

DXP and AI

Personalization and content generation in Drupal, Adobe Experience Manager, and Umbraco

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1. Introduction

AI is becoming an important part of digital experience platforms (DXPs). Teams need to produce more content, respond faster to audience behavior, and support a growing number of channels, brands, and markets. At the same time, expectations for brand consistency, security, accessibility, and regulatory compliance remain high.

The main challenge is integrating AI into the full content lifecycle: planning, drafting, approval, publishing, personalization, measurement, and reuse. At enterprise scale, this also involves dependencies across content management systems (CMSs), digital asset management (DAM), product information management (PIM), customer data platforms (CDPs), commerce, analytics, and marketing automation.

Connecting a language model to a CMS is only a starting point. Output quality depends on the context provided to the model, reliable data, brand guidelines, approval workflows, access controls, and cost monitoring. Responsibilities also need to be clear. AI can prepare drafts, while people should approve content with legal, reputational, financial, or regulatory implications.

This white paper covers:

- Four levels of personalization, from rules to cross-channel orchestration
- Practical uses of generative AI in content production and management
- Differences between Adobe Experience Manager, Drupal, and Umbraco
- Platform selection criteria based on architecture, scale, and organizational readiness
- How to start with a focused, measurable pilot supported by appropriate safeguards

Important!

AI in a DXP combines technology, content, data, operating processes, governance, and measurement. Its value depends on how these elements work together.



2. How AI supports personalized digital experiences

Personalization adapts content, message sequencing, or the next action to an audience's context. AI can increase the scale and speed of these activities, but it does not replace an experience strategy, a data model, or measurement.

2.1 Four levels of personalization maturity

Level	How it works	Example	Key requirements
1. Rules	Teams define conditions and the corresponding variants.	A different banner for visitors from a particular country or traffic source.	Clear rules, reliable measurement, and conflict management.
2. Behavioral data	Decisions use events, visit history, profiles, or segments.	Content recommendations based on previously viewed categories.	Consent, data quality, visitor identification, and current segments.
3. AI selects or creates a variant	A model selects an existing variant or generates a draft for a specific context.	Several headline versions for a segment, followed by a test.	Approved sources, guardrails, approval workflows, and experimentation.
4. Cross-channel orchestration	Decisions are coordinated across websites, apps, email, and other channels.	Continuing communication in another channel based on an earlier interaction.	Consistent profiles, frequency management, channel integration, and governance.

2.2 Segmentation and content recommendations

AI can help identify patterns in data and build segments, but each segment still needs a business purpose. Too many microsegments make content production, measurement, and maintenance harder. Start with a few segments linked to a specific decision, such as which content, product, or next step to recommend.

Recommendations can cover articles, products, services, support resources, or the next action. Their effectiveness depends on metadata quality, an up-to-date catalog, available behavioral signals, and a suitable objective. For low-traffic content, simple rules or editorial curation may be more appropriate than a machine learning model.

2.3 Real-time personalization

"Real time" needs a precise definition. It can mean updating a profile after an event, making a decision during a visit, or immediately activating that decision in a channel. Each option has different latency, identification, consent, and integration requirements. Before implementation, identify which decisions require an immediate response and which can run hourly or daily.

2.4 Personalization across three platform approaches

Platform	Typical personalization approach	Role of AI
Adobe Experience Manager and Adobe Experience Cloud	AEM manages content. Adobe Experience Platform, Real-Time CDP, Adobe Target, and Adobe Journey Optimizer can support segments, testing, decisions, and orchestration. These are separate products within the ecosystem.	Creating content variants, enriching assets, supporting decisions, and optimizing based on measurement.
Drupal	Rules, modules, and integrations with data and decision services can support context-based personalization. Responding to user intent requires suitable data and a designed decision layer.	Flexible choice of providers and models. AI can support editorial workflows, search, recommendations, or the API layer.
Umbraco	Personalization typically combines CMS capabilities with .NET components and selected data, automation, or AI services.	Integration through Umbraco.AI, Microsoft.Extensions.AI, or custom solutions. Scope depends on versions and packages.

2.5 Measuring results

Do not assume that AI will automatically increase engagement or conversion. Results depend on audience size, data quality, the hypothesis, the number of variants, test duration, and attribution. Define a primary metric and guardrail metrics for each use case. For example, measure visits to a contact form while also monitoring abandonment, errors, and load times.



PRACTICAL RECOMMENDATION

First, define the decision you want to improve, the data it requires, and how you will measure results. Then select the AI model and where to integrate it.

3. Generating content with AI

Generative AI provides the most value when it reduces repetitive work, increases the number of variants that can be tested with appropriate controls, or makes content easier to reuse. High-risk material should require human review before publication

3.1 Key use cases

Use case	Business value	Human oversight
Content drafts	Shorter time from brief to first draft.	Check facts, tone, purpose, and completeness.
Message variants	Faster preparation of content for tests, segments, and channels.	Assess whether differences are meaningful, consistent with the brand, and proportionate to the personalization need.
Product descriptions	Scale production across large catalogs and fill content gaps.	Validate specifications against PIM data and review legal information and marketing claims.
Translation and localization	Faster adaptation for different languages and markets.	Review by someone familiar with the language, culture, terminology, and local requirements.
SEO content	Suggested structures, metadata, headings, and variants.	Prevent duplication, thin content, and material that offers little value to users.
Visual assets	Rapid concepts, variants, and format adaptations.	Check usage rights, brand consistency, accuracy of representation, and required labeling.
Tagging and search	Better metadata, asset discovery, and reuse.	Review vocabularies, tag quality, and sensitive information.
Quality checks	Identify inconsistent tone, omissions, prohibited wording, and potential errors.	Make the final decision, particularly for regulated content and legal material.

3.2 Where AI capabilities come from

- **Built-in platform capability.** Available in a specific platform version or vendor service. Activation, permissions, configuration, and usage-based charges may still apply.
- **Module or extension.** Adds capabilities to a CMS. The organization or implementation partner may be responsible for version compatibility, updates, and security.
- **Integration with an external model.** Passes context from the CMS to an AI service through an API. This offers flexibility but requires data protection, observability, spending limits, and error handling.
- **Additional product or license.** May be needed for capabilities delivered through separate DAM, CDP, orchestration, work management, or content production tools. Confirm licensing scope before committing to an architecture and budget.

3.3 A controlled publishing process

1. **Brief and sources.** Define the objective, audience, channel, constraints, and approved knowledge base.
2. **Generation.** Record the model, prompt, parameters, version, and usage.
3. **Automated checks.** Review completeness, restricted data, terminology, and potential legal or brand risks.
4. **Human review.** The content owner checks facts, tone, and suitability.
5. **Approval and publishing.** Follow defined roles and maintain an audit trail.
6. **Measurement and withdrawal.** Track results and errors, and retain the ability to replace content quickly.

3.4 Governance rights and security

- Before sending personal data, trade secrets, or unapproved material to an external model, establish the required authorization, legal basis where applicable, and technical controls.
- Define which sources the model may use, who approves outputs, and how long logs are retained.
- Review model provider licensing terms, data usage policies, and rights to generated material.
- Apply access controls, spending limits, quality monitoring, and a response procedure for incorrect or unsafe outputs.
- Keep records that identify content generated or modified using AI.



Where human approval is essential

People should retain approval authority over legal, medical, financial, regulated, crisis-related, and reputation-sensitive content. They should also approve departures from brand guidelines and assess facts and usage rights.

4. AI in practice across Drupal AEM and Umbraco

The following sections describe three architectural approaches. Capabilities depend on versions, licenses, modules, regions, and configuration. Confirm current requirements in vendor documentation and commercial terms before making a decision.

4.1 Drupal

Approach to AI and personalization

Drupal is an open-source platform where AI is typically implemented through community-contributed modules, a provider abstraction layer, and integrations with external services. Organizations can choose a cloud model, an enterprise service, or a model hosted in their own environment.

Structured content, taxonomies, Search API, components, and integration mechanisms provide a foundation for context-based personalization. AI can extend this foundation by analyzing permitted behavioral signals, such as page visits, searches, form submissions, downloads, chatbot questions, and other actions. Responding to what users seek in a particular session requires suitable data and a designed decision layer.

Key capabilities and integrations

- The Drupal AI ecosystem provides a shared integration layer for different providers and operation types. Scope depends on installed modules and versions.
- Potential uses include content generation and editing, translation, CKEditor integration, semantic search, retrieval-augmented generation (RAG), and workflow automation. RAG retrieves relevant source material to provide context for model responses.
- Drupal can integrate with DAM, PIM, CDP, commerce, and analytics through APIs, modules, or an integration layer.
- Embeddings, or numerical representations of meaning, and vector search can help find semantically related content.
- Semantic search can improve interpretation of queries. Personalized ranking, intent classification, and recommendations require additional context and suitable logic.
- A designed decision layer can select dynamic components, calls to action (CTAs), recommended resources, offers, or component order.

Example use cases

A multilingual portal uses AI to draft summaries and translations. Content then goes through the standard editorial approval workflow. In another scenario, semantic search uses embeddings and an approved content library to improve information retrieval across a large website.

Strengths

- Choice of model providers and the ability to reduce dependence on a single ecosystem.
- An open architecture with extensive integration and extension options.
- A useful starting point for organizations with strong technical capabilities and requirements specific to their architecture.

Limitations and success factors

Flexibility brings greater responsibility for architecture, module selection, updates, security, and observability. AI capabilities are not a single, ready-made enterprise package. Assess module maturity, version compatibility, support, and total maintenance costs. Implementation also requires a provider integration layer, spending limits, and AI governance.

Organizational fit

Drupal is well suited to organizations that value open source, require custom integrations, and operate complex content or public-facing websites, including multilingual environments with detailed user roles. They also need a team capable of maintaining a modular architecture.

4.2 AEM and Adobe Experience Cloud

Approach to AI and personalization

Adobe Experience Manager as a Cloud Service can provide the content and asset management layer. In the broader Adobe Experience Cloud ecosystem, separate products handle customer data, segments, decisions, channels, and measurement. The ecosystem's value grows when an organization connects these products into a shared process.

Key ecosystem components

Component	Architectural role	Considerations
Adobe Experience Manager Sites	Create, manage, and deliver content and experience components.	Capabilities depend on the AEM offering and configuration.
AEM Assets	DAM for assets, metadata, and distribution.	AI can enrich metadata; scope depends on the service.
Adobe Experience Platform and Real-Time CDP	Profiles, events, segments, and customer data activation.	Separate products requiring integration, a data model, and governance.
Adobe Target	Experience testing and personalization.	Requires defined offers, activities, data, and measurement.
Adobe Journey Optimizer	Cross-channel communication and decision orchestration.	Channel and integration scope depends on licensing and configuration.
Adobe Analytics and Customer Journey Analytics	Behavior measurement and journey analysis.	Customer Journey Analytics uses Adobe Experience Platform data and is a separate product from Adobe Analytics.
Adobe Firefly and Adobe Express	Visual generation, adaptation, and creative work.	Confirm availability and access rights.
GenStudio for Performance Marketing	Produce and scale marketing variants aligned with brand guidelines.	A separate application with integration-specific requirements and scope.
Adobe Workfront	Plan work, resources, and approval processes.	A separate product that can support content operations governance.

Generative AI in AEM

AEM as a Cloud Service documentation describes Generate Variations integrated with selected editors. It creates variants from user input, subject to access requirements and generative action consumption. AEM documentation also covers asset capabilities such as smart tagging and integrations with Adobe Express and Firefly for specific scenarios. Confirm availability for the intended configuration and region.

Example use cases

A team creates an approved content fragment in AEM, prepares variants for audience segments, runs an experiment, and analyzes results. In a broader implementation, Adobe Experience Platform or Real-Time CDP can supply profiles and segments, Adobe Target can support personalization, and Adobe Journey Optimizer can coordinate cross-channel communication.



Strengths

- A coordinated approach to content, assets, data, personalization, orchestration, and measurement when the appropriate ecosystem components are implemented.
- Support for organizations managing multiple brands, markets, and large asset libraries.
- AEM as a Cloud Service reduces some infrastructure responsibilities for the platform.

Limitations and success factors

The full approach requires multiple products, licenses, integrations, and skills. It also needs a mature data model, governance, process owners, and the ability to coordinate change across marketing and IT. Available features deliver value when teams put shared content, data, and measurement into practice.

Organizational fit

AEM and the broader Adobe ecosystem suit midsize and large organizations with complex requirements, multiple brands or markets, and a need to manage content, DAM, personalization, and orchestration at scale. The case is strongest when an organization already uses or plans to adopt several Adobe Experience Cloud products.

4.3. Umbraco

Approach to AI and personalization

Umbraco is a .NET-based CMS. AI can be added through the official Umbraco.AI layer in supported versions or through .NET integrations. Official documentation describes Umbraco.AI as a provider-agnostic integration layer built on Microsoft. Extensions.AI. It requires a compatible CMS version and the appropriate provider packages.

Key capabilities and integrations

- Umbraco.AI provides a consistent approach to connections, profiles, and provider integrations, including OpenAI, Azure OpenAI through an appropriate endpoint, and other documented provider packages.
- The .NET architecture supports integration with Azure services, PIM, commerce, search, analytics, and marketing tools.
- Personalization can be implemented in application logic or through an external CDP, rules engine, or decision service.

Example use cases

An editor uses an implemented backoffice feature to draft a description and SEO metadata. An Umbraco.AI profile routes the request to the selected provider, and the output returns as a draft for approval.

Another scenario uses embeddings and approved content for semantic search or RAG.

Strengths

- A natural fit for organizations and teams working with Microsoft technologies and .NET.
- A composable DXP approach that allows organizations to select individual components rather than a complete suite.
- Potentially lower ecosystem complexity than large enterprise suites, with flexibility to extend the solution.

Limitations and success factors

Enterprise capabilities depend on selected third-party products and integrations. The organization is responsible for architectural consistency, error handling, protecting credentials and secrets, spending limits, and monitoring. Check Umbraco.AI version requirements and package maturity before production deployment.

Organizational fit

Umbraco suits organizations seeking a modern .NET CMS, flexible integrations, and phased AI adoption. It is a candidate for midsize environments and larger solutions where teams deliberately build a composable DXP and have the necessary integration skills.



5. Platform comparison

The table compares platform approaches. Final scope depends on versions, licenses, modules, and solution architecture.

Kryterium	Adobe Experience Manager	Drupal	Umbraco
Platform model	Commercial enterprise platform with broader capabilities through Adobe Experience Cloud.	Modular open-source CMS and content management framework with an extensive extension ecosystem.	.NET CMS supporting a composable architecture and integrations with selected services.
Generative AI	Capabilities in AEM as a Cloud Service and additional Adobe tools. Some require separate products, permissions, or generative action consumption.	Primarily modules and model provider integrations. Provider flexibility requires assessment of component maturity.	Umbraco.AI in supported versions and .NET integrations. Requires a provider package and service configuration.
Personalization	AEM with Adobe Target, Adobe Experience Platform, Real-Time CDP, and Journey Optimizer can support extensive personalization and orchestration.	Rules, modules, and integrations with CDPs, analytics, and decision engines.	Application logic and integrations with selected personalization, data, or automation services.
DAM	AEM Assets provides DAM within the Adobe ecosystem.	Drupal media capabilities and external DAM integrations; scope must be designed.	CMS media capabilities and external DAM integrations, selected according to library scale.
Customer data	Integration with Adobe Experience Platform and Real-Time CDP as separate products.	External CDP, data warehouse, or custom data model through APIs and modules.	External CDP or data services, often in the Microsoft ecosystem but also from other providers.
Integration flexibility	Extensive, particularly within Adobe. External integrations require design and management.	Extensive architectural flexibility and provider choice.	Flexible integration through .NET, APIs, and a composable architecture.
Omnichannel	Extensive capabilities through Journey Optimizer and other services.	Headless or API-first delivery with external orchestration and greater integration responsibility.	Headless or API-based delivery with external orchestration; scope depends on the solution.
Governance	Extensive roles and processes in Adobe products. A shared model requires organizational implementation.	Detailed workflows and permissions are possible; AI governance must be designed and maintained.	An accessible editorial model; AI and integration governance usually requires extensions or custom solutions.
Organizational readiness	High, particularly for multiple products and data-driven personalization.	Moderate to high for architecture, DevOps, and module maintenance.	Moderate; higher for complex composable DXPs and multiple integrations.
Implementation and maintenance complexity	High for the full ecosystem. AEM as a Cloud Service reduces some infrastructure work.	Depends on scope. A simple CMS can have moderate complexity; an extensive DXP requires strong architecture.	Usually moderate for a CMS; increases with components, channels, and enterprise requirements.
Typical scale	Midsize and large organizations, particularly those managing multiple brands and markets.	From midsize websites to complex enterprise and public-sector platforms.	Midsize organizations and larger .NET solutions, depending on architecture.
Best-fit use cases	Coordinated content, DAM, data, personalization, and orchestration at scale.	Flexible custom content platforms with control over architecture and providers.	A modern .NET CMS and composable DXP with phased AI and integration development.

Compare more than capabilities!

Compare integration costs, available skills, maintenance models, vendor dependence, and the organization's pace of change alongside platform capabilities.

6. Choosing the right platform

Base the choice on business needs, existing architecture, the operating model, and the ability to maintain the solution. Available AI capabilities are one part of that decision.

6.1 When to consider Drupal

Consider Drupal when:

- Open source and architectural control are key requirements.
- Multiple websites, brands, or markets need a shared platform and consistent governance.
- The CMS is part of a broader ecosystem and requires CRM, CDP, DAM, e-commerce, marketing automation, or analytics integrations.
- Complex content needs to be reused across websites, apps, and other channels.
- Security and control require custom, granular permissions, workflows, auditability, and architectural oversight.
- CMS or DXP modernization is moving toward composable or headless architecture.
- AI is planned for personalization, semantic search, recommendations, RAG, or content workflow automation.
- The team has Drupal, PHP, DevOps, and security skills, or access to a maintenance partner.
- Custom requirements exceed what a packaged suite provides.

Key dependencies include module maturity, support, version compatibility, security maintenance, and AI integration design. Drupal is a fit for platforms requiring flexible integrations and adaptation to complex organizational needs. AI services can build on existing architecture and data without tying the whole DXP to a single model or AI provider.

6.2 When to consider AEM and Adobe Experience Cloud

Consider AEM and the broader Adobe ecosystem when:

- Multiple brands, countries, and channels require strong governance.
- Content management and DAM need to operate at scale.
- Personalization will use profiles, segments, testing, and orchestration, and the organization uses or plans to use several Adobe products.
- The organization is ready for a coordinated business, data, and technology program.
- Budget and skills support implementation and effective use of the ecosystem, licenses, and integrations.

Key dependencies include data architecture, identity, consent, content and data governance, licensing, integrations, and process adoption. Another approach may be more appropriate for a straightforward CMS requirement, limited use of additional Adobe products, or a preference for independently selected components.

6.3 When to consider Umbraco

Consider Umbraco when:

- The organization prefers .NET and Microsoft technologies.
- An intuitive CMS needs room to grow through APIs and composable components.
- AI will be introduced in stages through a selected provider, without purchasing an extensive DXP suite.
- The team wants control over integration code and the pace of development.
- Enterprise requirements matter but do not justify the complexity of the full Adobe ecosystem.

Key dependencies include a compatible CMS version, AI provider packages, .NET skills, and solutions for customer data, DAM, and orchestration. Another approach may be preferable when the organization needs a broad integrated ecosystem for DAM, CDP, personalization, and campaigns, or when .NET is not its primary technology standard.

A PRACTICAL DECISION PROCESS

1.

Define three to five priority use cases and expected outcomes.

2.

Assess the current CMS or DXP, data, integrations, skills, and maintenance costs.

3.

Define nonfunctional requirements, including security, availability, accessibility, performance, data residency, and auditability.

4.

Prepare a target architecture and operating model with owners for content, data, and AI.

5.

Compare extending the current platform, modernizing through a composable architecture, and moving to a different ecosystem.

6.

Validate assumptions in a pilot with clear metrics and exit criteria.

7. Conclusion

AI in a DXP is part of a broader content and customer experience management process. It can accelerate content preparation, increase the number of tested variants, improve asset discovery, and support personalization decisions. It still requires reliable data, appropriate architecture, governance, clear accountability, and measurement.

Adobe Experience Manager and Adobe Experience Cloud support a broad, integrated approach through multiple products. Realizing its value requires the necessary licenses, integrations, and organizational readiness. Drupal offers open-source flexibility, control, and provider choice, with greater responsibility for architecture and maintenance. Umbraco offers a practical approach for .NET environments and composable DXPs, while selected external components often handle customer data, personalization, and orchestration.

The right choice depends on scale, the existing technology stack, budget, support, skills, and strategic use cases. A practical starting point is a measurable pilot with one audience group, a limited content type, a controlled approval process, and predefined success and withdrawal criteria.

Discuss your platform, content workflows, and personalization priorities with Sii's experts. Our Digital Experience Platforms services cover platform selection, implementation, integration, development, and maintenance across Adobe Experience Manager, Drupal, and Umbraco.

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- Drupal: AI tools and projects in the Drupal ecosystem: https://www.drupal.org/docs/develop/development-tools/ai-coding-tools-for-drupal-development/ai-tools-and-projects-in-the-drupal-ecosystem
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