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# MODERN WEB AND MOBILE DEVELOPMENT TECHNOLOGIES AND FRAMEWORKS

Mobile Application Development Mobile applications are commonly classified into three types: native, HTML5 (web apps), and hybrid3 4. (Julius Azasoo, 2023 - 2024)

### Native Applications

These are built specifically for a given mobile platform, such as iOS or Android, using the respective Software Development Kits (SDKs) and programming languages3 (Lectre Notes on Mobile Application Development.pdf, n.d.) 4 (Julius Azasoo, 2023 - 2024). For example, iOS development typically uses XCode and Objective-C, while Android development primarily uses Eclipse and Java, though other languages are possible 3 (Lectre Notes on Mobile Application Development.pdf, n.d.).... Android, being open-source and customizable, is supported by Google and the Open Handset Alliance (OHA)9 10. (Lectre Notes on Mobile Application Development.pdf, n.d.) Native apps generally offer the best performance, visual appeal, and leverage platform-specific features like multi-touch gestures and fast graphics APIs 3 (Lectre Notes on Mobile Application Development.pdf, n.d.).... Developing native apps requires a higher level of experience and specific tools like Android Studio or Eclipse for Android, and a Mac with XCode for iOS 8. (Javier Cuello & José Vittone, 2013)...

### HTML5 Applications (Web Apps)

utilize standard web technologies such as HTML5, JavaScript, and CSS 3 (Lectre Notes on Mobile Application Development.pdf, n.d.) 15 (Julius Azasoo, 2023 - 2024). They adhere to a "write-once-run-anywhere" approach, enabling cross-platform compatibility without requiring installation from app stores15 (Julius Azasoo, 2023 - 2024).... These apps are device-agnostic and accessible via any modern mobile browser, with content often being searchable17 (Lectre Notes on Mobile Application Development.pdf, n.d.). However, they typically require an internet connection and have limitations in accessing native device functionalities like the camera or secure offline storage16 (Lectre Notes on Mobile Application Development.pdf, n.d.)18. (Julius Azasoo, 2023 - 2024)

### Hybrid Applications

combine elements of both native and HTML5 apps16 (Lectre Notes on Mobile Application Development.pdf, n.d.)19. They are primarily built using web technologies (HTML5, JavaScript) and then wrapped within a thin native container, such as PhoneGap, to access native platform features16 (Lectre Notes on Mobile Application Development.pdf, n.d.).... This approach allows developers to use a nearly identical codebase for different platforms (e.g., Android and iOS) and distribute them through app stores22. (Julius Azasoo, 2023 - 2024)

Web Application Development Web development relies on fundamental internet protocols and powerful frameworks.

### Web Basics

The World Wide Web (WWW), invented by Tim Berners-Lee, serves as an information space where documents are identified by Uniform Resource Locators (URLs), interlinked by hypertext, and accessed via the Internet23. (Lecture Notes on Web Application Development .pdf, n.d.) Web browsers (e.g., Google Chrome, Mozilla Firefox) act as clients, interpreting HTML documents and communicating with web servers using protocols like HTTP24 25. (Lecture Notes on Web Application Development .pdf, n.d.) HTTP (HyperText Transfer Protocol) is a stateless request/response protocol for transmitting hypermedia, while HTTPS is its secure, encrypted counterpart26 (Lecture Notes on Web Application Development .pdf, n.d.)... HTML (HyperText Markup Language) defines the structure and formatting of web pages, supporting elements like text, images, video, and hyperlinks24.. (Lecture Notes on Web Application Development .pdf, n.d.).. XML (Extensible Markup Language) provides modularity for data, structure, and view, allowing custom tags and separation of content from presentation31. (Ze-Nian Li and Mark S. Drew, 2004)

### Backend Technologies and Frameworks

#### PHP

As a server-side scripting language embedded in HTML, PHP is widely used for managing dynamic content, databases, and session tracking32 (Lecture Notes on Web Application Development .pdf, n.d.). It is open-source, supports numerous databases, and is known for its execution speed32 33. (Lecture Notes on Web Application Development .pdf, n.d.) PHP can perform system functions, handle forms, and manage user access33 34. (Lecture Notes on Web Application Development .pdf, n.d.)

#### MVC Framework

The Model-View-Controller (MVC) is an architectural pattern that separates an application into three logical components: Model (business logic, data interaction), View (user interface, data rendering), and Controller (handles requests, manipulates data, interacts with views)35 36. Popular PHP MVC frameworks include CodeIgniter, Kohana, Cake PHP, and Zend, each offering distinct features like lightweight design, robust security, or rich component sets37....

#### Servlets and JSP

Servlets are Java server-side programs acting as a middle layer between web browsers and server-side resources like databases, enabling dynamic web page creation3940. They offer better performance, portability, and security41. JavaServer Pages (JSP) build upon Servlets, embedding Java code directly into HTML to streamline content modification and designer collaboration4243.

Spring Framework

Spring simplifies the creation of Java enterprise applications, offering a robust MVC framework for flexible and loosely coupled web applications4445. Spring Boot further enhances developer productivity by providing minimal configuration and embedded application servers, supporting features like tracing, metrics, and battle-tested security protocols (SAML, OAuth, LDAP)4647.

#### Django

A Python-based web framework, Django is known for rapid application development due to its "batteries included" philosophy, offering built-in features for user authentication, administration, forms, and file uploads4849. It follows an MVC-like architecture, separating model (business logic), view (UI logic), and controller (handled by Django itself)50.... Django's scalability and the extensive Python library ecosystem allow for advanced integrations like machine learning and image processing4950.

# IMPACT OF COMMON DEVELOPMENT TECHNOLOGIES AND FRAMEWORKS ON DESIGN, FUNCTIONALITY AND MANAGEMENT

## Design Impact

Native apps

offer the highest degree of customisation and adherence to platform-specific design guidelines, leading to superior user experience, optimal performance, and native look and feel11.... However, this necessitates separate design efforts for each operating system (e.g., Android, iOS, Windows Phone)54. Designers must consider factors like screen density (e.g., Android's low, medium, high, extra-high densities; iOS's retina/non-retina) and typography (e.g., Android's sp for scalable pixels, iOS's px) to ensure visual consistency and legibility across diverse devices55.... The use of wireframes and prototypes, developed through various tools from paper sketches to specialised software, is crucial for evaluating navigation, interaction, and overall usability early in the design process61....

HTML5 and Hybrid apps

provide cross-platform compatibility, simplifying design distribution, but often result in more generic interfaces that may not fully align with the native look and feel of each OS16.... While hybrid apps can incorporate some native controls, achieving a truly customised aesthetic can increase complexity and development time2265.

## Functionality Impact

Native applications

excel in functionality by providing full access to device-specific hardware features, such as cameras, geolocation, contacts, and secure offline storage11.... This enables rich, high-performance applications with multi-touch gestures and complex interactions1153. Android, for instance, offers features like multi-tasking, resizable widgets, and support for various connectivity options6667.

HTML5 applications

constrained by browser capabilities, have vital limitations in accessing native device functionality and secure offline storage1618. They typically require an internet connection for full functionality68.

Hybrid apps

bridge this gap by offering access to native platform features through a thin container, combining the broader reach of web technologies with enhanced functionality16....

### Web frameworks

like PHP, Servlets, Spring, and Django provide robust server-side functionalities. PHP enables file manipulation, form handling, and extensive database interactions3334. Spring offers comprehensive enterprise-level features including security, data access, and microservice capabilities44.... Django streamlines user authentication, content management, and integrates with powerful Python libraries for advanced features like machine learning and web scraping4850.

## Management Impact

Mobile application management

involves a structured development lifecycle: conceptualization, definition, design, development, and publishing69.... Project teams, ranging from a minimum of a designer and developer to larger multidisciplinary units, require agile collaboration and effective communication, especially for remote work73.... Publishing apps to official stores (e.g., Google Play, App Store) involves fees, adherence to submission guidelines, and navigating distinct approval processes76.... Post-launch, continuous monitoring through analytics tools (e.g., Google Analytics, Localytics) provides insights into user behaviour and app performance, guiding subsequent updates and promotional strategies79....

Web application management

benefits from MVC architecture, which promotes scalable and extensible projects by separating concerns35. HTML5's "write-once-run-anywhere" approach simplifies distribution and support compared to native apps, as updates don't require re-downloading from a store64. Frameworks like Spring Boot accelerate development with minimal setup, enhancing developer productivity46.

# IMPACT OF WEBSITE DESIGN ON SEARCH ENGINE RESULTS

The design of a website significantly influences its visibility in search engine results. While the sources do not explicitly detail "SEO techniques," they highlight aspects that are inherently linked to search engine optimisation. HTML5 web applications, by nature of being web-based, make their content "searchable," which is a considerable advantage for applications like online shopping17.

Traditional search engines primarily rely on text-based queries and the hierarchical structure of information, where hyperlinks between web pages (identified by URLs) are crucial for navigation and content discovery8283. For visual content, such as images and videos, dedicated content-based retrieval systems (e.g., C-BIRD) utilise features like colour, texture, and shape to find relevant matches84.... However, these systems face challenges like the "sensory gap" (discrepancy between an object and its computational description) and the "semantic gap" (difficulty in machine interpretation of image semantics for user understanding)8487.

# IMPROVE WEBSITE RANKING USING SEARCH ENGINE OPTIMIZATION (SEO) TECHNIQUES

While the provided sources do not directly offer a comprehensive explanation of specific Search Engine Optimisation (SEO) techniques for improving website ranking, they do allude to concepts that are foundational to searchability and content retrieval.

The ability for HTML5 applications to have their content on the web inherently makes them "searchable"17. Effective content, regardless of its format (text, images, video, or audio), contributes to its discoverability. Technologies for content-based retrieval for images and videos, by categorising and indexing features such as colour, texture, shape, and even facial expressions or spoken documents, enable broader search capabilities beyond mere text8889. The use of keywords, extracted through techniques like word stemming and frequency counting, can be used to parse titles and captions, enhancing their discoverability within databases and for hyperlink generation90.

Furthermore, mechanisms like "relevance feedback" in content-based image retrieval systems, where user input refines search results by adjusting weighting systems, underscore the importance of aligning low-level features with high-level user concepts, indirectly improving search performance over time9192. Although these are primarily for content retrieval within a database context rather than general web ranking, they illustrate principles of how digital content can be made more accessible and relevant to user queries.

# Conclusion

Modern web and mobile application development encompasses a diverse ecosystem of technologies and frameworks, each with unique impacts on design, functionality, and management. Native mobile apps offer unparalleled user experience and access to device features, while web and hybrid approaches prioritise cross-platform compatibility and ease of distribution. Robust web frameworks provide powerful backend functionalities crucial for dynamic content and complex operations. The inherent searchability of web content and the evolving landscape of content-based retrieval are key for discoverability, although explicit SEO techniques are not detailed in the provided materials. The continuous evolution of these technologies underscores the need for designers and developers to adapt and innovate to meet user demands in an increasingly interconnected digital world.

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