An introduction to Web Engineering

Chapter -1

Why web engineering?

- From info medium to Application medium
- Web applications today are full-fledged, complex software systems
- Technologies and standards are used as a development platform and as a user platform at the same time

A Web application is a software system based on technologies and standards of the World Wide Web Consortium (W3C) that provides Web specific resources such as content and services through a user interface, the Web browser.

Web

- The term "web" commonly refers to the World Wide Web (WWW), which is a system of interconnected webpages and resources that are accessible via the internet. It is a network of information and services that allows users to access and share multimedia content, communicate with others, conduct research, and perform various tasks online.

Key Components of web

- **Web Pages**: Web pages are documents written in HTML (Hypertext Markup Language) that can contain text, images, videos, links, and other multimedia elements. These pages are hosted on web servers and are accessible through web browsers.
- **Hyperlinks**: Hyperlinks, or simply links, are clickable elements on web pages that allow users to navigate between different pages and resources on the web. By clicking on a link, users can access related content, websites, documents, or multimedia files.
- **Web Browsers**: Web browsers are software applications used to access and view web pages on the internet. Popular web browsers include Google Chrome, Mozilla Firefox, Apple Safari, Microsoft Edge, and Opera.

Key Components of web

- **URLs (Uniform Resource Locators):** URLs are addresses used to identify and locate resources on the web. They consist of several components, including the protocol (e.g., http:// or https://), domain name (e.g., www.example.com), and specific path or page identifier (e.g., /page1.html).
- **Web Servers:** Web servers are computers or systems that store and deliver web content to users over the internet. When a user requests a web page, the web server processes the request, retrieves the requested page or resource, and sends it back to the user's web browser.
- **Internet Protocols:** The web relies on various internet protocols, including HTTP (Hypertext Transfer Protocol) and HTTPS (HTTP Secure), for transferring data between web servers and clients securely and efficiently.
- **Search Engines:** Search engines like Google, Bing, and Yahoo index web pages and provide users with a way to search for specific information or content on the web. Users can enter keywords or phrases into a search engine's search bar, and the search engine returns relevant results from its index.

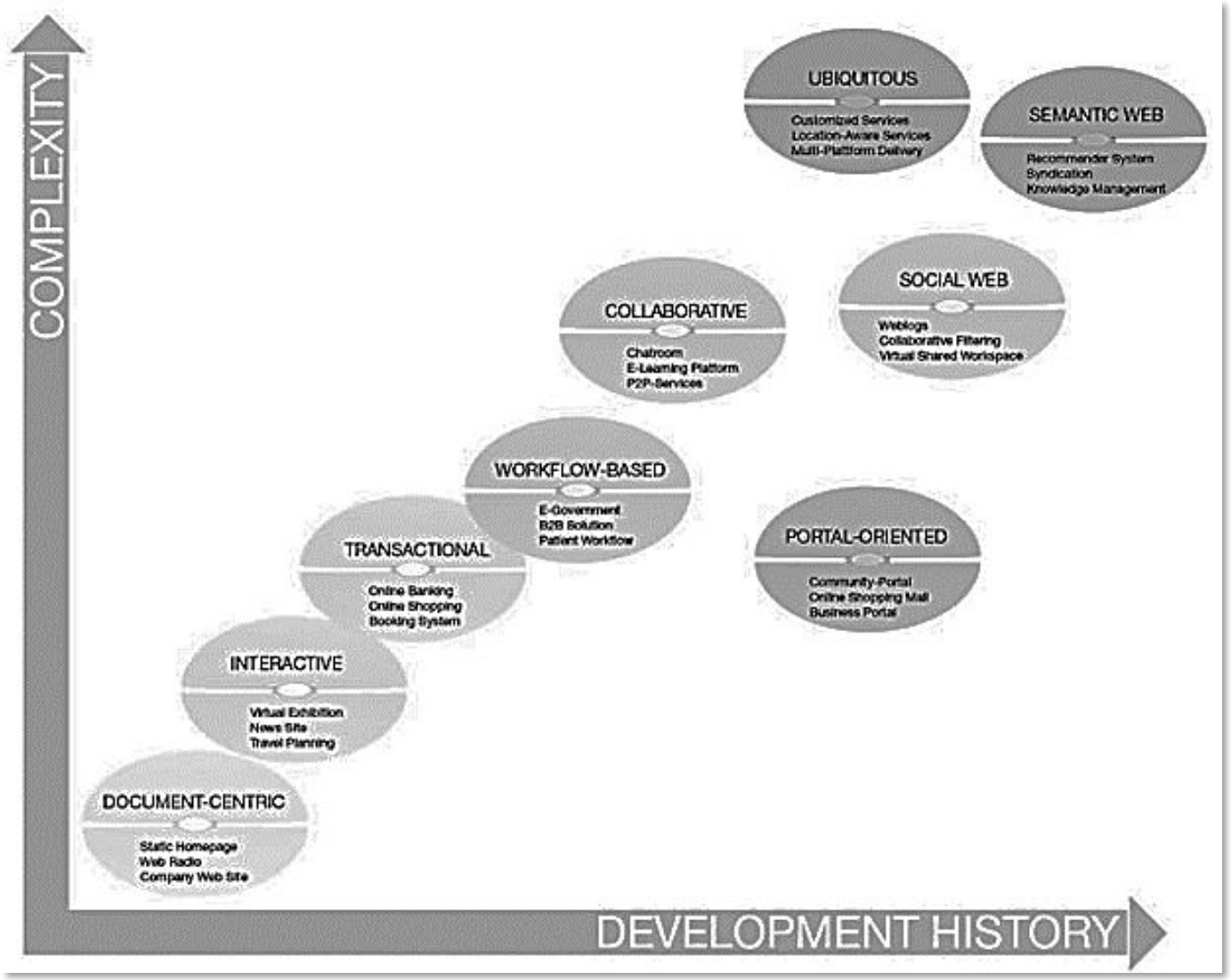
Web Application

- A web application, often referred to as a web app, is a software application that runs on web servers and is accessed through a web browser over a network, typically the internet. Unlike traditional desktop applications, which are installed locally on a user's device, web applications are accessed remotely through the web browser, allowing users to interact with them regardless of their location or the device they are using.

Web Engineering

- Web engineering is a discipline that focuses on the systematic, disciplined, and quantifiable approach to the development, operation, and maintenance of high-quality web-based systems and applications. It involves applying engineering principles, methodologies, and techniques to design, build, deploy, and manage web-based solutions that meet user requirements, adhere to industry standards, and satisfy business objectives.

Categories of Web Applications



- Document centric
- Interactive
- Transactional
- Workflow-based
- Collaborative
- Social Web
- Portal-oriented
- Ubiquitous
- Semantic Web

Document centric Web application

- precursor to Web applications
- stored on a Web server as static HTML docs and sent to the Web client in response to a request
- updated manually
- often results in outdated information
- Danger of inconsistencies
- simplicity and stability
- Short response time

Example:

Static homepages, simple web presences for small businesses belong in this category.

Interactive Web application

- CGI (Common Gateway Interface) and HTML forms based
- Dynamically generated Web pages and links

Example:

- virtual exhibitions,
- news sites,
- timetable information.

Transactional Web application

- more interactivity
- Data Driven
- Allow info. update by user
- efficient and consistent handling of the increasing amount of content

Example:

- Online banking,
- online shopping
- booking systems
- Hotel website+room booking system

Workflow-based Web application

- handling of workflows within or between different entities
- Interoperability
- require a certain structuring of the automated processes and operations
- Challenges:
  - complexity of the services
  - the autonomy of the participating companies
  - robust and flexible workflow

Example:

- B2B solutions in e-commerce
- e-government applications in the area of public administration
- Web-based support of patient workflows in the health sector.

Collaborative Web application

- Groupware
- High degree of communication between the co-operating entities
- support shared information and workspaces

Example:

- Wiki
- Google meet
- E-learning platforms (google classroom)
- Scheduling systems

Social Web application

- Find Related objects of interest
- Find people with similar interests
- people provide their identity to a community of others with similar interests

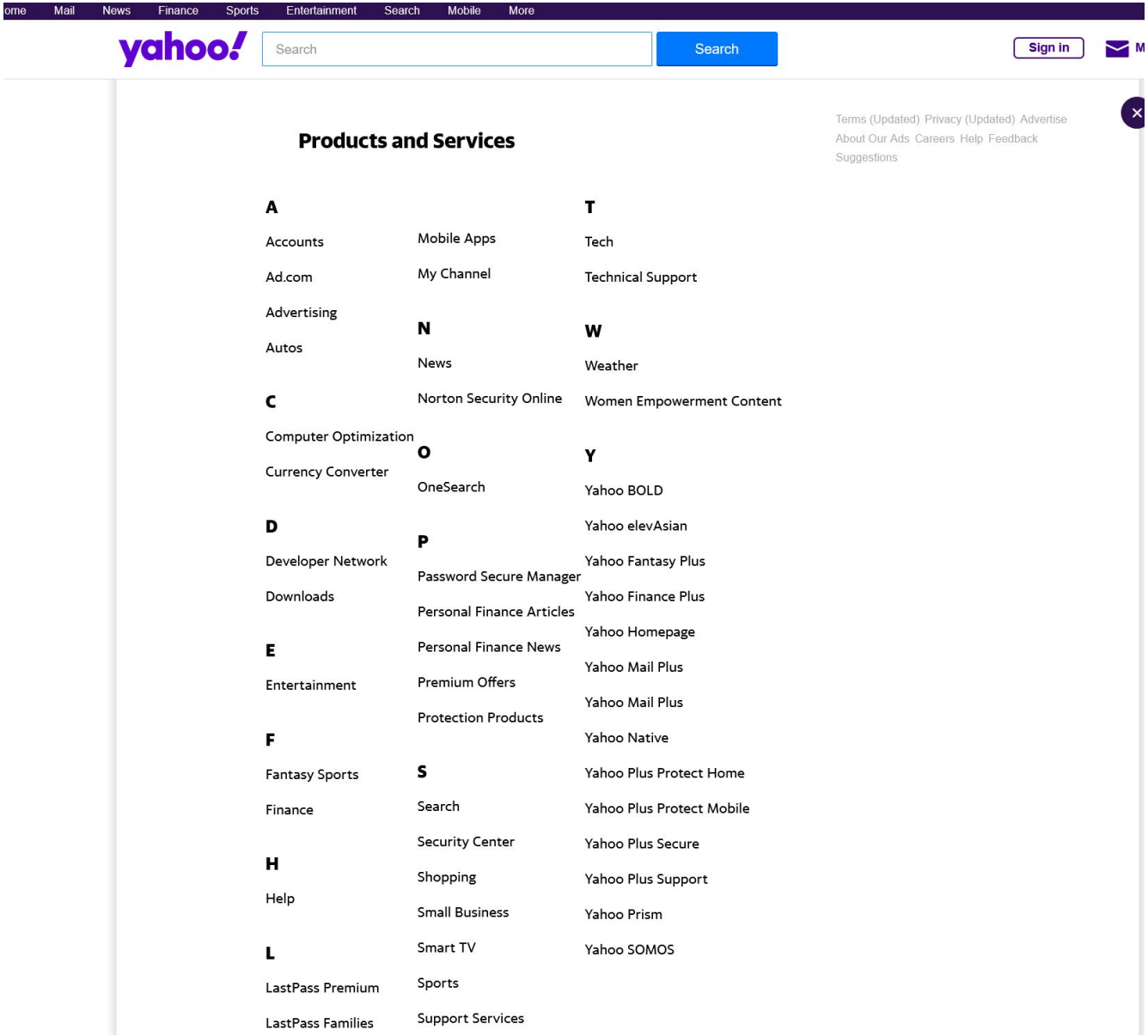
Example:

- blogs
- Friendster
- Facebook
- Quora

Portal-oriented Web application

- Central hubs to access web
- Provides single point of access to separate, potentially heterogeneous sources of information
- specialized portals
  - business portals
  - marketplace portals
  - community portals
  - Healthcare portal

Yahoo!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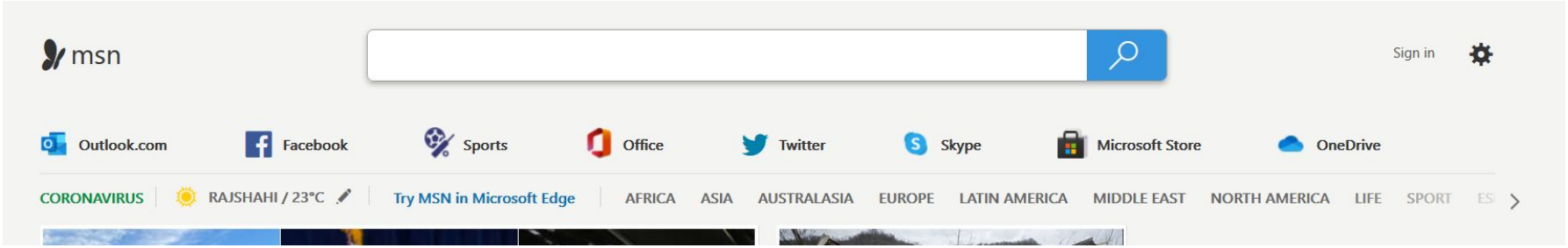
MSN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MIDDLE EAST
NORTH AMERICA
LIFE
SPORT

Ubiquitous Web application

- The term "ubiquitous web application" refers to a type of web application that is accessible and available everywhere, seamlessly integrating into users' daily lives across various devices and platforms.

Ubiquitous Web application

- **Cross-Platform Compatibility:** Ubiquitous web applications are designed to work across different devices and operating systems, including desktop computers, laptops, smartphones, tablets, and other internet-connected devices.
- **Responsive Design:** These applications employ responsive design techniques to adapt their layout and functionality based on the screen size and device capabilities, ensuring a consistent user experience across various platforms.
- **Offline Functionality:** Many ubiquitous web applications provide offline capabilities, allowing users to access certain features or content even when they are not connected to the internet. Offline data synchronization ensures that users can work seamlessly across devices and maintain continuity in their tasks.
- **Cloud-Based Infrastructure:** Ubiquitous web applications often rely on cloud-based infrastructure for storage, processing, and scalability. This allows users to access their data and services from anywhere with an internet connection and ensures high availability and reliability.

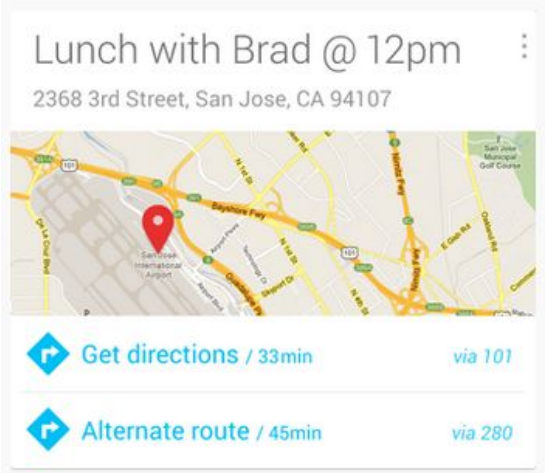
Ubiquitous Web application

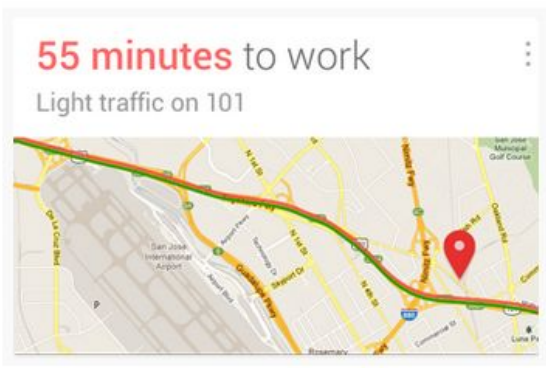
- **Location Awareness:** Some ubiquitous web applications utilize location-based services to deliver personalized content, recommendations, or functionality based on the user's geographic location. This enhances the relevance and usefulness of the application in different contexts.
- **Integration with Native Features:** Ubiquitous web applications may integrate with native device features and capabilities, such as cameras, GPS, sensors, and push notifications, to provide enhanced functionality and user interactions.
- **Seamless User Experience:** The goal of ubiquitous web applications is to provide a seamless and frictionless user experience, allowing users to transition seamlessly between devices and environments while maintaining continuity in their tasks and interactions.

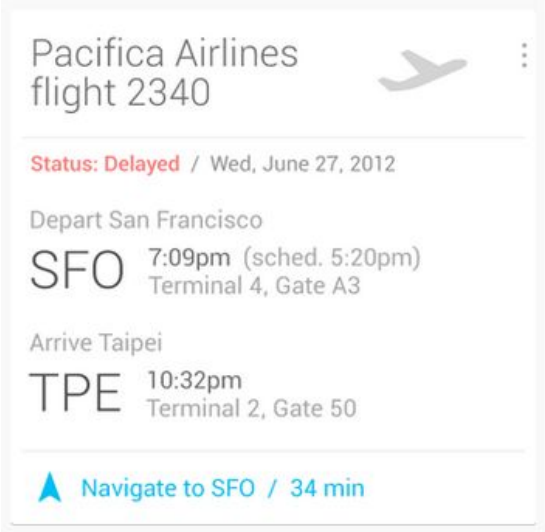
Ubiquitous Web application

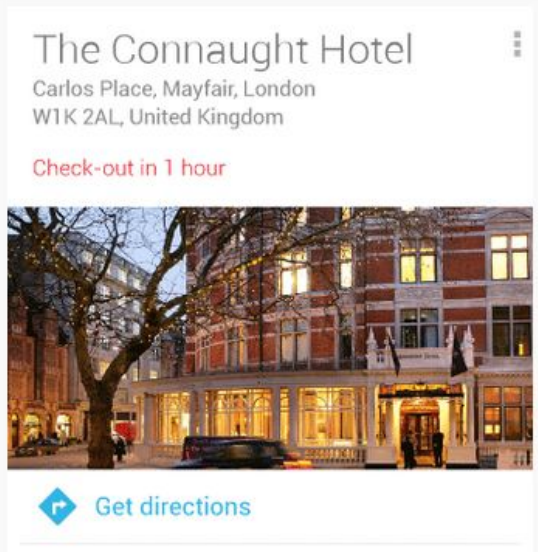
- Customized services anytime anywhere and for any device
- personalization (dynamic adjustments according to the users' situation)
- location-aware services
- Limitations:
  - Limitations Of Mobile devices
  - The context

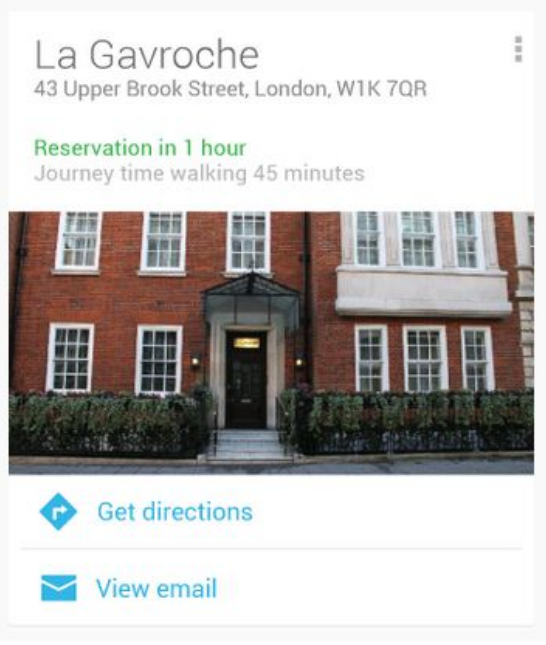
Example of Ubiquitous Web App (Google Now)











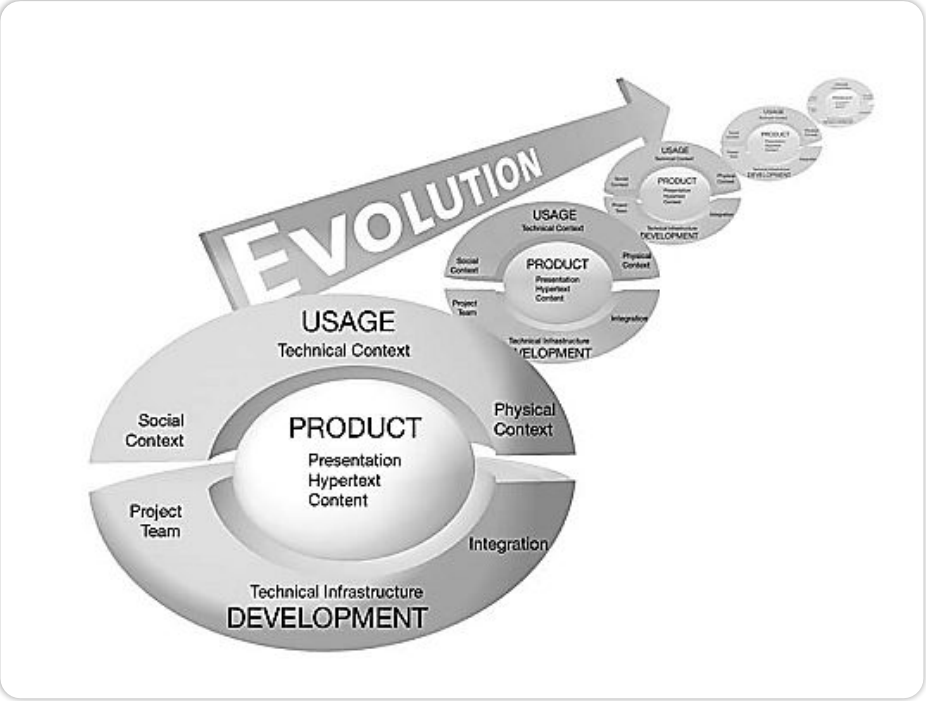
Semantic Web application

- Presenting information on the Web not only for humans, but also in a machine-readable form
- Facilitate knowledge management on the Web
- Content syndication
- Locating new relevant knowledge, e.g. by means of recommender systems
- Supports more ubiquitous

```
SELECT
        price, spec, photo
FROM
        Internet
WHERE
        product_name  LIKE ‘iphone’
```

Characteristics of Web Applications

- Web applications differ from traditional, non-Web-based applications in a variety of features worth looking into
- Characteristics and arranged along 4 dimensions
  - Product
  - Usage
  - Development
  - Evolution



Characteristics of Web Applications

- Product-related Characteristics
  - Content
  - hypertextual structure (navigational structure)
  - presentation (the user interface)

Product-related Characteristics

- Content
  - Content is equally important as the Web application
  - Web application developers : programmers and authors
  - provided as tables, text, graphics, animations, audio, or video
  - Targeted to certain user groups
  - Content Quality
    - Update frequency
    - exact, consistent and reliable

Product-related Characteristics

- Hyper-text
  - a basis for the structuring and presentation of information
  - Non linear
  - Basic elements
    - **Nodes :** uniquely identifiable info unit
    - **Links :** path form one node to another
    - Anchor :
  - Problem:
    - Disorientation: lose ones focus while browsing
    - cognitive overload : overwhelmed by the amount of info

Product-related Characteristics

- Presentation

  Two special features of Web applications at the presentation level

  - **Aesthetics**
    - Look-and-feel
    - Visual presentation of web pages
    - often determines success or failure
  - **self-explanation**
    - should be possible to use without documentation.
    - interaction behavior must be consistent

User-related Characteristics

- Heterogeneous usages
- Users vary in numbers and cultural background
- devices have differing hardware and software characteristics
- The usage of Web applications is characterized by the necessity to continuously adapt to specific usage situations, so-called contexts

User-related Characteristics

- Social Context: Users
- Technical Context: Network and Devices
- Natural Context: Location and Time

Social Context: Users

- Spontaneity:
  - user cannot be expected to be loyal
  - users will only use if it appears to bring them immediate advantage.
  - Unpredictable user load
  - Scalability is extremely important
- Multiculturality
  - developed for different user groups
  - large and hardly foreseeable heterogeneities in terms of abilities, knowledge and preferences
  - Personalization is difficult
  - User context must be made a development stage

Technical Context: Network and Devices

- Quality of Service:
  - bandwidth, reliability, and varying stability of the connection are independent factors that must be considered to guarantee appropriate quality of service

- Multi platform delivary
  - offer services to devices with very different specifications (e.g. monitor size, memory capacity, installed software)
  - different browser
  - difficulties in creating a consistent user interface and in testing Web applications

Natural Context: Location and Time

- Globality:
  - internationalization
  - location-aware services
  - security of Web applications (content restriction)
- Availability
  - Immediately available
  - Permanent availability demand stability

Development-related Characteristics

- The Development Team
- Technical Infrastructure
- Process
- Integration

The Development Team

- Multidisciplinary

Case Study

- SafeHomeAssured.com

Pressman (page-4)

Are WebApps Really Computer Software?

How they are different from conventional Software?

Attributes that distinguishes them

- Network intensiveness
- Concurrency
- Unpredictable load
- Performance
- Availability
- Data driven
- Content sensitive.
- Continuous evolution
- Immediacy.
- Security
- Aesthetics