Preface

Information systems have long moved to Web with concomitant effect on a flock of associated aspects, some of which are Web technology, semantics, application domain, organization, distribution, storage, access, information assurance and development. The practice on each of those aspects has independently evolved over time more or less equally, yet some, such as, analytics, security and cloud dominance have played more of an important part. So, it is timely to collate a compendium for ready reference displaying the state of art on Web-based systems.

Web-based systems are software application infrastructure suites accessible via a Web browser over a network connection using HTTP. They contain assorted set of well-evolved tools involving programs, storage, communication and protocols molded together to provide integrated functionality (Collis & Moonen, 2009). The most visible side of a Web-based system would be the application. A Web-based application runs inside a Web browser, yet it may as well be a client-based one, that is, a small part of the program is downloaded to a user terminal, be it a PC, pad or smart phone, but processing is done over the Internet on a remote server. Web-based applications are often called as Web apps. Some examples are light applications such as Flash games, online utilities as calculators and calendars; Web services such as WebEx, eBay, and Internet (electronic) banking. The application spectrum further extends from Web-based word processors and spreadsheet applications to Dropbox and likes, and web email services such as GMail, and Yahoo, as well as more intensive enterprise information and management systems. And lately, the cloudized versions of those mentioned where usually the difference is not noticeable by the user.

A simple search on "web-based systems" returned more than 221 million results on Google. Ubiquity of Web-based systems is no surprise given the significant advantages availed, such as, streamlining and improvement of business processes, providing cross platform compatibility, secure live data, reduced costs, being highly accessible, highly deployable, easily managed and updated. Complemented by advances in security and technology, web-based systems have become the information mainstay of businesses, government organizations, and social structure of the society.

As systems moved into the "web-based world," information systems development underwent a radical shift (Harindranath & Zupancic, 2002). At about this time two important concepts were recognized at the outcome of developments that took place. The first is the term 'Web Engineering'; it came to be pronounced "taking inspiration from software engineering" and in "an explicit acknowledgement of the multi-dimensional nature of Web applications" due to the need to manage diversity and complexity of Web application development (Murugesan & Deshpande, 2001). The second is the realization that Web has been for people to read and interpret and not for machines; that is, the Web content used by human beings was not equally understandable by programs and that 'the data' was not available on its own sake

as it came attached to its program. "A new form of Web content that is meaningful to computers" would be likely to foster "a revolution of new possibilities," that is called "The Semantic Web" (Berners-Lee, Hendler, & Lassila, 2001). Then on, a new genre of Web technology followed that is structured by specific linguistic expressions based on new standard languages. There came communally recommended specifications of Resource Description Framework (RDF, https://www.w3.org/TR/rdf-primer/) and Web Ontology Language (OWL, https://www.w3.org/TR/owl-features/). Subsequently, many others followed this first step towards redesigning the Web-based World through consensus-built community standards (https://www.w3C.org).

The euphoria created by semantic Web initiative led to proposition of a proper scientific base for 'Web' in particular and Web-based systems in general, that is, a transitioning to a 'Web Science'.

Significant research must still be done to be able to engineer future successful Web applications. We must understand the Web as a dynamic and changing entity, exploring the emergent behaviors that arise from the "macro" interactions of people enabled by the Web's technology base. We must therefore understand the "social machines" that may be the critical difference between the success or failure of Web applications and learn to build them in a way that allows interlinking and sharing. (Hendler, Shadbolt, Hall, Berners-Lee, & Weitzner, 2008)

Web science is taken by many as an enlightening vision and engineering initiative towards building 'the Knowledge Society' (Lytras et al., 2009). By all means, the vision and the drive associated with it are still prevailing today.

Web-based systems were developed using static HTML pages. The technology advanced to respond the need for attractive, changing, interactive, and adaptive presentations through new and evolved tools such as HTML5 and CSS, client-side scripting in JavaScript, XML and Ajax, application development using PHP, ASP.NET in C#, Java Server Faces (JSF), Angular (https://angular.io/) and comparable others. It became possible to address user needs for dynamism through adaptive behavior embedded into the Web pages such as adaptive systems (Wade, Ashman, & Smyth, 2006), user self-service systems (Cooper, Lichtenstein, & Smith, 2009), and e-commerce (Oliver, Livermore, & Sudweeks, 2009) to name a few. The evolution of existing tools and techniques as well as generation of brand new ones used for creating dynamic, responsive, collaborative, adaptive, and semantic oriented Web applications has been continuing ever since.

Web-based systems have been picked up as prime information system by almost all walks of life, study, science, business, government, and enterprises. By and large, education, be it in science or in practice, was one of the early fields of study that picked up information technology, Web, and Web-based systems as early as 1997 (Khan, 1997; http://badrulkhan.com/; Goeller, 1998). The drive is still continuing also incorporating semantic modelling, metasystems and metacognition to name a few topics (Elçi, Elçi, & Çelik, 2016; Elçi, Vural, & Elçi, 2017; Railean, Elçi, Çelik, & Elçi, 2015; Railean, Walker, Elçi, & Liz, 2016), question chain learning mechanism (Zhang & Chu, April 2016), and Massive Open Online Courses (MOOCs, http://mooc.org/; http://moocs.com/about/).

Another important early adaptor of Web-based systems was the e-health and health care related sectors, for example for clinical studies (Veerbeek, Voshaar, & Pot, 2012), disease surveillance (Choi,

Cho, Shim, & Woo, 2016), personal health records (Markle Foundation, 2003; Wang & Dolezel, 2016). Let me also mention Protégé (https://protege.stanford.edu/), the best ontology editor there is offering a suite of tools to construct domain models and knowledge-based applications with ontologies, which was created in a medical school as PhD thesis way back in 1988!

Moving to cloud technology use for Web-based systems and concomitant evolution of Internet of Things, Web of Things, big data and the use of analytics appear to have already created a series of disrupting innovations. It is sure that big data and analytics will carve a big niche in everyone's future (Elçi, 2016, 2017).

OBJECTIVE OF THE BOOK

This book provides a sample of relevant theoretical frameworks, current practice guidelines, industry standards and the latest empirical research findings in web-based systems. Chapters are written by professionals who helped improve understanding of the issues and their strategic role in wherever Web-based application systems have penetrated.

TARGET AUDIENCE

The target audience of this book is professionals and researchers working in the field of Web-based information systems in industry, commerce, education, health, government and research in various disciplines, e.g. enterprise application, social networks, information technology, semantic technology, analytics, and knowledge management. The book as well provides insights and support for executives concerned with the management of Web-based systems in different types of application environments.

ORGANIZATION OF THE BOOK

The book is organized into four sections containing totally 20 chapters.

Section 1: Engineered Web Now!

Section 1 introduces web-based systems as sophisticated software environments accessible via a Web browser over a network connection using HTTP; and, goes ahead covering sample cases of Web engineering. Sampled in this section are the Chapters 1 through 6. A brief description of these chapters follows.

Chapter 1 proposes a logical architectural model of Web-based enterprise application development and evolves a lifecycle addressing many challenges faced, visually, related to system automation, security, harmonizing data, integration of data and application, user demands, selection of technology, internationalization, so on. Also addressed is the skill set required and challenges faced for developing Web-based enterprise applications.

Chapter 2 suggests a life cycle model based on service-oriented architecture and shows steps to integrate web applications using the Web services.

Chapter 3 presents an enhanced framework that eases the process of integrating tag software into web application. The framework addresses issues in requirement elicitation, development, testing, and updating phases.

Chapter 4 identifies challenges and best practices in main approaches and principles adopted by web design and e-business companies in creating immersive user experiences through several structured case study interviews vis-à-vis design of Web and mobile applications.

Chapter 5 outlines a new approach to automatically detect learner's thinking and learning styles, considering they may change over time in an unexpected and unpredictable way. This approach, based on the Felder Learning Styles Model and Hermann thinking styles model, aims at facilitating Adaptive Social Network Site (ASNS) in order to increase the efficiency in Web-based learning.

Chapter 6 presents several use cases of the "Web in your Pocket" (WiPo), offline access to pre-curated Web resources. The important WiPo use cases considered, namely, tourism, health, & search and rescue, demonstrate the potential of WiPo.

Section 2: Web of Things and Semantics Employed

Section 2 introduces the data availed through Internet/Web of Things cases and how to make some sense of it for use in Web-based information systems. Sampled in this section are the Chapters 7 through 10. A brief description of these chapters follows.

Chapter 7 addresses the need to schedule the operation of home appliances in order to reduce the electricity demand, thus cost, of homes by Home Energy Management System (HEMS). This study considers extracting valuable sequence pattern and association rules from large amounts of raw data generated by in-house sensors. Such knowledge mining discovering useful findings on resident behavior helps HEMS managing home appliance electricity demand.

Chapter 8 evolves a semantic approach for monitoring and development of training processes for individuals with Autistic Spectrum Disorder (ASD) along with supporting these processes and extending them. The "Instructive Activity Suggestion System" (IASS) provides an agent-based instructive and educational activity suggestion system for children and their parents.

Chapter 9 examines adoption of ever-growing Web of Things in healthcare delivery, as a modality to change how healthcare can be accessed improving the quality of life. There are good reasons to anticipate that the healthcare sector will overcome obstacles and progress, taking positive steps to embrace IoT/WoT technology, albeit at a slower pace than in other sectors.

Chapter 10 proposes a novel approach contributing to the field of temporal information retrieval area. This approach concerns classifying queries on the basis of query event time, that is, detection of temporal classes on the basis of query temporal profile in order to deduce query intent.

Section 3: Semantic Technology Forward

Section 3 looks into theory and practice of the web beyond World Wide Web and introduces semantics-based operating milieu. Sampled in this section are the chapters 11 through 16. A brief description of these chapters follows.

Chapter 11 presents a new approach for the ontology alignment change problem. It proposes a formal framework consisting of a number of phases in order to facilitate capture of ontology change for maintainers. The framework evolves alignment maintaining consistency with a minimal of change, and permits maintainers validate the new alignment.

Chapter 12 presents a new integration system for heterogeneous data in a P2P environment, called MedPeer. The system employs a method for finding similarities between local concepts in data sources and those of domain ontology through a global similarity measure. The tool allows dealing with concepts contexts where the neighborhood used is not limited to direct links of concepts but goes further by exploiting indirect ones.

Chapter 13 proposes a comprehensive approach for schema versioning in τXSchema-based multitemporal XML repositories. The approach allows designers changing the temporal schema, the conventional schema, and their logical and physical annotations. This then corresponds to supporting transaction-time schema versioning of temporal data.

Chapter 14 provides a general overview of a framework for semantic Web services discovery. It shows different kinds of agents composing the proposed architecture and how they are organized in using communication, services description, semantic matching algorithm, satisfying quality of service requirements, and integration of user profile in services discovery process.

Chapter 15 discusses Web services composition at both design and deployment time considering both Functional Requirements (FRs) and Non-Functional Requirements (NFRs). This work suggests a complete approach consisting of modeling NFRs as scopes and defining their interdependencies, performing a composition with associated FRs, and verifying the conformance of generated result according to user's requirements.

Chapter 16 advances a novel approach in building patterns-based semantic mashups. Recognizing key challenges of semantic composition of Web services, such as creation and/or modification of workflows, computing similarities between data in various services, and automating construction of enhanced composite application, this chapter thus enhances the integration quality of data and services in generating mashup applications.

Section 4: Analytics to the Rescue?

The final section of the book, recognizing the need to deal with knowledge recovery from multiple semi-/un-structured data sources without pre-specified clear semantics, thus, looks into essentially statistical approaches. Sampled in this section are the Chapters 17 through 20. A brief description of these chapters follows.

Chapter 17 provides a brief introduction to social network analysis and outlines advancement as well as limitations on some recent topics high on popularity, such as, influence analysis, community detection, and link prediction.

Chapter 18 presents a working model of named-entity disambiguation techniques and mapping entities to correct matches in, for example, DBpedia. Also considered are the difficulties in the extracted named-entity connecting procedure.

Chapter 19 discusses a Dynamic Quota Calculation System for dynamically allocating and charging usage in Mobile Data Communication Systems. This approach uses two cascaded routines: Self-Organizing Map clustering based on a Sliding Window followed by Markov Chain routine. This way, optimal quota arrangement in the current system and maximum efficiency in signalization are achieved.

Chapter 20 investigates effective and efficient ways to carry out text mining and sentiment analysis on real datasets for a real business issue. The outcome of this work, which is an innovative customer rating framework merging text clustering and sentiment scoring, produces interesting insights that could be used for further research and in other businesses.

Atilla Elci
Aksaray University, Turkey

THANKS

I owe sincere thanks to many fine people who pitched in their effort for this book. Without many authors who offered their best academic studies this book would not have become a reality; I appreciate their contributions. I am hereby expressing my gratitude to the many reviewers who supplied insightful comments on these submissions, thus helping me decide and select the best contributions.

My special thanks go to (Ms) Jan Travers, Director of Intellectual Property and Contracts at IGI Global, for offering me the chance to prepare this summation volume. Support of Colleen Moore and Maria Rohde, also of IGI Global, were greatly appreciated.

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