



## Effective Information Architecture for Web based Systems

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**Abstract:** *Information is the most valuable resource for any organization and plays a crucial role in decision making. With the advancement in Web engineering, the nature of business changed as web sites became more information intensive. The user has the freedom to interact with the digital information in a number of ways, using a variety of devices. The superabundance of information has led to loss of control over the information, further resulting in newer challenges in effective performance of managerial functions. Information Architecture (IA) is an exact information organization and management approach, which aims at organizing information over shared environments to support findability and usability. It is imperative to create an effective Information Architecture, which assists the user to step logically through a system, convinced that he is getting closer to the information that is being required. This paper discusses the significance of an effective Information Architecture in accessing right information and the steps to develop an effective IA.*

**Keywords-** *Information Architecture; Effective Information Architecture; Information Access; Web site design; Information Systems.*

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### I. INTRODUCTION

It is well said “Data and content are more and more important and valuable than hardware, and must last much longer”. With the rapid growth in Web technologies, the data which was earlier proprietary to the companies engaged in traditional business is now available and accessible to many. The digital information is open and accessible to the user from different contexts, with a variety of devices. It is essential to understand whether the information is useful and relevant. Timely availability of relevant information is a major concern. IA is an emerging discipline contributing to the goal of finding necessary information, by providing a holistic view on the flow of information in an enterprise.

Information Architecture can be described as “a process for describing and classifying information”. It is the art of expressing a concept or a model of information used in activities that require explicit details of complex systems. This term was originally coined by Richard Saul Wurman, who was an architect & a graphics designer.

Information Architecture is a phrase made up of two words – “information” and “architecture”. Information is the data or facts & figures having some meaningful form to the user. When the data is processed, information is attained. A piece of data may be information for one; it may be just a combination of numbers & text for another. This depends upon the context in which it is being viewed. Architecture is the art and science of designing and constructing buildings and other physical structures. It is both the process and product of planning, designing and constructing form. From the information technology perspective, it refers to the activity of designing any kind of system. It is a formal description of a system, or a detailed plan of the system at component level to guide its implementation. [1]

Information architecture is most commonly associated with websites and intranets, but it can be used in the context of any information structures or computer systems. An Effective Information Architecture is indispensable to an enterprise or a web based system, leading to high user experience and attainment of the goals of findability and usability.

### II. INFORMATION ARCHITECTURE

Information architecture is defined by the Information Architecture Institute as [2]:

1. The structural design of shared information environments.
2. The art and science of organizing and labeling web sites, intranets, online communities, and software to support findability and usability [3].
3. An emerging community of practice focused on bringing principles of design and architecture to the digital landscape.

It is ‘a high-level map of the information requirements of an organization.’ It is a personnel, organizational and technology independent profile of the major information categories used within an enterprise [7]. The goal of information architecture is to enable the provisioning of right information in appropriate context to the stakeholders who need it. It provides a way to map the information needs of an organization, relate them to specific business needs and document their interrelationships. It provides a proactive basis for Information Systems development.

There are a lot of definition of IA concluded by different researchers and practitioners. The analysis of all the definitions has been presented with the help of a table in [4].

Table 1: Table of Definitions [4]

Definition	Attribute of Definition									
	Year	Structure	Organiz e	Label	Art/ Craft	Science	Business/ Enterpris e	Find/ Use	Manage	Others
Morville & Rosenfeld	2006	√	√	√	√	√		√	√	
IAI	2008		√	√	√	√		√		
Dickson & Wetherbe	1989						√			High level map
Carter	1999						√			Infrastructure
Evernden	2003	√							√	Theory, Principles
Subramaniam	2004	√	√	√		√				Navigate, Index
Wikipedia	2008					√				Model, Concept
Morrogh	2008								√	Environment, design process
NCER	2005		√						√	Data collection, exchange, standards
Garrett	2002				√			√		Purposes, action
Barker	2005	√								Group, Navigate terminology,

### III. EVOLUTION OF INFORMATION ARCHITECTURE

In early times, using computers was considered to be a domain of experts. Internet, in its childhood days, was relatively limited and was largely used by academicians & researchers. Then the web emerged, acting as a catalyst to transform Internet radically [5]. The growth of Web as a global platform resulted in digitization of information.

With the proliferation of Internet & Web technologies, every kind of information is available to the user on the Web. It is just a click away from him, no matter what would be the device to access it. The platform has become more important than the devices. One common example can be banking services. People are no more dependent upon “brick and mortar” style of banking. They are doing banking transactions using mobiles, palmtops, desktops, etc. Thus, Web has become a repository of functionality & content. As more and more data is being put up on the Web, physical boundaries are blurring rapidly. There are no more boundaries between different kinds of information. The augmentation of data has led to an amalgam of information and documents over the web. This information overload has also resulted in greater complexities and loss of control over information. Another challenge being faced by the organizations is how to direct people through the vast amount of information to get what they want in a timely manner.

As data & content are the most valuable things for the user, it has become a great necessity to organize this data in a manner that it is easily & effectively accessible by the user, according to his needs and demands. The internet, e-commerce, organizational interdependencies, knowledge management and systems thinking have helped drive the view of information as a critical organizational asset [6].

### IV. LITERATURE REVIEW

Information architecture forms a significant part of Information Technology (IT) architecture. Several authors have emphasized upon the significance of the magnitude of Data or Information Architecture within IT architecture. IA has been considered as a useful Information Systems (IS) planning and implementation tool, particularly for the organizations using information technology as a strategic tool [12]. In [13], Earl highlighted the importance of strategic management of IT and segmented the field into three domains: Information Technology, Information Systems and Information Management. He used the term Architecture to represent the IT framework into four domains: Computing, Communications, Data and Applications. On similar grounds, different agencies have expressed IT architecture into a number of domains [1, 16, 17], wherein Information domain being a primary domain. Following paragraphs present a brief review of some of the related work done in the area of Information Architecture.

In, the authors have emphasized the inherent relationship between Information architecture and Business Process Reengineering (BPR). The redesigning of business processes is essential in view of the industrial and technological advancements and frequent changing nature of business. They stressed that information architecture is a central element of strategic IT architecture, and emphasized that IA can streamline enterprise-wide cross-functional processes business procedures. In [11], the authors presented an approach to develop global information architecture, which lay a foundation for building IA for a large-scale organization. They explained architectural view of information, by taking example of construction architecture. They pointed out that ‘developing and implementing an information architecture’ may be ranked as the most important IS management issue. They stressed the need for a target architecture that is based on business functions, organization structure and existing applications. They recognized that the data model is always incomplete because of the large size of organization. In [14], the authors also supported their argument to focus on a manageable subset of the organization that is of current relevance and interest, and then gradually expand it for the entire organization. They emphasized the need for appropriate level of accuracy, timing for business initiatives and the much needed commitment from senior management.

With the growth of interest in e-business and e-commerce, a number of information architectures based on the Internet technology have been proposed, but most of these architectures focused on IS and IT strategies, but overlooked Information Management (IM), which is an important aspect. In [21], the authors state information architecture to be an important blueprint for implementing successful e-strategy. They emphasized the need to integrate Information Management strategy with IT and IS strategies, along with organization structure, managerial activities and information use. The authors stress upon strategy and information management aspect, but do not propose a normative model for development of IA. Also, this paper focuses more towards business capabilities and talks less about the technical details related to development of IA. An open research issue is to investigate the effects of contextual factors on the development of information architecture, such as culture, management style, task structure, role, and norms.

IA has been rather neglected amongst the architecture domains in practice. The organizations usually implement e-commerce systems in a haste to have Internet presence, and creation of a soundly managed information base is rarely found. The authors have highlighted six domains of research issues in IA, which could help researcher as well as practitioner [20]. These are technical issues like information quality and security, storage and retrieval, searchability and accessibility, metadata, relationship between information and process; and organizational issues like ownership, governance and organizational structure. Information Architecture should also take into account: determination of data storage locations, use and access, design and administration of databases, the definition and coding of data and communication protocols for interchange between organizations, as well as security and privacy [14]. The business information architecture must not only define technological components, such as application systems, office automation and communications networks, but also consider all aspects of the information requirements of an organization. The authors pressed upon the fact that IA should be flexible enough to satisfy future needs of an organization [21, 22]. He emphasized that information architecture should also take into consideration the functional aspects of information technologies like voice, video, image [22] and proposed five generalized information architectures for global corporations and evaluated their tradeoffs on the basis of a few cost variables. However, these architectures are too generalized to be applied to any specific organization. Also the trade-offs have been considered using only three types of cost variables. There can be more categories of cost variables for consideration.

Information Architecture principles and practices has been successfully used in developing an asynchronous learning environment, to enhance satisfaction amongst online learners. In [23], the author has dealt with the differences between asynchronous learning and traditional learning; and familiarize with the role information architect plays in providing the same experience to the online learner. In [24], the author state that usability is often the most neglected aspect of web sites developed for Web Based Learning (WBL) environments. They recommended the user interface design principles which include consistency, visibility of important elements, formatting of web pages' content, navigational aids and feedback to users. They also suggested some preliminary heuristics for IA evaluation of WBL tools in South Africa. However, this research was limited only to heuristic evaluation through organization, labeling, navigation, searching. It did not take into consideration personalized or customised view of information on the basis of content type, learning style and content functionality; and the aptitude level of the learner. Also, other evaluation techniques could be considered. The prominence of IA methodology in the development of information portal content, guides in building a "user-centered and service-oriented" design [19, 25]. IA integrates the information services and resources and various information systems of the campus in a manner that personalizes web interface and provides understandability and clarity along with usability. The stages are Concept Design, Organize information content, Generate access path to information, Information display and release, Information content maintenance [19]. In [25], the authors discuss how information architecture methodology directs the creation of campus information portal system to result in greater satisfaction amongst the users. The IA methodology is comparable to the System development methodology, keeping information at fore.

An effective Information Architecture can guide in organizing a large amount of information to provide an optimal user experience. In [15], the authors extend the concept of classical Information architecture with features provided by search patterns and advanced interfaces in the case very large content intensive websites. This enhances user experience of searching and navigation to sense making, at-a-glance understanding, playful exploration and serendipitous browsing. They proposed new design strategies to develop enhanced IA which can transform (parts of) websites into Rich Internet Applications (RIAs). Two open research issues are classification and relevance of content items.

The growth in Internet also resulted in the growth of e-commerce and e-business. E-business implies the streamlining and integration of business processes for proper flow of information both internally and externally. The authors elucidate the issues being confronted at the time of e-business system implementation from enterprise architecture viewpoint and propose directions for their problem solving [27]. They also focus upon the need of enterprise architecture viewpoint, while implementing innovations of the business models. These implementations are not effective if only management approach is considered.

## **V. DEVELOPING AN EFFECTIVE IA**

Information Architecture aims at the development of interfaces that facilitate the flow of useful and relevant information to the user. The organizations are mostly 'data rich but information poor' as they lag in accessing useful information from the billions of gigabytes accumulated every day. The problem of information overload could be minimised by developing an effective information architecture, which provides a suitable framework for the information strategy of an organization. It will allow effective flow of information within and outside the organization; to the stakeholders as and when demanded. Further, rapid advances in Internet and web technology need development of such IA frameworks that

consider electronic commerce and electronic business. Thus flexibility and adaptability are key issues to be focused upon.

Information architecture forms a firm foundation for great Web design. It is the blueprint of the site upon which all other aspects are built – form, function, metaphor, navigation and interface, interaction, and visual design. It should be included as a major component of architectural planning and assessment. In [8], the need for an IA checklist to be prepared is suggested which can be used to incorporate IA into the architectural review process. Information Organization and Information access are the most important areas of this checklist. It is of utmost importance to create an effective Information Architecture, so that the user can appreciate the efforts done by the designers & experience a joyful ride into the system. Effective information architectures enable people to quickly, easily and intuitively find content. It enables people to step logically through a system confident they are getting closer to the information they require [9]. Effective information architecture comes from understanding business objectives and constraints, the content, and the requirements of the people that will use the site (Fig 1).

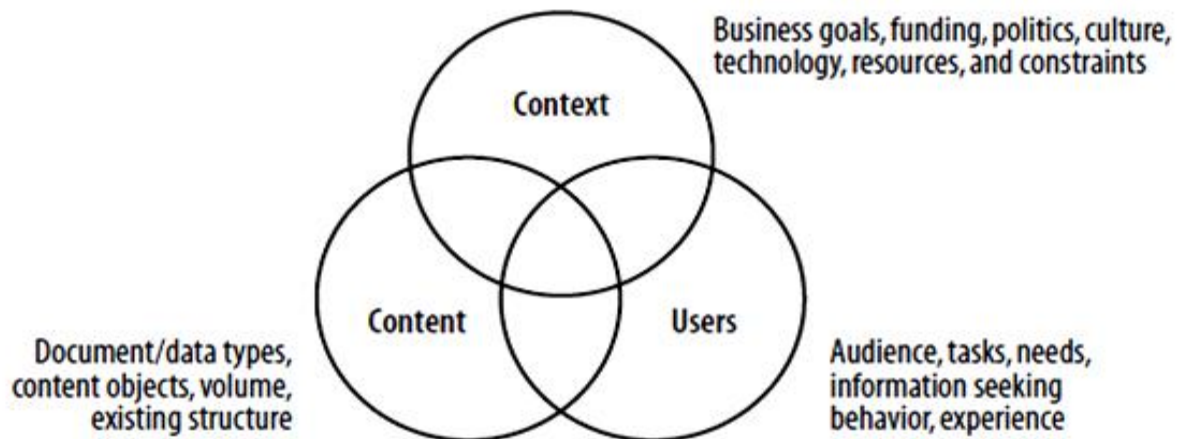


Fig.1. The inputs of information architecture [3]

There are three basic inputs required to develop an IA [11]:

- Business functions: identification of functions needed to be performed in that business to succeed.
- Organization Structure: mapping of organization structure to business functions by determining which manager(s) are responsible for each function. Useful for determining which manager is responsible for development of IA.
- Existing Applications: mapping of existing applications to business functions, in order to determine the functions performed by existing applications.

The development process broadly encompasses five steps (Fig 2):

1) *Initiate an IA process*: Firstly, An IA process should be initiated within the organization, which should aim at defining the purpose or the mission and goals & objectives for the system. For this questionnaires should be prepared & stakeholders should be interviewed.

2) *Define system users*: To be effective, IA should reflect the way people think. The next step is creating a design which focuses on the users or the intended audience of the system. It is essential that the user is involved in creation of information architecture. Scenarios, or story boards, are useful in visualizing the audience. Competitive Analysis is equally helpful in gathering new ideas.

3) *Define the content*: Another important phase is to decide upon the content – both functionality and information. The most effective method for understanding the quantity and quality of content proposed for a system is to conduct a content inventory. Content inventories identifies-

- All of the proposed content for a system
- Where the content currently resides
- Who owns it?
- Defines any existing relationships between content.

They also aid in the process of migrating content between the old and new systems. Then the content can be grouped and labeled to define an overall structure.

4) *Define the structure*: The next step is to define the system's structure, which is the foundation on which you build other elements. A well-designed structure makes it easy to define a navigation system, and the two together make designing page layouts and templates a snap. It involves usage of organizational, functional and visual metaphors for easier navigation.

5) *Define design (Visual design, in case of Web site)*: A good site structure when combined with an effective visual design enables the users to construct a mental map of the site. This involves creating Layout Grids, design sketches and documents.

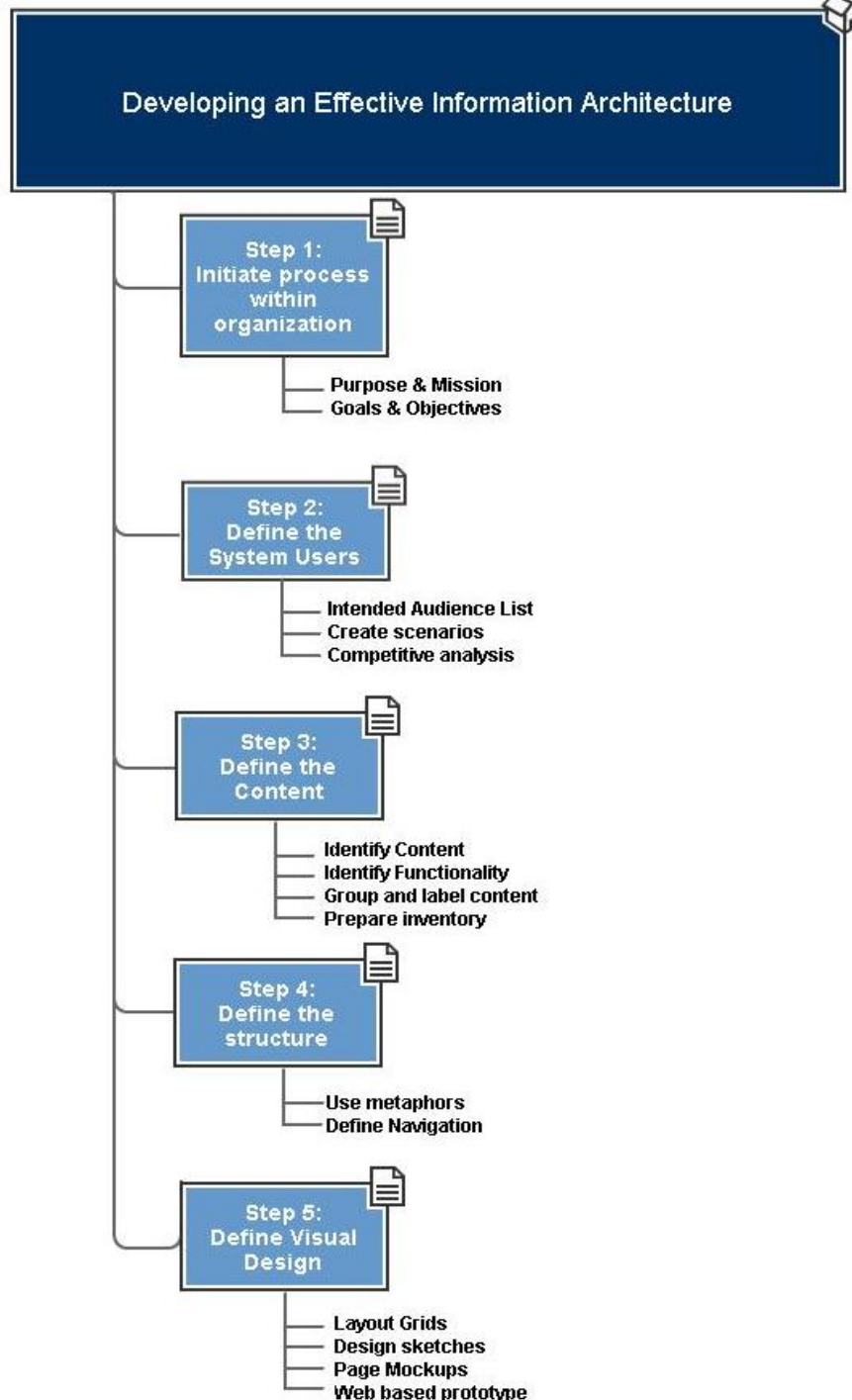


Fig. 2. Steps in Developing an Effective IA

## VI. CONCLUSION

IA plays a significant role in the development of information system. It provides proactive basis for information system development, in order to have a framework for developmental planning & better functionality. IA proves beneficial at all levels of management because development of IA reduces cost of collecting, searching, retrieving and maintaining data in long term. Due to changing nature of Web and growing expectations of the user, it is necessary that the information be organized in such a way that users are facilitated with easy access to information of their interest. An Effective Information Architecture is indispensable to an enterprise or a web based system, leading to high user experience and achievement of his information seeking goals. It establishes an effective dialogue between the user and the system that leads to access of required information effectively and efficiently.

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