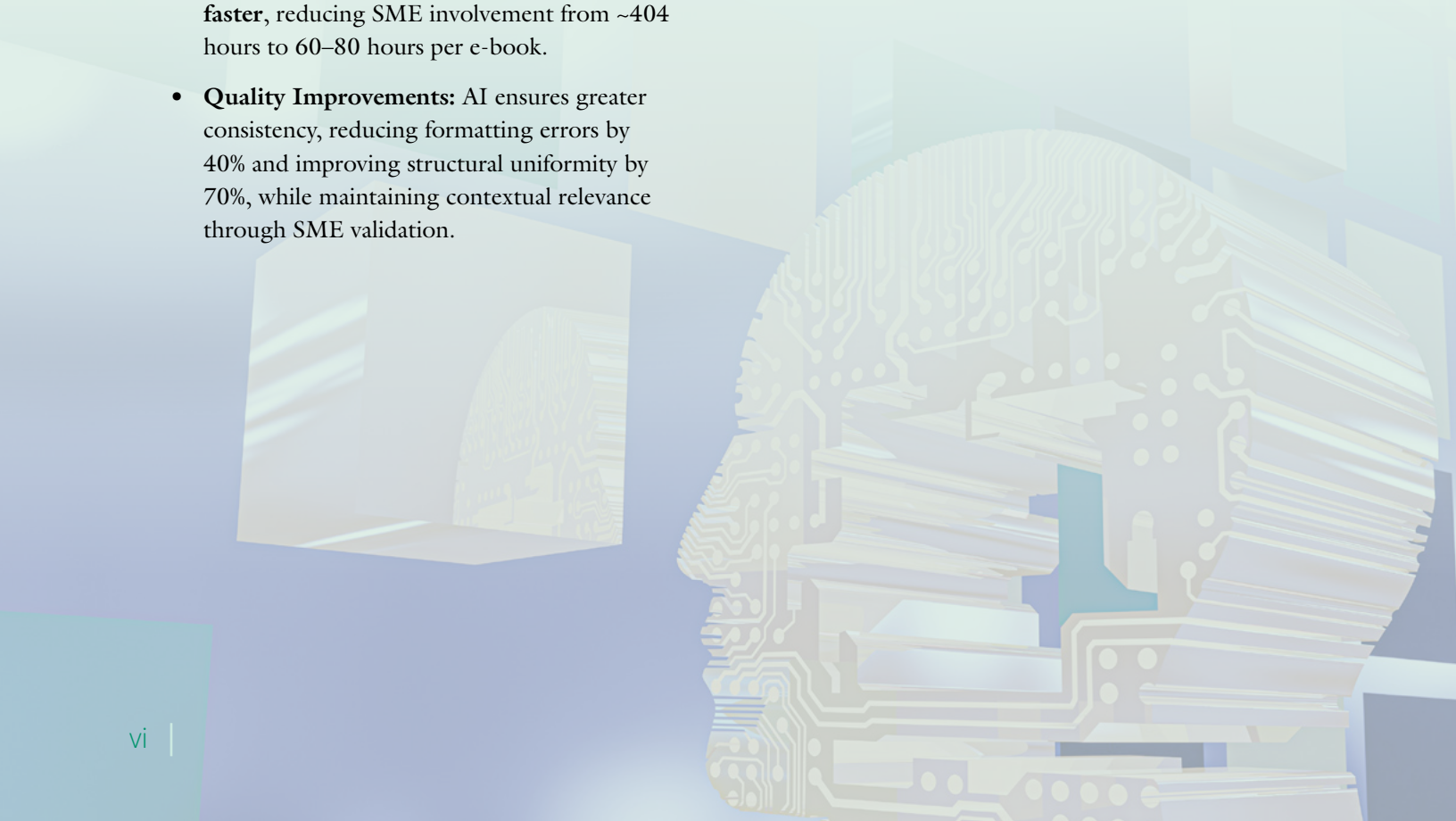
- **Cost Savings:** AI-assisted development reduces overall costs by **29% per e-book**, primarily through a **45.3% reduction in personnel costs** and a **64.2% reduction in materials cost**, despite an 86% increase in technology investment.
- **Efficiency Gains:** Development cycles are **50% faster**, reducing SME involvement from ~404 hours to 60–80 hours per e-book.
- **Quality Improvements:** AI ensures greater consistency, reducing formatting errors by 40% and improving structural uniformity by 70%, while maintaining contextual relevance through SME validation.
- **Scalability:** Institutions can expand into new technical areas and languages without proportional increases in resources, enabling rapid responses to industry needs.

Strategic Benefits:

- Enhanced organisational capacity and technological skills.
- Increased competitiveness and leadership in innovation within TVET.
- Opportunities for partnerships, funding, and sustainability through efficient practices and workflows.

Recommendation:

Prioritise AI-assisted OER development strategically. The break-even point is reached after 3–4 e-book projects, making this method cost-effective and ready for the future. A phased plan, including training and risk mitigation strategies, is crucial to maximise benefits and maintain quality.



Business Case for AI-Assisted OER Development in TVET: A Comparative Analysis of Traditional Versus AI-Enhanced Approaches

Overview

The Trainer-in-the-Loop AI project demonstrates the potential of AI in transforming Technical and Vocational Education and Training (TVET) through AI-assisted Open Educational Resource (OER) development. This business case compares traditional and AI-enhanced OER creation methods, evaluating costs, quality, efficiency and value.

Project Background

COL conducted a research study in 2021/22 on the status of implementation of blended TVET in Pan-Commonwealth countries. Based on the research findings, COL's competency standards for a blended TVET trainer and the skill set for a blended TVET trainer were developed in 2022. Consequently, a training programme for blended TVET teacher trainers was designed to address skill sets related to two competencies: preparing a blended TVET course and facilitating a blended TVET course. The blended delivery of the TVET (BDT) programme was piloted in 2023 with 42 BDT master trainers from the Vocational Training and Development Centre (Jamaica), Kenya School of TVET (Kenya), Technical and Vocational Teacher's College (Zambia), Kaduna Polytechnic (Nigeria), Namibia College of Open Learning (Namibia), Botswana Open University (Botswana) and Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development (Ghana).

The Trainer-in-the-Loop AI project grew out of challenges identified during the Blended TVET (BDT) programme, where it was revealed that the lack of access to high-quality learning materials aligned with occupational standards and the curriculum hindered effective skills development. This initiative expands on COL's existing standards for blended TVET trainers and addresses the rapidly evolving needs of technical vocational education.

Key outputs of the project:

- **Customisation:** Focus on a specific National Occupational Standard in a technical field that comprises approximately 5 to 6 competency units.
- **Generated content:** Session plans, learner guides, instructor guides, learning materials (text summaries, case studies, e-books, etc.), multimedia content, assessment tools, guidelines and checklists, simulations and scenarios that are tailored to a specified National Occupational Standard and curriculum.
- **TVET trainers with AI in TVET skills and competencies:** Oversight to ensure that OER developed with AI meets quality standards in terms of accuracy, relevance, and alignment with the National Occupational Standard and curriculum requirements.

Outcomes:

- Improved capacity and capability of TVET practitioners to innovatively leverage global

technological advancements, thereby improving the quality of skills training for decent employment.

- Sustainable large-scale integration of AI in TVET, achieving impact at regional, national and global levels.

The project brought together 30 subject matter experts (SMEs) from four countries — Ghana, Kenya, Jamaica, and Nigeria — focusing on two technical areas: Fashion Design Technology (16 experts) and Science Laboratory Technology (14 experts). This business case explores the entire process of creating OER, starting with finding suitable materials with open licenses and ending with producing professionally formatted e-books that are ready for distribution.

COL is implementing two additional interrelated projects focused on human-centred OER adaptation. COL-CEMCA is running Teacher-in-the-Loop AI projects in India, collaborating with CBSE & CISCE, and the State Board of Haryana to develop teaching resources in Mathematics. COL is also partnering with CENDLOS & WESCO in Ghana to co-create teaching resources in Biology. All three projects employ a GenAI system, emphasising development and maintenance, as well as AI ethics and impact research.

Methodology

The analysis uses a thorough cost-comparison framework to examine direct and indirect costs, quality metrics, and strategic value indicators. It relies on data from SMEs, coordinator reports, time tracking records and quality assessments of the project's output. The figures used to develop this business case are estimates, as personnel rates differ across territories and development time varies depending on the programme level and the complexity of the competency standards and curricula.

Traditional OER Development Model

In the traditional approach to OER development, SMEs follow a linear, manual process to find, evaluate and modify OER. This process involves manually searching OER repositories to find suitable content, then carefully reviewing it line by line for relevance and accuracy. Next, they adapt the content through comprehensive contextualisation and rewriting, followed by in-house formatting or expert design services. Finally, they conduct multiple review cycles, which require significant participation from SMEs.

Resource Requirements

Developing highly complex original educational content for a 140-page manuscript takes a significant amount of time for a first-time SME. This process involves a steep learning curve and iterative refinement, requiring the SME's deep involvement throughout.

The development process can be broken down into three distinct phases. The first phase, **Research and Content Creation**, is the most time-consuming, requiring around 245 hours. This includes 70 hours for literature review and research, 140 hours for writing and developing original content, and 35 hours for initial content structuring. This phase involves the bulk of the creative and analytical work needed to transform subject matter expertise into structured educational material.

The **Review and Refinement** phase requires around 100 hours of meticulous attention to quality assurance. This includes 52 hours for comprehensive self-review and editing, 18 hours for coordinating peer review processes, and 30 hours for validating content accuracy.

The final **Collaboration and Finalisation** phase requires around 60 hours, including 28 hours of working with instructional designers, 24 hours for design, layout, and review/proofing activities, and 8 hours for final approval and sign-off

procedures. The entire development process takes approximately 404 hours, equivalent to around 40 weeks of dedicated work.

Traditional development usually takes 18–24 months to complete the OER development lifecycle. This process relies heavily on SME availability and involves several sequential workflow stages. Additionally, quality control checkpoints add to the timeline because they involve manual review processes that often require multiple revisions.

The traditional approach also involves considering the technology infrastructure, which includes basic publishing platforms, communication tools, standard office software, collaboration platforms, content management systems and traditional document version control processes.

AI-Assisted OER Development Model

The AI-assisted model combines generative AI tools with human oversight and validation throughout the development workflow. This process involves automated scanning and filtering of OER repositories, generating abstracts and adaptations, and assisting with design and layout optimisation. It also flags inconsistencies for human validation and streamlines workflows, reducing manual intervention.

An AI platform uses open-source models for content generation and summarisation, assists with layout and design, enhances version control and feedback, and integrates consistent checking and validation of the content.

AI assistance fundamentally shifts SME roles from content creation to validation and contextual expertise, reducing the time SMEs need to invest to about 60–80 hours per e-book, a 40–47% reduction in time. This allows SMEs to focus on accuracy validation and industry relevance. Efficiency improves with faster feedback cycles, reduced revision requirements, and enhanced quality due to consistent formatting and structure across all materials.

Cost Analysis

This cost analysis compares the costs of traditional and AI-assisted approaches to developing OER. It looks at three main cost areas: personnel, technology and infrastructure, and materials and resources.

The results show that although requiring a larger initial investment in technology, AI-assisted approaches result in significant cost savings in personnel and materials, leading to an overall 29 per cent cost reduction per e-book project. This analysis uses standard industry rates and time allocations based on best practices for developing instructional content.

Categories of Direct Costs: Traditional Versus AI-Assisted E-book Development

Table 1 A: Personnel costs

Description	Cost per day (USD)	Number of days	Cost per e-book/project (USD)
Traditional approach			
SME compensation	190	15–20	2,850–3,800
Coordinator supervision	152	6–8 days	912–1,216
Editorial support	127	10–12	1,270–1,524
Design specialist	101	8–10 days	808–1,010
Total traditional personnel cost: $5,840–7,550 per e-book			
AI-assisted approach			

Description	Cost per day (USD)	Number of days	Cost per e-book/project (USD)
SME compensation	190	8–10	1,520–1,900
Coordinator supervision	152	4–5	608–760
Editorial support	127	6–8	762–1,016
Technical support	114	3–4	342–456
Total AI-assisted personnel cost: $3,232–$4,132 per e-book			
Personnel cost savings: 45.3% reduction (using midpoint values: $6,695 vs. $3,682)			

Table 1 B: Technology and infrastructure costs

Description	Cost per e-book/project (USD)
Traditional approach	
Software licensing, Communication platforms Storage and hosting Hardware depreciation	1,013–1,418 (midpoint: $1,216)
AI-assisted approach	
AI platform licensing Enhanced infrastructure Integration costs Maintenance and support costs	1,958–2,565 (midpoint: 2,262)
Technology investment: 86% increase (using midpoint values: $2,262 vs. $1,216) **NOTE:** *This increase is offset by efficiency gains and reduced personnel requirements.*	

Table 1 C: Material and resource costs

Description	Cost per e-book/project (USD)
Traditional approach	
Research materials and licensing Design assets and templates	945
AI-assisted approach	
Automated research capabilities AI-generated design assets	338
Material cost savings: 64.2% reduction ($945 vs. $338)	

Table 1 (A–C) was developed by the authors drawing on project activities and benchmarking against standard practice for developing e-books.

Table 2: Cost comparison summary: Traditional versus AI-assisted e-book development

Cost category	Traditional approach (USD)	AI-assisted approach (USD)	Variance (USD)
Personnel	6,695 (midpoint)	3,682 (midpoint)	45.3% reduction
Technology	1,216 (midpoint)	2,262 (midpoint)	86.0% increase
Materials	945	338	64.2% reduction
Total per e-book	**8,856**	**6,282**	**29.1% reduction**

Table 2 was developed by the authors, drawing on the data presented in Table 1 (A-C)

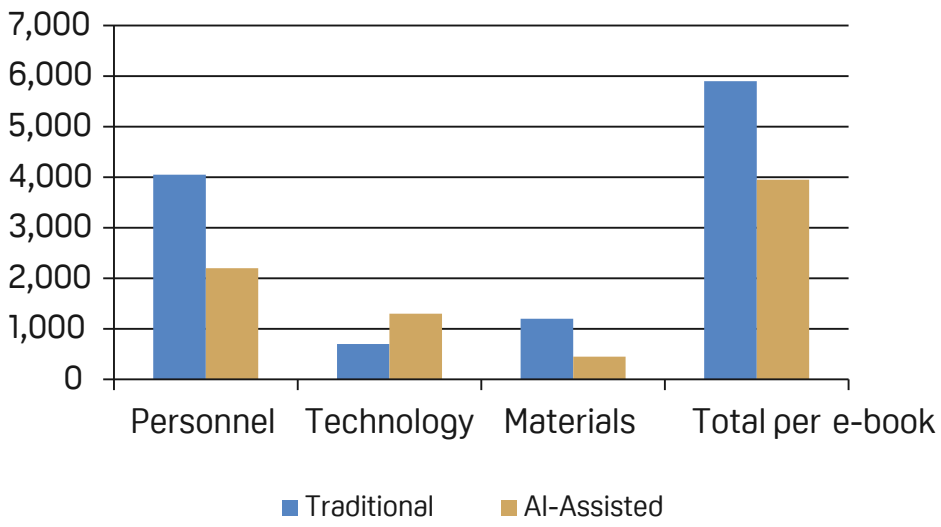


Figure 1: Cost comparison summary: Traditional versus AI-assisted e-book development.

Figure 1 was developed by the authors based on the data presented in Table 2.

Interpretation:

- **Personnel costs:** AI-assisted development reduces personnel costs by approximately **45.3%**, shifting SME roles from content creation to validation.
- **Technology costs:** AI-assisted methods require an **86% increase** in technology investment, which is offset by efficiency gains.
- **Materials costs:** Significant savings of **64.2%** due to automated research and AI-generated design assets.
- **Overall:** Total cost per e-book drops from **$8,856** (traditional) to **$6,282** (AI-assisted), a **29% reduction**.

Table 3: Sample return on investment projection (3–year): Traditional versus AI-assisted e-book development

Assumptions: 15 e-books per year

Year	Traditional costs (USD)	AI-assisted costs (USD)	Annual savings (USD)	Cumulative savings (USD)
Year 1	132,840	94,230	38,610	38,610
Year 2	132,840	94,230	38,610	77,220
Year 3	132,840	94,230	38,610	115,830
Break-even point: After 3.5 e-book projects				

Table 3 was developed by the authors drawing on the data presented in Table 1 (A-C), project activities and benchmarking against standard practice for developing e-books.

The AI-assisted approach brings significant savings, with a 45.3% reduction in personnel costs and a 64.2% reduction in materials cost. However, it does require a higher investment in technology, which increases by 86.0%. This, however, is offset by efficiency gains. Despite this added technology expense, the project still achieves substantial overall savings of nearly $2,574 per e-book, a 29% cost reduction compared to traditional methods.

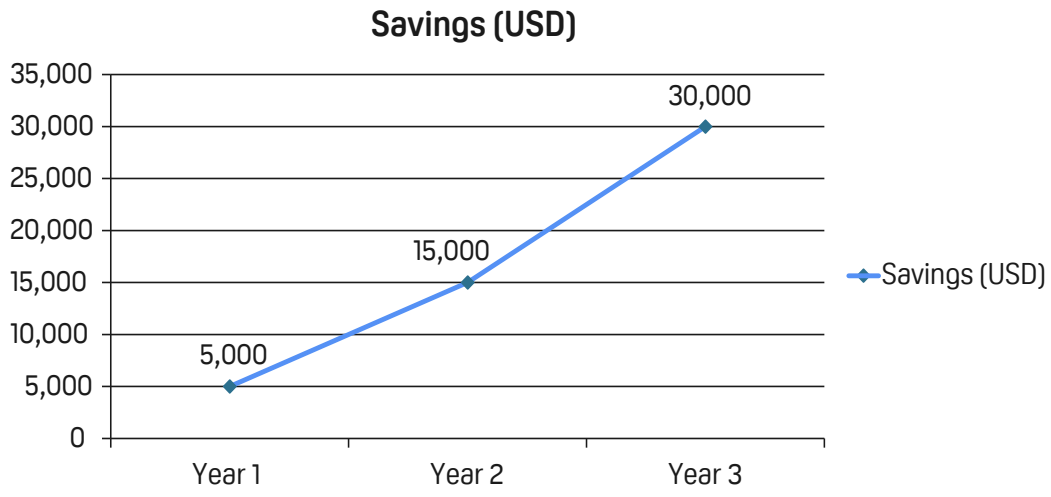


Figure 2: Cumulative savings over 3 years: Traditional versus AI-assisted e-book development.

Figure 2 was developed by the authors based on the data presented in Table 3.

Interpretation:

- **Year 1:** $38,610 savings
- **Year 2:** $77,220 cumulative savings
- **Year 3:** $115,830 cumulative savings

Breaking-even occurs after **3–4 e-book projects**, confirming strong ROI and long-term sustainability.

Output Quality and Quantity

Using the Trainer-in-the-Loop project as a basis for evaluation, the AI-assisted approach curated around 900 OERs across both subjects — 400 in Fashion Design Technology (FDT) and 500 in Science Laboratory Technology (SLT). Nineteen (19) e-books were completed — 7 in FDT and 12 in SLT. In the traditional approach, typically, 2.5–3.0 OERs per SME hour would have been produced without AI assistance. With AI assistance, 4.5–6.0 OERs per SME hour would have been produced. AI assistance led to the development cycles being 50 per cent faster.

Both approaches fully align with National Occupational Standards and curricula in terms of content quality. The AI-assisted approach should provide even greater consistency. In terms of pedagogical effectiveness, AI-assisted materials should offer better structural consistency while still maintaining expertise from SMEs. Additionally, SME oversight ensures that both approaches remain culturally and contextually relevant.

With AI assistance, consistency across contributors would improve by 70 per cent and formatting and structural errors would decrease by 40 per cent. This should also lead to a higher satisfaction rate among participating SMEs.

Risk Analysis and Mitigation

The shift to AI-assisted methods in OER development presents both opportunities and challenges, requiring careful evaluation of risks and strategic plans to address them.

Traditional approach risks

Traditional OER development has significant risks that delay projects and limit scalability. Limited experts create dependencies, delay timelines and restrict an organisation's ability to undertake multiple projects simultaneously. Inconsistent quality from contributors leads to uneven experiences and the need for extra quality control.

Manual processes cause delays, scope creep, schedule problems and budget changes. The resource-intensive traditional approach has scalability limitations, making it hard for organisations to respond to growing demand or adapt to changes.

Risks within traditional frameworks are hard to mitigate. Dependency on individuals limits flexibility, making projects vulnerable to personnel changes. Manual quality control is time-consuming and inconsistent, making content outdated before completion or requiring frequent, costly revisions.

AI-assisted approach risks

The AI-assisted approach also comes with risks, such as technology-related concerns and challenges with quality assurance that require specific management techniques. Productivity may initially suffer as team members need time and training to become used to new tools and processes. There is also a risk of AI-generated errors, so oversight is necessary to guarantee that the material is reliable and effective.

If AI technologies aren't available or working well, relying on them can lead to single points of failure and disrupt project continuity. Long-term savings exist, but the initial outlay is substantial and requires careful planning and rationalisation.

Quality assurance is required to prevent AI-assisted development from becoming over-reliant on automation and to ensure essential human oversight. Contextual accuracy issues could arise from AI systems' inability to capture specialised information or subtle industry requirements that human specialists would often include. Furthermore, AI models can introduce biases that compromise the appropriateness and inclusivity of the content.

Risk mitigation strategies

Effective risk mitigation in AI integration requires a layered approach that addresses technological and human factors. For SMEs and coordinators to gain confidence and proficiency with new tools, a thorough training programme must be implemented that offers skill development and ongoing support, with clear guidelines for using AI tools to prevent misuse.

In AI-assisted development, quality assurance protocols are essential. Human reviews and multi-stage validation processes must be applied to AI-generated content. Regular audits should be performed to identify areas for improvement, and feedback should be provided to refine the development process.

Technology risks should be managed by building resilience and redundancy into AI-assisted workflows. Technology platforms should be updated regularly, a diverse AI tool portfolio used to lower the risk of failure of any one component, and contingency plans created to minimise technology disruptions.

Strategic Benefits Analysis

The use of AI-assisted methods in the creation of OER for TVET has major strategic advantages in several key areas.

Immediate Benefits

Increased efficiency

AI in the development processes increases efficiency and speeds up project delivery. It cuts development time by 50 per cent, helping organisations quickly respond to industry changes. By automating repetitive processes like content structuring, drafting, and format standardisation, AI allows SMEs and other professionals in the process to focus on important tasks like validation and quality assurance. AI assistance also improves consistency across all educational materials and formats, eliminating a common problem in traditional development where different contributors create different styles and structures.

Cost savings

The benefits outlined above are accompanied by improvements in cost efficiency. Development

expenditures are usually reduced by 30–48 per cent for organisations. Reduced coordination overhead simplifies project management, which lowers expenses. Editorial workflows are optimised, reducing revision cycles. The time and resources required for careful editorial review and corrections are significantly decreased when AI systems automate formatting and consistency checks.

Long-term benefits

AI-assisted OER development results in long-term advantages. It helps institutions grow and innovate by scaling efficiently into new areas without adding resources. This also enables them to serve diverse learners in different languages and markets.

Scalability and growth

AI assistance makes cross-regional implementation much easier. It facilitates knowledge sharing and collaboration among institutions. Standardising processes and automating adaptation reduces the complexity of deploying educational resources across different regions and cultures. As a result, institutions can expand their reach and impact while maintaining high-quality standards.

Innovation leadership

AI education can enhance organisations' leadership, TVET industry standing, and technology transfer opportunities. It also enhances institutional capability, attracts interest from international organisations, and promotes new partnerships and funding opportunities.

Sustainability benefits

As organisations automate, they benefit from sustainability and maintenance cost savings. The quality of AI systems improves over time as they learn from human interactions and feedback. The knowledge base created with AI-assisted development becomes a valuable asset that offers a competitive edge and supports future innovations.

Organisational capacity building

AI-assisted approaches enhance the organisational skills of SMEs in TVET education and improve their technology skills. By building capacity, institutions develop internal expertise in selecting AI tools, streamlining workflows, and managing digital projects, reducing their reliance on outside help. This preparation also enables institutions to set up frameworks for adopting AI and become comfortable with advanced tools, paving the way for wider technology use. As a result, institutional capacity is strengthened and institutions gain a competitive edge, becoming well-positioned for long-term success in the evolving TVET education sector.

Next Steps for Adoption

To successfully implement AI-assisted OER development in TVET institutions, a phased and strategic approach is recommended:

1. Develop policies and strategies for implementing and scaling AI-assisted OER development in TVET institutions

a) Define institutional policies for AI integration, including ethical use, data privacy, and quality assurance.

b) Set up an oversight committee to monitor implementation and compliance.

2. Conduct capacity building

b) Design and deliver training programmes for SMEs, coordinators, peer reviewers, quality assurance officers and technical staff on AI tools and workflows.

b) Develop guidelines for "Trainer-in-the-Loop" processes to ensure human

validation, multicultural competence, and contextual relevance.

3. Pilot implementation

a) Pilot the implementation of approximately 900 OER and 19 e-books created through the TiL AI project for the Level 4 Fashion Design course and the Level 6 Science Laboratory Technology course.

b) Select Level 6 for the development of OER for the Fashion Design course and Level 4 for the Science Laboratory course in the second phase of AI-assisted OER adaptation and development.

c) Develop a minimum of 3–4 e-books to reach the break-even point and validate cost savings and efficiency gains.

d) Monitor performance metrics such as development time, cost, and quality consistency.

4. Technology setup

a) Integrate the AI-powered OER platform and repository, content management systems, and collaboration tools.

b) Ensure redundancy and contingency plans to mitigate technology-related risks.

5. Quality assurance protocols

a) Implement multi-stage validation processes that combine AI-generated outputs with SME reviews, peer reviews, and validation by quality assurance officers.

b) Schedule regular audits and feedback loops to improve workflows.

6. Scale and expand

a) After successful pilots, expand into more technical areas and more languages.

b) Standardise processes across departments and partner institutions to enhance scalability.

7. Secure partnerships and funding

a) Leverage cost-efficiency and innovation leadership to attract external funding and partnerships.

b) Explore opportunities for technology transfer and collaborative projects with industry and development agencies.

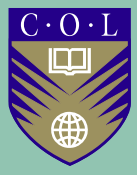
Conclusion

The evidence clearly shows that AI-assisted OER development can transform TVET institutions. The business case is compelling across multiple dimensions, offering substantial cost savings, improved educational quality, and an opportunity to take the lead in educational technology.

Typically, organisations break even after just 3–4 e-book projects, recovering their initial technology costs through reduced personnel and materials expenses. AI-assisted approaches address key challenges in the development of educational resources, such as enabling quick expansion into new technical areas and providing access in new regions through multi-language support.

AI-assisted approaches enhance consistency, ensuring uniform quality with faster response times, thereby resolving a long-standing issue in traditional development.

The adoption of AI-assisted OER development leads to strategic advantages, such as opening doors to partnerships, funding, and revenue through technology transfer, improved technology skills for SMEs and other participants in the process. In AI-assisted OER development, the combination of cost savings, operational efficiencies, quality improvements, and strategic advantages enables organisations to achieve significant transformation in the competitive educational landscape.



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