

# Next-Gen Instructional Design: AI's Revolution in Transforming Virtual Training Development

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## ABSTRACT

This paper presents an in-depth analysis of how Artificial Intelligence (AI) is reshaping Interactive Multimedia Instruction (IMI) content development for virtual training. Using a mixed-methods comparative analysis of production metrics and stakeholder feedback, we examine the impact of AI on Instructional Systems Designers' (ISDs) workflows, emphasizing measurable gains in productivity and cost-effectiveness without sacrificing quality. The study draws data from over 140 personnel in the Navy Ready Relevant Learning (RRL) program.

Our research demonstrates that custom AI platforms and tools, featuring Retrieval-Augmented Generation (RAG), Large Language Models (LLMs), and enhanced data synthesis, significantly accelerate content development, from storyboard drafting to instructional assessment creation. Machine Learning (ML) tools enhance consistency, reduce manual formatting burdens, and support crafting instructional assessment questions, optimizing interactions with Subject Matter Experts (SMEs). By comparing high- and low-usage periods during implementation, we show that increased AI engagement strongly correlates with ISD task completion rates.

To quantify the value of productivity gains, we used a cost-adjusted framework that compares token usage costs with labor hours saved. Even during this early implementation period - marked by evolving workflows and increasing tool adoption - the analysis revealed consistently positive net value and strong return on investment (ROI), confirming that efficiency gains translate into meaningful cost reductions. With over 45,000 AI-enabled inquiries processed to date, the productivity elasticity analysis shows that a 1 percent increase in AU usage yields a 0.27 percent increase in completed tasks, highlighting the scalable and compounding impact of AI integration on output efficiency. Qualitative findings reinforce that AI can be a productivity multiplier augmenting human-led design.

These results confirm the transformative value of AI in the IMI development lifecycle. AI-enhanced workflows are positioned as a strategic enabler of scalable, cost-efficient, and high-quality training for all stakeholders in virtual training development.

## ABOUT THE AUTHORS

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## INTRODUCTION

The landscape of military training has undergone unprecedented transformation with the integration of AI and ML technologies. As these technologies become increasingly sophisticated, they are fundamentally reshaping how Instructional Systems Designers (ISDs) approach the development of Interactive Multimedia Instruction (IMI) for virtual training environments. The challenge facing training developers today is not whether to adopt AI technologies, but how to implement them strategically to maximize efficiency while maintaining the highest standards of instructional quality.

This paper examines a comprehensive case study centered on the Ready Relevant Learning RRL Fiscal Year 2024 Content Conversion Aviation (RRL FY24 CC Aviation) program, where Integration Innovation Inc. (i3) incorporated an advanced AI-assisted development environment to transform IMI development workflows, along with other AI tools that aid in the automation of content generation. Our approach represents a paradigm shift in how training content is conceptualized, developed, and refined, utilizing Retrieval-Augmented Generation (RAG) and advanced Large Language Models (LLMs) to create specialized chatbots capable of analyzing Government-Furnished Information (GFI) and accelerating content creation processes.

The research significance extends beyond mere technological implementation. With growing demands for rapid deployment of high-quality training solutions and increasing pressure to optimize resource allocation, the defense training community requires empirical evidence of AI's tangible benefits. This study addresses that need by providing quantitative and qualitative analysis of AI integration across a workforce of over 140 ISDs, offering insights that can inform strategic decisions for similar implementations across the defense training enterprise.

The scope of this investigation encompasses multiple dimensions of the IMI development lifecycle, from initial content analysis and storyboard creation to quality assurance and stakeholder collaboration. By examining both productivity metrics and user experience data, this research provides a holistic view of AI's transformative potential in military training development, while also addressing implementation challenges, building user trust in the AI tools, and lessons learned from real-world deployment. This aligns with the broader evolution of AI in education from reactive automation tools to proactive instructional assistants (Roll & Wylie, 2016). Our findings further support the perspective that AI should augment, not replace, human-led instruction, enabling greater scalability and instructional consistency across diverse learning environments (Luckin, Holmes, Griffiths, & Forcier, 2016).

## BACKGROUND

### The Role of IMI and Instructional Systems Design in Naval Training

Interactive Multimedia Instruction (IMI) is a foundational element of modern naval training, enabling immersive, standardized learning experiences through text, graphics, audio, video, and animation. IMI supports mission-critical objectives such as technical skill development, procedural training, and competency validation, all of which directly impact fleet readiness and operational performance.

Instructional Systems Designers (ISDs) are central to this process, translating complex technical content into pedagogically sound training modules. Their responsibilities include content analysis, storyboard creation, assessment development, and iterative collaboration with SMEs. These roles are grounded in instructional systems theory, which emphasizes systematic approaches to learning design (Reiser & Dempsey, 2017). This work is especially demanding

in the naval context, where ISDs must address classified materials, rapidly evolving technologies, and dispersed learners—all under tight development schedules.

### **Training Excellence and Fleet Readiness**

Naval training quality directly correlates with operational outcomes. Effective IMI development reduces time-to-competency, minimizes training-related errors, and ensures performance consistency across diverse environments. However, the traditional ISD workflow—dependent on manual document analysis, SME collaboration, and multiple review cycles—often creates bottlenecks that strain resources and timelines. One of the most cited bottlenecks in IMI development is the availability and responsiveness of SMEs.

Our project sample group consisted of over 140 ISDs from RRL FY24 across numerous projects, illustrating both the scale and urgency of this challenge. The high volume of Government-Furnished Information (GFI) and the demand for rapid, high-quality training delivery underscore the need for enhanced development processes that maintain quality while improving throughput. AI tools that help pre-draft content or clarify complex domain language have shown to improve SME engagement by reducing cognitive load and streamlining iterative reviews.

### **The Case for AI Integration**

Emerging technologies such as AI and ML offer a path to optimize IMI development by automating routine tasks, improving content quality, and accelerating production timelines. Recent systematic reviews highlight the growing use of AI across a range of educational applications, from tutoring systems to content generation and personalized learning (Almalki & Aziz, 2021).

The defense training community increasingly seeks solutions that can balance rigor with efficiency—without compromising the accuracy or effectiveness of instructional materials. This paper examines the AI-enhanced approach deployed in the Navy RRL program, and its impact on ISD productivity, content quality, and training development efficiency.

Recent research reinforces this opportunity. A 2024 study by AlShaikh et al. demonstrated how an AI Educational Video Assistant based on the Cognitive Theory of Multimedia Learning (CTML) significantly improved engagement, clarity, and usability in educational content. The integration of Large Language Models with Automatic Speech Recognition in multimedia design shows how AI can enhance instructional outcomes while maintaining pedagogical standards (AlShaikh, Al-Malki, & Almasre, 2024). This evidence underscores the relevance of AI-driven instructional tools in supporting the complex design challenges faced by ISDs in military training contexts.

While the case for AI integration into our day-to-day workflows is quite compelling, the question of whether or not the investment in these automation tools would ultimately prove to be fruitful and increase performance enough to result in a positive return on investment.

## **METHODOLOGY**

### **Research Design and Approach**

This study employed a mixed-methods comparative research design to evaluate the impact of AI integration on IMI development workflows within the Navy RRL program. The design balanced quantitative performance metrics with qualitative stakeholder feedback, providing a comprehensive assessment of productivity, quality, and user experience outcomes. This process was both iterative and interactive allowing us to adjust where necessary and also to fully abandon certain automation efforts if efficiency gains were not realized in user testing and engagements. High- and low-AI usage periods were defined based on monthly query volume thresholds and tool engagement metrics, with task completion data normalized by ISD count.

By leveraging a phased rollout of AI capabilities within the RRL program, the research was able to capture comparative data across distinct periods and teams. This approach allowed for pre/post analysis, concurrent group comparisons, and longitudinal tracking of AI-enhanced versus traditional workflows.

**AI Intervention**

The central technological intervention studied in this research was a modular, AI-powered ecosystem developed to augment instructional design processes. Its architecture integrates LLMs and Retrieval-Augmented Generation (RAG) and is combined with custom ML tools to support ISDs across the IMI development lifecycle.

The platform includes custom RAG chatbots for rapid document analysis, grammar and style models to enforce quality standards, formatting linting tools for document compliance, AI pipelines for content generation, and domain-specific virtual personas to offload routine SME interactions. This approach leverages the combined strengths of large language models and external knowledge retrieval. This architecture is based on the Retrieval-Augmented Generation approach, originally developed for knowledge-intensive natural language tasks (Lewis, et al., 2020).

These tools are embedded within ISD workflows, enabling real-time assistance while maintaining user familiarity. The platform supports scalable deployment based on project needs and team readiness. To illustrate the breadth of AI technologies deployed, Table 1 summarizes the primary AI methods implemented within the Navy RRL program and their specific functional roles.

**Table 1. AI Implementation Methods in Navy RRL Program**

AI Methods	Implementation and Usage
Custom Trained Chat Bots	RAG-enabled chatbots for rapid GFI consumption and analysis
Content Linting Tools	Automated tools to identify and flag formatting and content issues
Grammar and Styling Models	ML models to improve grammar, writing style, and consistency
Document Generation Pipelines	AI pipelines for structured, standards-compliant document creation

The implementation of these technologies was not limited to backend automation; they were purposefully embedded in the ISD workflow to provide targeted support for common instructional development tasks. Table 2 provides a detailed look at how these tools were used to enhance specific areas of instructional design.

**Table 2. AI Applications in Instructional Design Workflows**

Application Area	Implementation and Benefits
Storyboard Creation	Rapid structure, story, and design
Crafting Instructional Assessments	LLM-supported question generation aligned with learning objectives
Automating SME Interaction	AI handles routine questions; SMEs focus on complex issues

In parallel, targeted Machine Learning applications were employed to address consistency, scalability, and localization challenges in IMI development. Table 3 highlights the specific ML-driven capabilities integrated into the AI-powered ecosystem and their practical impact on training content production.

**Table 3. Machine Learning Applications for IMI Development**

ML Application	Implementation and Impact
Grammar/Formatting Standardization	Consistent application of rules across all content types
Content translation	Accelerated and accurate localization for multilingual training delivery
Reduced Manual Labor	Automated tasks boost content throughput

Beyond content acceleration, AI-enabled platforms are now delivering measurable gains in learner outcomes. Interactive video tools, including AI-driven motion detection, object tracking, and automated video overlays, have been associated with improved learner engagement (up to 92 percent), higher completion rates (78 percent), and increased knowledge retention (85 percent) in digital training environments (Lozano, 2023). These tools represent a new frontier for ISDs seeking to embed AI into immersive instructional experiences. In future iterations of this

research, similar learner-facing analytics may be used to assess downstream impacts on training effectiveness. These claims are further supported by research from the Journal of Educational Multimedia and Hypermedia, which emphasizes the affordances of video-based learning interactions in educational design (Evi-Colombo, Cattaneo, & Betrancourt, 2020).

## **IMPLEMENTATION: PHASED AI INTEGRATION IN NAVY RRL**

### **Program Context and Implementation Strategy**

The Navy RRL program served as an ideal testbed for evaluating the phased integration of our approach within a large-scale defense training development operation. The scope and operational diversity of the program, which spans over 140 ISDs and numerous concurrent projects, provided meaningful opportunities for comparative analysis and continuous refinement of the AI-enhanced workflow.

The implementation strategy followed a structured, three-phase deployment approach. This strategy allowed for incremental capability introduction, user acclimation, and real-time feedback integration, all while maintaining support for ongoing training development efforts.

**Phase 1 - Pilot Implementation:** This initial deployment focused on foundational platform capabilities within a limited subset of ISD teams. Primary features introduced during this phase included basic chatbot functionality for GFI analysis, document correlation tools, and content generation capabilities. Workflow integration was closely monitored, and data was collected to establish baseline comparisons. During this phase, efforts were able to be adjusted or corrected in order ensure the AI automation tools both effective and that the user adoption and trust in the tools were handled with close attention.

**Phase 2 - Expanded Rollout:** Building on lessons learned, Phase 2 extended the platform capabilities to additional teams and introduced more advanced features such as persona-driven SME chatbots, grammar/style compliance tools, and formatting automation. Greater integration with quality assurance workflows and cross-team collaboration tools began during this stage, accompanied by iterative system optimization based on user feedback.

**Phase 3 - Full Integration:** The final phase achieved full deployment across the RRL program. Teams gained access to the full suite of platform capabilities, including analytics dashboards and usage tracking. Customization based on team roles, project complexity, and performance data enables workflow optimization and deeper integration with program management tools.

### **Platform Capabilities and User Experience**

The AI toolset delivered a cohesive set of tools that targeted known pain points in the IMI development lifecycle. Among the most impactful capabilities were:

- **Intelligent Document Processing:** The platform's RAG-based backend enabled the rapid digestion of complex GFI, dramatically reducing research time. Teams that previously required hours to extract relevant content from technical manuals reported completing similar tasks in minutes.
- **Persona-Based Expertise:** Virtual SMEs trained on domain-specific content reduced the burden on human SMEs, allowing them to focus on higher-level validation while automating common queries and reference lookups.
- **Content Generation and Standardization:** LLM-driven tools assisted ISDs in producing high-quality instructional materials aligned to style guides. Automated formatting reduced the frequency of rework and improved consistency across deliverables.
- **Collaborative Workflow Enhancement:** AI-supported tools facilitated real-time content sharing, review, and feedback among ISDs, SMEs, and Quality Assurance (QA) personnel, improving transparency and turnaround across development phases.

### **Change Management and Training Support**

Successful implementation depended as much on user adoption and organizational readiness as on technical performance. Important change management activities included:

- **Role-Based Training:** Customized training tracks addressed the unique needs of ISDs, QA staff, and program leaders. Early adopters participated in hands-on onboarding workshops and served as peer mentors.
- **Continuous Feedback and Iteration:** Usage data and regular check-ins informed ongoing development priorities. Feature enhancements and interface adjustments were made based on real-world challenges and user suggestions.
- **Quality Assurance Alignment:** Human validation checkpoints remained critical to ensure that AI-supported content met instructional standards. This hybrid approach allowed teams to benefit from automation while preserving accountability.

The phased implementation not only accelerated overall adoption but also established a strong foundation for long-term scalability. The insights gained from this deployment cycle inform broader applications of AI in defense training environments and provide a replicable model for similar transformation initiatives.

## DATA ANALYSIS AND RESULTS

To assess the impact of AI integration on IMI development workflows, we conducted a comparative analysis between periods of traditional and AI-enhanced operations within the Navy RRL program. The analysis focused on three key dimensions: productivity, content quality, and user adoption.

### Productivity Analysis

Our productivity analysis reveals the most immediate gains in document processing, while we focused our efforts on Training Guide (TG) and Lesson Plan (LP) development where most implementation occurred. The platform's RAG-based technical manual ingestion capability transformed document analysis tasks from hours-long processes into minute-long operations.

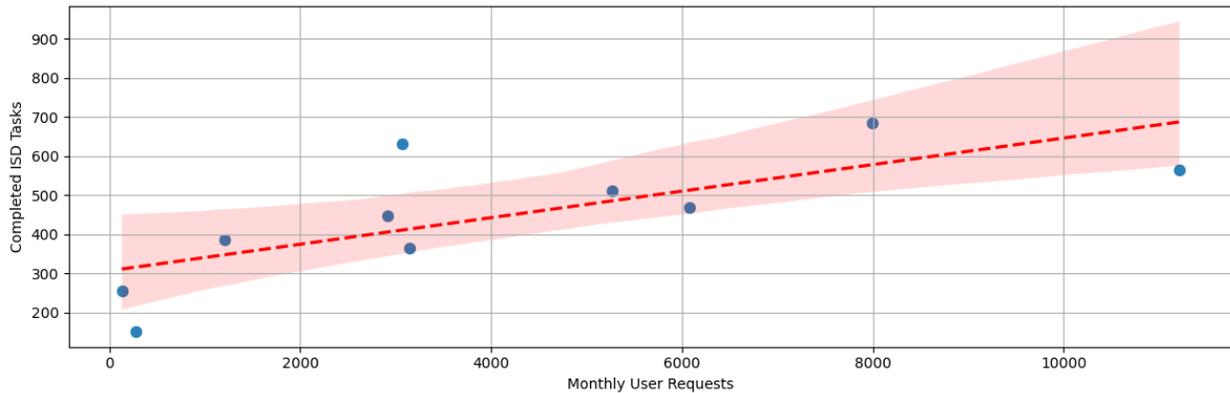
**Table 4. Development Time in Traditional and AI-Enhanced Workflows**

Metric (Average Time)	Traditional Workflow	AI-Enhanced Workflow	% Improvement
Trainee Guide Development	24 hours	8 hours	300%
Lesson Plan Development	16 hours	4 hours	400%

The RRL program presents a major opportunity for increased efficiency through automated development of TGs and LPs. ISDs can produce over 300 TGs and LPs each month depending on the complexity of the IMI being produced. This development requires an average of 3 days for TGs and 2 days for LPs under manual processes, depending on complexity of content. The AI-enhanced development pipelines now deliver 80–90 percent complete drafts to ISDs within seconds. ISDs then finalize the remaining 10–20 percent of content in just 1 day for TGs and half a day for LPs before sending the materials to SMEs for review. This shift transforms ISDs from manual content creators into quality assurance specialists, resulting in a substantial reduction in labor hours and accelerating overall production timelines while maintaining instructional integrity.

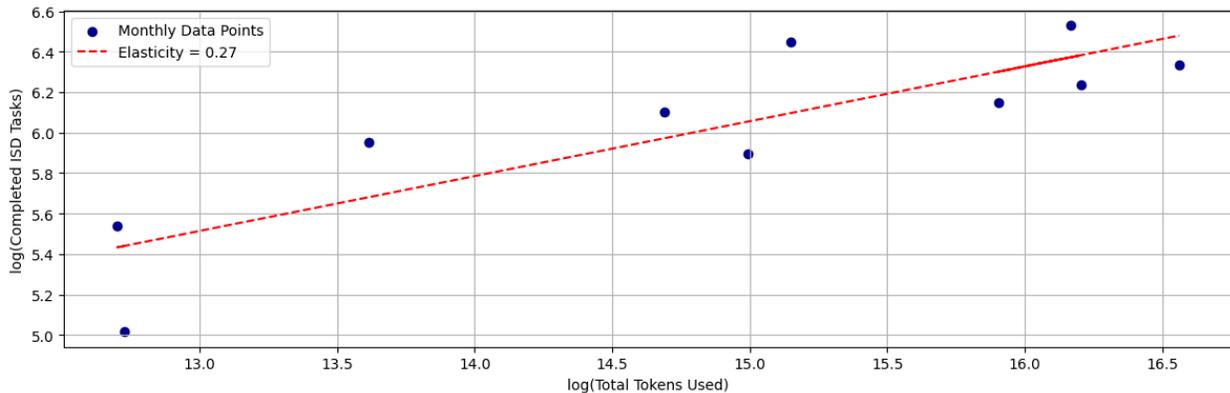
To evaluate the relationship between AI tool engagement and ISD productivity, we analyzed our RAG system's user requests and completed ISD tasks across a 10-month period. A Pearson correlation test showed a strong positive correlation ( $r = 0.735$ ,  $p = 0.015$ ), indicating that increased AI platform usage is significantly associated with higher task completion rates. This finding supports the hypothesis that AI-driven tools enhance instructional development throughput.

To further quantify the relationship, we developed a simple linear regression model using monthly user requests as the independent variable and completed ISD tasks as the dependent variable. The model produced a statistically significant result ( $p < 0.05$ ), with an  $R^2$  value of 0.55, meaning that approximately 55 percent of the variance in task completion can be explained by platform usage volume. Although moderate, this explanatory power likely reflects the limited sample size and early-stage deployment, as implementation began less than a year ago. As user adoption reaches steady-state and usage patterns mature, we expect future analyses to show stronger correlations. Figure 1 illustrates the observed linear relationship between user engagement and completed tasks during the initial implementation period.



**Figure 1. Correlation Between AI Tool Usage and ISD Task Completion**

To estimate the responsiveness of ISD productivity to AI usage, we applied a log-log regression model to calculate elasticity over a 10-month implementation period. The resulting coefficient of 0.27 suggests that a 1 percent increase in token usage yields a 0.27 percent increase in task completions. While modest on the surface, this elasticity reflects meaningful productivity gains that scale with adoption. For program managers, this represents compelling early evidence that incremental increases in AI utilization translate into measurable and scalable improvements in operational output.



**Figure 2. Productivity Elasticity Between AI Tool Usage and ISD Task Completion**

### Content Quality and Consistency

Informal surveys with ISD team leaders indicate that output quality has remained consistent or improved following AI tool implementation. These tools enable ISDs to process large volumes of documentation more efficiently, accelerating content generation while helping them refine their inquiries to SMEs. SMEs, however, have reported concerns regarding AI-generated content that occasionally contains incomplete, incorrect, or improperly structured elements, which they perceive as minor quality reductions.

This feedback reveals the tension between efficiency gains and quality maintenance inherent in AI-assisted content development. The AI tools accelerate initial drafting process and enhance ISD comprehension of source materials, reducing overall development timelines. While SME reviews may require increased attention to ensure accuracy, the program achieves net time savings without compromising final output quality. Enhanced efficiency in initial content creation offsets the additional review requirements, maintaining instructional integrity while substantially reducing production cycles.

### User Adoption and Workflow Integration

Platform usage data showed a steady rise in engagement, with daily active users increasing by 48% during the first 90 days of deployment. User feedback highlighted improved clarity of task expectations, faster turnaround on SME

responses, and a higher degree of confidence in AI-supported outputs. On average, users require less than one week to achieve proficiency with core features.

### Cost-Effectiveness Analysis

To assess the economic impact of AI-enhanced development, we conducted a cost-adjusted analysis that converts token usage into dollars and compares it against labor value saved—producing a Net Value function and a cumulative ROI metric. Token costs are calculated by applying standard per-thousand pricing rates to both prompt and completion token consumption. Labor value is derived from ISD task volume and known efficiency gains, translated into dollar savings using a fixed hourly labor rate.

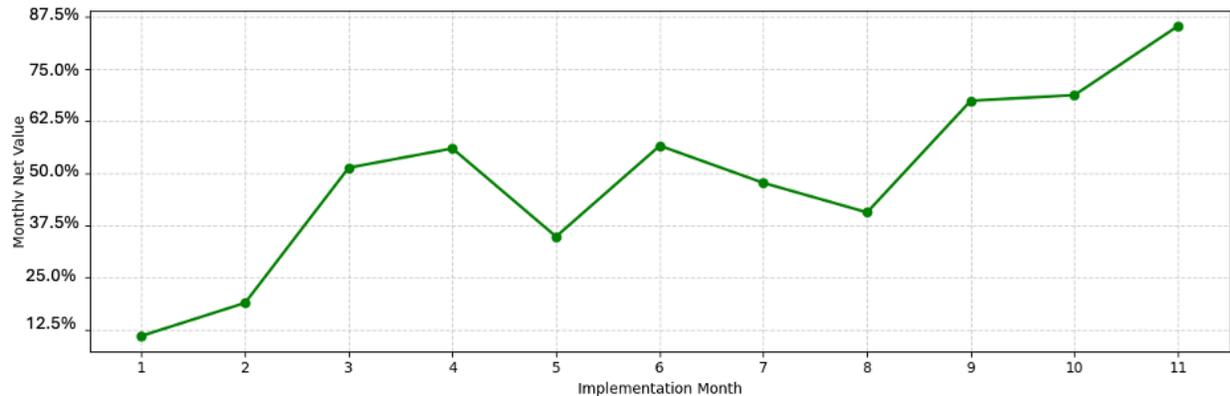
$$\text{TokenCost}_t = \left( \frac{\text{PromptTokens}_t}{1000} \cdot c_p \right) + \left( \frac{\text{CompletionTokens}_t}{1000} \cdot c_c \right) \quad (1)$$

$$\text{LaborValue}_t = (\text{TG}_t \cdot 16 + \text{LP}_t \cdot 12) \cdot \text{HourlyRate} \quad (2)$$

For each time period,  $t$ , we compute the Net Value of productivity-based labor saving using equation (3).

$$\text{NetValue}_t = \text{LaborValue}_t - \text{TokenCost}_t \quad (3)$$

The calculation of monthly net value gained through AI-enhanced automation represents labor cost savings minus token expenses. Figure 3 visualizes the month-over-month progression of net value to illustrate consistency and scale of these gains if AI-enhanced automation had been used for all IMI development during the implementation period.



**Figure 3. Monthly Net Value During AI-Enhanced ISD Development**

Additionally, we can evaluate the cumulative return on investment (ROI) of implementing these tools by calculating a ratio of harvested cost savings to total investment, which includes token costs, R&D, infrastructure, and other product costs related to the RRL program. ROI is then defined as:

$$\text{ROI} = \frac{\sum_t \text{NetValue}_t}{\sum_t \text{TotalInvestment}_t} \quad (4)$$

This framework enables a meaningful financial interpretation of productivity gains by expressing them as harvested value—specifically, cost reductions attributable to automation. Over the 10-month period, cumulative labor savings, measured in thousands of hours, substantially exceeded the cost of token usage, resulting in a highly favorable net value and return on investment (ROI) exceeding ten times the associated token expenditures. The analysis demonstrates that AI-driven automation delivers strong and increasing productivity gains relative to its operational cost, reinforcing its value as a cost-effective enabler of instructional design efficiency.

Across the 10-month period, cumulative labor savings—measured in thousands of hours—far exceeded the associated token usage costs. This resulted in a consistently positive net value and an exceptionally high return on investment (ROI). In practical terms, each unit of token expenditure yielded dozens of units of equivalent labor productivity. These results confirm that the AI-driven automation pipeline is not only accelerating throughput but doing so with remarkable cost-efficiency.

## IMPLEMENTATION CHALLENGES AND INSIGHTS

The integration of AI technologies into established training development workflows revealed several critical implementation considerations that inform future deployments. These insights extend beyond technical performance metrics to encompass organizational, operational, and strategic factors essential for successful AI adoption in defense training environments.

**Infrastructure and Resource Requirements:** Early deployment phases highlighted the computational intensity of AI-driven functionalities. Insufficient resource allocation led to performance degradation and reduced user adoption, emphasizing that hardware infrastructure must scale with AI capabilities. Organizations pursuing similar implementations should conduct thorough capacity planning and invest in computational resources before deployment.

**Security and Classification Constraints:** The classified nature of defense training materials presented unique operational challenges. AI tools unavailable in classified environments significantly limited productivity optimization potential. This barrier underscores the critical need for security-compatible AI solutions that can operate across various clearance levels.

**Organizational Dynamics and Change Management:** Team restructuring events during the implementation period complicated productivity measurement and created moving targets for assessment metrics. These organizational changes highlighted the importance of flexible evaluation frameworks and change management protocols that can adapt to evolving team structures while maintaining measurement validity.

**User Feedback and Iterative Development:** Responsive feedback mechanisms are essential for maintaining user trust and tool refinement. The complexity of AI-enhanced workflows requires continuous user input to optimize functionality and address emerging challenges, demonstrating that successful AI integration depends as much on organizational learning as on technical capability.

**Skepticism and Resistance to Innovation:** Some users exhibited a fear of change, expressing concerns about the reliability of AI and its potential to disrupt established workflows. This hesitation was increased when the AI tools produced occasional suboptimal results; such instances disproportionately influenced perceptions, leading some to prematurely dismiss the tool's overall effectiveness. Despite its consistent success in delivering impactful results in most cases, isolated shortcomings often magnified or reinforced preexisting biases. Addressing this resistance required efforts to build trust, emphasize the tool's strong performance history, and position occasional errors as opportunities for continuous improvement rather than indicators of failure. This type of resistance aligns with research described as "mistrust of AI", a form of skepticism and wariness that is often rooted in instinct rather than direct experience, which can significantly hinder adoption in organizational settings (Golgeci, 2025).

These experiences reinforce that AI implementation in defense training requires comprehensive planning that addresses technical, organizational, and security dimensions simultaneously. The lessons learned provide a foundation for scaling AI-enhanced instructional design across broader defense training initiatives.

## CONCLUSION

This study demonstrates that AI integration fundamentally transforms Interactive Multimedia Instruction development by delivering measurable improvements in productivity, content quality, and cost-effectiveness. Our analysis of the Navy RRL program reveals that AI-enhanced workflows reduced development time by 75-80 percent for key deliverables while maintaining instructional standards, with correlation analysis showing a strong positive relationship between AI tool usage and task completion rates. The economic impact proves equally compelling, with our analysis showing substantial net value gains and a highly favorable ROI. These results establish a comprehensive case for AI adoption in military instructional design, demonstrating that automation delivers significant efficiency and cost-effectiveness without compromising quality.

The success of AI-enhanced IMI development aligns with broader DoD Digital Modernization Strategy objectives and demonstrates practical pathways for implementing emerging technologies in mission-critical training environments. The modular, phased approach provides a replicable framework for other military branches seeking to modernize training development processes while maintaining quality and security standards. While existing research emphasizes AI's impact on learner outcomes, this study addresses the under-explored dimension of AI's role in transforming instructional design workflows themselves, providing actionable insights into a critically important dimension of AI integration in defense education (AlShaikh, Al-Malki, & Almasre, 2024), (Campbell & Wang, 2023).

The foundation established through this implementation enables expansion toward adaptive learning models and personalized training experiences—approaches increasingly recognized as essential to modern technology-enhanced learning systems (Xie, Chu, & Wang, 2019). As military training requirements continue to grow in complexity and urgency, AI-driven approaches offer a proven pathway for maintaining instructional excellence while achieving unprecedented operational efficiency. The Navy RRL case study illustrates that AI-enhanced instructional design constitutes a paradigm shift that enables scalable, efficient, and high-quality training development capable of meeting evolving defense training demands.

While the findings demonstrate significant productivity and ROI gains, the adoption of AI tools in instructional design also raises challenges around user trust, explainability, and validation of outputs, particularly in high-stakes training environments. Future work should explore strategies to build user confidence through transparency, human-in-the-loop workflows, and rigorous content review processes

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