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LIBRARY REFERENCE SERVICES BASED ON ARTIFICIAL INTELLIGENCE

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Abstract
Libraries are commonly known for information acquisition and organization - for easy access. The third vital service rendered by the Library is the dissemination of the acquired information, which is more delicate than the acquisition services. Reference services fulfill this third library function which are especially, offered by Library Information Scientists. This arm of Library service, focuses on establishing prompt contacts between users and the right resources, thereby saving the research or searching time of the user. The advent of Digital Library Systems is known to have ignited the massive drift from the traditional library system, which is expected to influence the entire mode of Library service delivery. This further implies that Library Reference services now have to move from offering full human assistance to a digital solution. Data dissemination in the sphere of Information Technology (IT) has gone wild, especially with the implementation of Artificial Intelligence (AI). Since Libraries have decided to join the IT sphere, it is then expected to adopt such competitive dissemination technology for its Reference Services. Using Analytic induction - a model for qualitative research design, this study carefully examines Library reference services in relation to AI-based solutions for selective Information dissemination. The result of this study is a discussion on how AI, which has Machine Learning paradigm underneath, can now be tuned to Knowledge Assimilation and Dissemination agents in an academic digital Library.

Keywords: Digital Library, Reference services, Artificial intelligence, Information dissemination

INTRODUCTION

Access to the right information in a library is about to get worse than tedious for users if reference librarians do not get helping hands. This is a reality that is encroaching every digital library that have not improved or designed its system to assist reference librarians with automatic dissemination.

Reference librarians also known as subject librarians are to recommend, interpret, evaluate, and/or use information resources to help patrons (or users) with specific information needs (American Library Association, 2016). Apart from requesting for on-desk services, reference is increasingly conducted via phone calls, chat and email. If online book stores are now very smart with almost accurate recommendations, then a digital Library cannot afford to offer less.

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According to Jadhav (2018, p. 170), human-machine partnership will not only help automate and coordinate our lives, but it will also transform how Knowledge Repository products and services will support professional development.

At this point, it is important to revisit a clear definition of a Library, to have an insight of how the objective of an ideal Library will be disrupted in the case of unfitting reference services.

A library is a collection of resources in variety of formats that are:

- Organized by information professionals or other experts;
- Physically, digitally, bibliographically, or intellectually convenient to access;
- In line with target services and programs;
- Provided with the aim of educating, informing, or entertaining a variety of audience;
- Meant to stimulate individual learning and advance the society as a whole. (George, 2010)

Today's information technology provides numerous solutions for real-time and selective dissemination of information. These solutions are most recently, delivered as AI (Artificial Intelligence) powered systems which leverage Machine Learning and Big Data at its core. What we get from such systems includes;

- Highly accurate suggestions,
- Chained follow-up services,
- Real-time broadcast,
- Smart backend resource management,
- Highly customizable user Interface,
- Sporadic data generation and reasonable pattern detection,
- Ever increasing knowledge base and so much more.

The challenge is in not only staying abreast of new trends in information delivery but also in putting it to best use for patrons (or users) whether in providing reference materials or as a reference transaction format. (Louise, 2006)

In an era where information goes after the users, it is not expected that providers who sit back to have users find them, remain relevant. Information is being generated at a high rate in today's world, even in narrow subject areas, which makes it difficult for researchers to keep themselves abreast of new developments in their fields. Hence, there is a need for optimal awareness services to meet such needs especially from an academic repository. Reference services are getting more complicated for subject Librarians due to increasing interdisciplinary research topics and team work. This reflects a need for a knowledge support system to help Librarians maintain contact with relevant materials for their users. Information formats and medium are now more than it was, few decades ago. It was mainly journal or periodical for the serials. Now we have conference papers, technical reports, patents, theses, and standards, all ranging from hard to multi-type electronic formats. This is that age where information spills on

every gadget even those with the poorest internet access. Therefore, today's library services have to thread such competitive path, so as to reach their target audience, patron or users.

The aim of this study is to initiate a digital library reference solution that offers prompt and relevant services in an era of highly competitive technologies such as AI.

This paper therefore, focuses on outlining the core constituents of library reference services. Next is a brief and theoretical introduction to Artificial Intelligence. Finally, a modular discussion on how new or basic digital library reference services can be optimized to inhibit Knowledge Assimilation and Dissemination agents with the use of Artificial Intelligence.

TAXONOMY OF LIBRARY REFERENCE SERVICES

Library Reference Service is defined as a part of library administration that deals with the assistance given to patrons in their use or quest for resources of the library. According to Kumar (2003), reference service helps to establish contact between a user and the right document at the right time, thereby saving the time of the user. (as cited in Fehintola & Adeniyi, 2011)

Credited with the "founding" of library reference service, Green (1876) said in a paper read at a meeting of the American Library Association, "A librarian should be as unwilling to allow an inquirer to leave the library with his question unanswered as a shop-keeper is to have a customer go out of his store without making a purchase."

Categories of Library Reference Services

In line with Green's illustration, library reference service has evolved over the years to constitute the following major categories and respective functions;

- Bibliographic Compilation: Subject bibliographies are compiled on requests from the users or on a regular basis in anticipation of users' needs. At times, bibliographies are compiled on special occasions, such as during seminars and workshops to provide the participants with the latest literature on the subject. (LIS, Module 4).
- Information Literacy: According to Tewell (2018), this involves developing instructional programs designed to teach library users how to find and evaluate information. An implementation of such programs is the introduction of "Use of Library" as a general course to be offered in all Nigeria tertiary institutions.
- Current Awareness Services (CAS) and Selective Dissemination of Information (SDI): Current awareness services focus on keeping users abreast of current developments in their respective field. With the inclusion of SDI, users gets alerts of more individualized development based on indicated interest or recommendation.

- Advisory Services: This is a fundamental aspect of reference services that is involved in, but not limited to suggesting library resources to users based on the need discovered by the librarian directly, through conversation or indirectly.

The Reference and User Services Association (RUSA) of the American Library Association has summarized these functions in its issued guidelines for the development and delivery of such services, which states, "Information services in libraries take a variety of forms including direct personal assistance, directories, signs, exchange of information culled from a reference source, reader's advisory service, dissemination of information in anticipation of user needs or interests, and access to electronic information." (RUSA, 2004, p.1).

Traditionally, the above services have been offered by persons at a designated desk known as the reference desk, within the library building, and can also be reached through telephone or mailed correspondence. To meet the information needs of the users in changing technological environment digital reference service is a natural solution which is supposed to be an advancement of the traditional reference service. (Chandwani, 2009).

Digital Reference Services

Digital reference service can be defined as the provision of reference services involving computer-based collaboration between library user and librarian over a digital network. Over time, the major role that digital reference services have attempted to improve is the communication between the Librarian and the users. On this basis, the following two categories of digital reference services were derived;

1. Asynchronous: This is a mode of communication between the Librarian and the users that does not involve instant feedbacks or real-time communication. Email is the oldest digital tool in this category and another commonly used tool is Web-forms which is provided on the library website.

2. Synchronous: As opposed to Asynchronous digital reference services, this category features real-time or instant communication over a digital network. Tools that are commonly promoted for such communication include Instant messengers which are test-based/instant messaging apps and Video Conferencing or VoIP (Voice over Internet Protocol) solutions.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is an area of computer science that that focuses on creating mostly software solutions that are capable of performing pseudo-human intellectual tasks.

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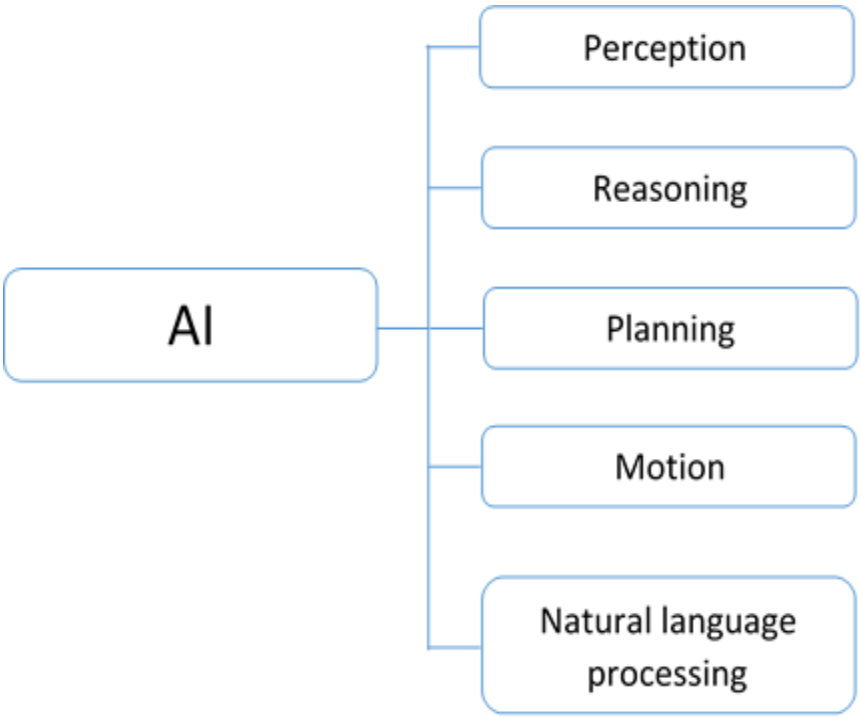

Figure 1: Branches of Artificial Intelligence

The above-mentioned branches imply that AI technologies can respectively, understand images, audio, and other media/physical objects, reasoning gives it the power to answer questions seamlessly from a self-grown or pre-stored knowledge base. It can infer the required steps to reach a goal in terms of planning, from its understanding of an environment, dynamic motion becomes possible. Lastly, understanding human language is a branch that has attracted so many contributions with significant success.

Machine Learning

Machine learning is an application of AI that provides a system the ability to perform specific tasks effectively without using explicit instructions, relying on patterns and inference instead. These patterns are mostly the result of BIG DATA processes.

Big Data

Big Data is a field that treats ways to analyze, systematically extract information from, or otherwise deal with data sets that are too large to be handled traditionally, to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.

Bibliographic Compilation and AI

Upon a request for bibliographic compilation by the user, the regular digital system will generate results based on keyword occurrence and in the order by which the data is

stored (ascending or descending). Artificial intelligence can optimize this process to yield a better result in the following ways.
Suggest complete sentence to keywords upon typing, which are not compulsorily exact. Thereby, offering options of other bibliographies that could be helpful or even better.
The result of a search is not based on the keyword by which it was stored or statically programmed but on relevance, which considers keyword density in the main text, past search patterns, interest of the researcher, location and other information that cannot be gotten in a single or day-long conversation. The speed of generating result is improved through stored usage model built from each user over time. This is why lots of tech analyst say "Google knows us better than we know our selves". The results are fast and just what we want. Librarians can now take break from the other end of the system by allowing AI to give a helping hand.

Information Literacy and AI

A scholar or researcher may find it difficult to use the library resources over time and develop disinterest for all of its services. Orientation programmes may have been organized but it remains a fact that not all fresh men or audience got it in that event.
AI can step in to improve literacy and even promote the use of the physical library facilities. Here is how; with AI-Powered learning tools, library instructions and guides can be passed to users at their most convenient spot, time and with individualized content. To add thrills, a virtual reality tour guide for the library can be provided to scholars even before they step into the library for the first time. This will educate and take care of those that will not want to ask their way within the library.

CAS and SDI with Artificial Intelligence

RSS feed, e-alerts or push notifications are quite handy for CAS but for SDI, only a tip has been explored. SDI as it is mostly practiced in digital reference services, deals with disseminating information to users based on interests which were indicated during signups, and/or research period. Just as we have in today's digital marketing sphere, it is expected that SDI moves a bit further with Artificial intelligence to achieve the following:

- Provide environment-based information which will vary as the user changes location.
- Refine users' interest based on regular library usage pattern rather than wait for the user to adjust his/her preference settings.
- Get feedback from users' interaction with notifications such as "opened", "not opened" and if a negative feedback is significant then interest should be reviewed.

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AI Based Advisory Services

Also powered by machine learning, an AI based Reference advisory service will not just offer suggestions or learning advices to users who requests for such services, but offer a prompt and data-driven service even when a user has not realized a deficiency in learning or the need for such support. AI systems can go as far as recommending contemporary resources that will help to resolve the user's mood and improve motivation for learning. Relevant quotes can also be served with close follow up analytics and restructuring.

All of these solutions and more are already in today's AI Virtual assistant solutions. The most popular virtual assistants are currently Amazon Alexa, Apple's Siri, Google Now and Microsoft's Cortana.

CONCLUSION

It is important to know that Artificial Intelligence in the provisioning of library reference services, does not take the place of a reference librarian rather, it assists the librarian with offering a service that meets the technological expectations of today's users. With the application of AI, it is seen that increasing interdisciplinary research topics can have the most useful bibliographies. Increasing amount of data from internal and external repository can now be optimally analyzed to match the individual needs of users. This brings in the AI-powered Knowledge Assimilation agent that can generate knowledge from library resources and user's system interaction through machine learning. Thus, keeping the Library as a whole at a relevant position in the institution and raising scholars that are data rich.

RECOMMENDATION

Academic Libraries don't have to build systems that are as sophisticated as Amazon Aleza and the other examples, but can build a model from some of its features for reference services. For cost efficiency such project should be delivered in phases and analyzed on regular basis for machine errors with steady staff availability for escalated support.

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